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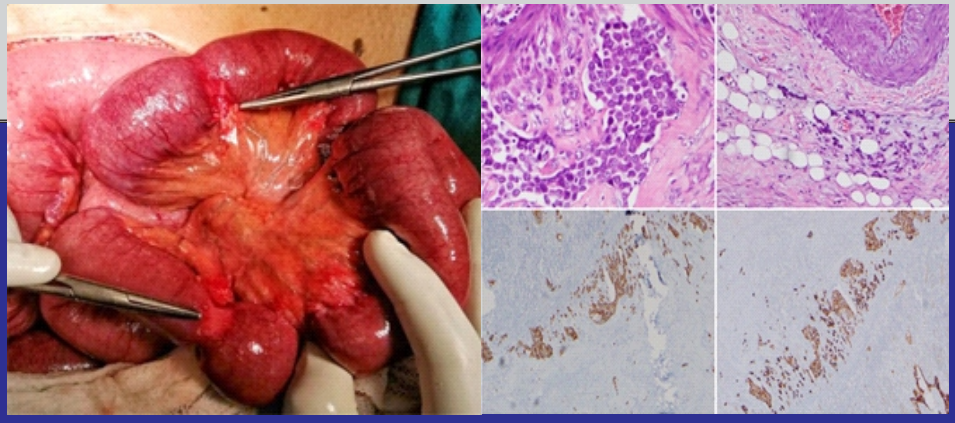

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Case Studies

LEADING ARTICLE

Resuscitative endovascular balloon occlusion of aorta (REBOA): expanding the window of survival in massive bleeding

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Keywords: REBOA in Sri Lanka; resuscitative endovascular balloon occlusion of Aorta; exsanguinating torso haemorrhage; REBOA; damage control; damage control; endo vascular trauma management; preventable trauma deaths

Introduction

Exsanguinating haemorrhage is responsible for 30 to 40% of early deaths from trauma, and most of these deaths occur within the first few hours of injury [1]. A study by A. Alarhyem et al. in 2016 revealed a precipitous rise in trauma deaths in victims with high-grade injuries with pre-hospital time <30 min [2]. The tenet of limiting time at the scene with rapid transport to definitive care (scoop and run) within this time frame is unrealistic and requires a different approach. It is estimated that nearly half of the deaths in the resuscitation room of the National Hospital of Sri Lanka is due to unattended exsanguination from trauma to the torso. An immediate intervention to stop exsanguination from torso trauma has been the focus for several decades. Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) is being explored primarily for this purpose. Advancing this novel strategy to trauma victims in the early phase of care may expand the window of survival to definitive care.

First described for trauma patients during the Korean War, aortic balloon occlusion has been in clinical use for more than 25 years in the field of vascular surgery, mainly as part of the treatment algorithm in ruptured abdominal aortic aneurysms (rAAA) and endovascular aortic repair (EVAR) [3]. Due to developments in endovascular techniques and catheter technology, REBOA has emerged and gained popularity in the last few years as a method for bleeding control in trauma. It is a relatively simple, minimally invasive method to temporarily occlude the aorta aiming at reducing the bleeding, gaining hemodynamic stability and maintaining perfusion to the heart and brain, thus, fundamentally gaining time to definitive surgical management [4].REBOA is one of the tools of EndoVascular resuscitation and Trauma Management (EVTM), a multidisciplinary concept that has been developed in recent years and published in several high impact journals, textbooks and manuals (Figure 1) [5].

The EVTM concept aims to combine modern endovascular and hybrid techniques and procedures, such as REBOA with traditional Advanced Trauma Life Support (ATLS) and Definitive Surgical Trauma Care (DSTC) for early multidisciplinary evaluation, resuscitation, and definitive management of hemodynamically unstable patients. This concept does not replace traditional surgery but instead incorporates all available tools into a common trunk. These tools and REBOA are just one of them, maybe used in both traumatic and non-traumatic causes of hemodynamic instability and can also be used in pre-hospital or austere environments with limited resources to focus medical resources and attention on the appropriate needs of the patient [6].

Figure 1. The EVTM concept displaying all aspects and parts of this multidisciplinary, patient centered model.

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REBOA technique, indications, and contraindications

In general, REBOA is used for bleeding control in non-compressible torso haemorrhage and aims at maintaining systolic blood pressure >80 mmHg and mean arterial pressure >50 mmHg for adequate perfusion to the brain and heart. It can be used in the zone I (descending thoracic aorta), zone III (infra-renal abdominal aorta) and in certain situations in zone II (para-renal/visceral) or iliac arteries [4]. The procedure itself is considered to be minimally invasive and done via a common femoral artery vascular access. In reality, as REBOA occludes the aortic blood flow, it becomes a highly invasive procedure that causes significant physiological changes that may, in turn, cause significant reperfusion injury and even mortality [7]. In recent years, the concept of partial aortic occlusion (pREBOA) or intermittent use of REBOA (iREBOA) was developed in order to mitigate the ischemia-reperfusion injury followed by REBOA use (especially zone I REBOA) [8].

While its use has been described in trauma and vascular surgery, it also has a major role in non-traumatic bleeding and resuscitation as part of the EVTM concept [6], with indications and contraindications for its use continuing to evolve. Existing evidence from case reports, animal and cohort studies suggest its use in both blunt or penetrating trauma; gastrointestinal (GI), obstetric- and gynaecology-derived bleeding events; visceral aneurysm rupture; thoracic and abdominal aortic aneurysm rupture; post-abdominal surgery; iatrogenic injuries; and, potentially, in both traumatic and non-traumatic cardiac arrest [6,9]. The lack of level 1 evidence such as randomized controlled trials, however, prevent consensus. Currently, there is only one ongoing randomized controlled trial, the UK-REBOA trial, with results hoped to be published within the upcoming years [10].

Some claim that the use of REBOA should be limited, as aortic occlusion and hemodynamic control can be obtained by laparotomy or thoracotomy. This is true, however, both procedures have their obvious limitations. They require many years of training and a high level of surgical experience, have a high threshold to be performed, are difficult to accomplish outside of an operating theatre and result in tremendous surgical insult to the patient with a high risk of associated complications. Vascular access, on the other hand, is usually described as the rate-limiting step of REBOA [11].

The suggested use of REBOA has been mainly in-hospital [5,6,12]; however, pre-hospital use has been reported in around 60 known cases in military and selected civilian reports [13] as well as in some unpublished data. The pre-hospital use of zone I (descending thoracic aorta) occlusion with REBOA has previously been controversial, especially in the case of thoracic trauma. However, recent studies report that 3-10% of pre-hospital major trauma patients may benefit from the use of REBOA [14].

Complications of the procedure

As with open occlusion of the aorta, REBOA is also associated with some major complications. These can mainly be divided into complications associated with vascular access, balloon positioning and occlusion time. The previous need for large sheath sizes (10-12 Fr) was a critical factor for access-related complications, now less common with the newer REBOA devices that only require a 7 Fr sheath and only external compression on removal (Figure 2) [15]. Complications such as distal embolization, air emboli, dissection and peripheral ischemia are access related, but can generally be avoided to a large extent with proper training. This is also to an extent true regarding complications associated with balloon positioning and inflation, such as aortic dissection, overinflation and aortic rupture and perforation. Complications related to occlusion time are one of the greatest limitations to REBOA. Prolonged ischemia followed by reperfusion can result in multiple organ failure and death [7]. This is to some extent avoided with the use of pREBOA or iREBOA, however, still poses a severe risk. There are still no clinical major trials that show the benefit of these methods. The ABOTrauma registry, as the AORTA USA registry, are collecting data on REBOA use and data is published continuously from the registries.

Figure 2. The EVTM "REBOA 2 GO" bag. Always contains 2 REBOA catheters, one 7 Fr introducer, one 8 Fr introducer, one micro puncture set, one 8 Fr Angio seal.

To be able to perform REBOA in a correct and safe way requires proper training and a multidisciplinary team. It is important to remember that REBOA does not treat the bleeding patient but allows time for definitive management. We highly advise using REBOA as part of the EVTM concept. It is not a risk-free procedure, and if performed incorrectly can cause more harm than good. It is therefore paramount that REBOA is to be used in highly selected patients with the correct indications.

Sri Lankan perspective

In April of 2020, a virtual REBOA/EVTM training program was telecast live at 5 centres island-wide to familiarize vascular and general surgical trainees/surgeons with basic concepts and skillsets of REBOA. A cadaver-based training program was conducted at the Department of Anatomy, Faculty of Medicine, University of Colombo. Vascular surgeons and residents had hands-on training on fresh cadavers and performed ultrasound-guided femoral arterial puncture and insertion and inflation of the REBOA catheters at the specified zone in the aorta. Currently, we are designing a cadaver-based training model at the University of Colombo with guidance from the vascular surgical department at Örebro University Hospital, Sweden.

Challenges, strategies, and future projection

We believe that REBOA is a viable tool for trauma management in Sri Lanka. To achieve expected goals, we have identified the following issues to be addressed and to seek remedial strategies. Lack of island-wide Emergency Medical Services (EMS) with highly trained paramedics result in most survivable trauma victims perishing on the roads. The current Sri Lanka College of Surgeons endeavour to support the Ministry of Health project to expand and upgrade EMS and Accident and Emergency (A&E), should also include REBOA training and service provision at the early in-hospital trauma care. Paramedics should be trained to identify, resuscitate and keep alive exsanguinating REBOA candidates till the victim reaches A&E, where an activated REBOA team awaits to take over. When the system matures, pre-hospital REBOA will be a viable extension to the REBOA services.

Organizing 24/7 REBOA services at the National Hospital of Sri Lanka as a pilot project necessitates teams to be trained, logistics to be worked out and surgeons and anaesthetists to be connected with a shared vision. Following this pilot project, new centres should be identified and prepared for the next stage. Ministry of Finance and Health officials need to be briefed and convinced on the benefit of spending an initial capital to gain dividends to the economy by a number of life-years saved upon implementation of this and other trauma initiatives.

The high annual trauma workload in Sri Lanka will provide an opportunity to collate sizable experiences on REBOA in a short period of time and collaborative research endeavours will provide an opportunity to share Sri Lankan experience on a global platform. Global collaboration with a shared vision to refine REBOA is the aim of the EVTM leadership with the moto "*No ego, just good science and collaboration*".

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Cothren CC, Moore EE, Hedegaard HB, Meng K. Epidemiology of urban trauma deaths: a comprehensive reassessment 10 years later. World J Surg. 2007;31(7):1507-1511. https://doi.org/10.1007/s00268-007-9087-2
2. Alarhayem AQ, Myers JG, Dent D, et al. Time is the enemy: Mortality in trauma patients with hemorrhage from torso injury occurs long before the "golden hour." Am J Surg. 2016;212(6):1101-1105. https://doi.org/10.1016/j.amjsurg.2016.08.018
3. Mayer D, Aeschbacher S, Pfammatter T, et al. Complete replacement of open repair for ruptured abdominal aortic aneurysms by endovascular aneurysm repair: a two-center 14-year experience. Ann Surg. 2012;256(5):688-695; discussion 695-696. https://doi.org/10.1097/SLA.0b013e318271cebd
4. Stannard A, Eliason J L, Rasmussen TE. Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) as an Adjunct for Hemorrhagic Shock. Journal of Trauma and Acute Care Surgery. 2011;71(6):1869-1872. https://doi.org/10.1097/TA.0b013e31823fe90c
5. Hörer T. Resuscitative endovascular balloon occlusion of the aorta (REBOA) and endovascular resuscitation and trauma management (EVTM): a paradigm shift regarding hemodynamic instability. Eur J Trauma Emerg Surg. 2018;44(4):487-489. https://doi.org/10.1007/s00068-018-0983-y
6. McGreevy DT, Sadeghi M, Nilsson KF, Hörer TM. Low profile REBOA device for increasing systolic blood pressure in hemodynamic instability: single-center 4-year experience of use of ER-REBOA. Eur J Trauma Emerg Surg. Published online January 30, 2021. https://doi.org/10.1007/s00068-020-01586-9
7. Sadeghi M, Dogan EM, Karlsson C, et al. Total resuscitative endovascular balloon occlusion of the aorta causes inflammatory activation and organ damage within 30 minutes of occlusion in normovolemic pigs. BMC Surg. 2020;20. https://doi.org/10.1186/s12893-020-00700-3
8. Sadeghi M, Hörer TM, Forsman D, et al. Blood pressure targeting by partial REBOA is possible in severe hemorrhagic shock in pigs and produces less circulatory, metabolic and inflammatory sequelae than total REBOA. Injury. 2018;49(12):2132-2141. https://doi.org/10.1016/j.injury.2018.09.052

9. McGreevy DT, Abu-Zidan FM, Sadeghi M, et al. Feasibility and Clinical Outcome of Reboa in Patients with Impending Traumatic Cardiac Arrest. Shock. 2020;54(2):218-223. https://doi.org/10.1097/SHK.0000000000001500
10. Jansen J O, Pallmann P, Mac Lennan G, Campbell M K, U K-REBOA Trial Investigators. Bayesian clinical trial designs: Another option for trauma trials? J Trauma Acute Care Surg. 2017;83(4):736-741. https://doi.org/10.1097/TA.0000000000001638
11. Matsumura Y, Matsumoto J, Kondo H, et al. Early arterial access for resuscitative endovascular balloon occlusion of the aorta is related to survival outcome in trauma. J Trauma Acute Care Surg. 2018;85(3):507-511. https://doi.org/10.1097/TA.0000000000002004
12. Hörer T, DuBose JJ, Rasmussen TE, White JM. Endovascular Resuscitation and Trauma Management: Bleeding and Haemodynamic Control. Springer Nature; 2019. https://doi.org/10.1007/978-3-030-25341-7
13. Lendrum R, Perkins Z, Chana M, et al. Pre-hospital Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for exsanguinating pelvic haemorrhage. Resuscitation. 2019;135:6-13. https://doi.org/10.1016/j.resuscitation.2018.12.018
14. Duchesne J, Taghavi S, Houghton A, et al. Prehospital Mortality Due to Hemorrhagic Shock Remains High and Unchanged: A Summary of Current Civilian EMS Practices and New Military Changes. Shock. Published online February 19, 2020. https://doi.org/10.1097/SHK.0000000000001522
15. DuBose RJ, Morrison J, Brenner M, et al. AORTA Registry 7F vs 11-12 F access: AORTA registry access size. Journal of Endovascular Resuscitation and Trauma Management. 2019;3(1). https://doi.org/10.26676/jevtm.v3i1.79

SCIENTIFIC ARTICLE

A study to determine the patient satisfaction and quality of services at the outpatient urology clinic of a tertiary care hospital

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Keywords: Service quality; patient satisfaction; outpatient clinic; urology; surgical clinic

Abstract

Introduction

Patient satisfaction is one of the benchmarks by which the quality of health care services is evaluated. The objective of this study was to assess the patients' satisfaction with services delivered at the urology outpatient clinic of Colombo South Teaching Hospital (CSTH), Sri Lanka.

Method

A descriptive cross-sectional study was done over three months (1.12.2019 – 28.2.2020) at the urology outpatient clinic of a tertiary care hospital in Sri Lanka. A pre-tested, self-administered questionnaire based on the SERVQUAL questionnaire was used to collect data. Seven questions were based on demography and eighteen were aimed at assessing responsiveness, tangibles, empathy and reliability. The Likert scale was used to determine the level of satisfaction.

Results

The study sample constituted of 220 patients. Nearly one third (32%) of them felt the waiting time to be registered at the clinic and to meet a doctor were too long. More than half (59%) said the clinic was overcrowded. However, over 90% of the patients perceived that staff characteristics, laboratory services and waiting time from the date of referral to the clinic appointment were satisfactory. Nearly 93% of the participants would recommend the clinic to a friend or a relative for seeking treatment.

Conclusions

Although patient satisfaction was good in many domains, by developing a better mechanism of giving appointments spread throughout the clinic, patient satisfaction and the quality of services provided at the urology outpatient clinic can be improved further.

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Introduction

Service quality is defined as the outcome of an evaluation process where the consumer compares their expectations with the service they have received [1]. Healthcare quality has two separate components, namely technical quality and functional quality [2]. Technical quality refers to the accuracy of clinical diagnosis and surgical procedures and is understandable to medical professionals. Patients perceive functional quality, which includes the satisfactoriness of the service delivery process [3]. Patient satisfaction is used as a benchmark for the evaluation of the quality of health care services of a health care facility [4].

Hence, patient satisfaction is an essential component in the evaluation of health services in addition to the medical outcome and cost of care [5]. Patients' opinions and perceptions can add to the usual indicators of quality in health care as it serves as an important source of information in recognising deficiencies and drawbacks in an institute [6]. Hence, in clinical practice, surveys on patient satisfaction may provide useful data on issues that need change. Furthermore, such information may serve as feedback to clinical staff to identify gaps between patients' expectations and perceptions. This would ensure that the best possible care is delivered to the patients. These reasons have made patients' opinions about health care services an important yardstick and patient satisfaction surveys have been made mandatory in the developed world [7,8].

Sri Lankan health services are recognized globally as a successful low-cost model. This laudable result is believed to be due to the universal adult franchise gained in 1931, high female literacy rate, free education system and free at the point of delivery health care delivery system established in 1951 [9]. According to Universal Health Coverage (UHC) accepted by the United Nations General Assembly in September 2015, we should ensure all people have access to promotive, preventive, curative, rehabilitative and palliative health services when needed and that services should be of good quality [10]. Although Sri Lanka plans to achieve UHC and Sustainable Development Goals and given priority to such policies very few studies had been conducted to evaluate the achievements and challenges in maintaining sufficient quality in the health care delivery system as specified in UHC.

Colombo South Teaching Hospital (CSTH) is the second-largest Teaching Hospital in Colombo District with 1110 beds. Approximately 1200 patients seek services at the outpatient department daily and 120 patients in the urology clinic per day which are held once a week. Though the quantity of work performed at the urology unit of CSTH has been high despite limited bed strength, the quality of services as perceived by patients has not been studied before [11,12]. Few studies have evaluated the patient satisfaction of services provided by outpatient departments of several hospitals in Sri Lanka [13]. However, studies to determine patient satisfaction at specialized clinics of hospitals in Sri Lanka are scarce.

The objective of this study was to assess the patients' satisfaction with services delivered at the urology outpatient clinic of CSTH, Sri Lanka.

Method

A descriptive cross-sectional study was conducted among patients attending the urology clinic of CSTH from 1 December 2019 to 29 February 2020. Data were collected using a self-administered questionnaire. However, an interviewer was available for any clarifications or help during the completion of the questionnaire. The member of the research team (KPD) who instructed and helped the potential participants and distributed the documents was not a member of the clinical team or the office staff of the urology clinic. This fact was informed to the study participants to minimize the bias that could result when giving information about staff performance.

SERVQUAL questionnaire which is adopted by service quality researchers and practitioners widely and has been proved to be useful in the health sector by many researchers was used for the survey [14,15]. After a pilot study, it was modified to ensure suitability for meeting the study objectives in the urology clinic of a government hospital in Sri Lanka. The questionnaire was translated into Sinhala and Tamil and those versions were back-translated to ensure validity with the help of linguistic experts. The modified questionnaire has basic demographic information and 18 multiple-choice questions aimed at patients' expression on different aspects of the functional quality of services rendered at the urology clinic. The response was based on a Likert scale. The questions were aimed to assess different domains of service quality - eight questions were to assess responsiveness, four for tangibles, three were on empathy, two for assurance and one on reliability.

The sample size was calculated using the Lwanga and Lemeshow formula. As there were no studies found on a similar population on patient satisfaction, the prevalence was set as 50% and estimated that 50% of the study population was satisfied with the received services, the highest sample size was calculated. The estimated sample size was 187. By taking into consideration an anticipated non-response rate of 15%, the final sample size was 220.

A systematic sampling method was used and every fifth patient seen at the urology clinic during the study period was recruited to the study. The inclusion criteria were adult patients who have attended the clinic at least twice before and volunteering to participate in the research. The newly registered patients on that day and those who did not give consent for the study or were seriously ill to fill the questionnaire were excluded from the study. Data were collected on consecutive clinic days during the three months study period. The approval for the study was obtained from the Ethics Review Committee of the Institute.

Results

A total of 222 patients completed the questionnaire. Two patients were removed from the analysis as they were new patients coming for the first time. The data belonging to the remaining 220 patients were analysed. Most patients (51.4%) were between 55-74 years of age (Table 1). The male to female ratio was 3.6:1. Of the study sample, 172 (78%) patients had studied up to GCE (O/L) only. Nearly half of the patients (109 patients, 49%) had travelled more than 20 km to arrive at the hospital. The urinary stone disease was the commonest (90 patients, 40.5%) illness among the patients. Malignancies were seen in 5.4% (12 patients).

Results of the patients' perceptions regarding the individual questions of the questionnaire are given in Table 2. Patients' detailed responses to few selected questions are given in table 3. Most patients have indicated satisfaction over questions related to tangibles, assurance, empathy and reliability. The areas where patients showed less than 50% satisfaction belonged to responsiveness. The waiting time before registration and to see a doctor was more than one hour for 55.9% and 81.5% of patients respectively. Furthermore, even in areas where the majority of the patients showed satisfaction, the proportion of very happy patients was around 10% (Table 3).

Discussion

Patient satisfaction surveys are used by administrators of health care institutes to improve the surroundings of the institute and facilities and resources available to patients [16]. However, the efficacy of patient-based feedback to improve the skills and attitudes of staff members who provide health care remains controversial [8]. This may be because most such surveys have been initiated and performed by administrators and managers rather than the care providers themselves. In contrast, this study was initiated and

Table 1. Socio-demographic data of the study population

Socio-demographic characteristics n=220	Frequency	%
Age category		
<18 years	2	0.9
19-34 years	10	4.5
35-54 years	69	31.5
55-74 years	114	51.8
>75 years	25	11.3
Gender		
Female	48	21.6
Male	172	78.4
Level of Education		
up to grade 5	41	18.5
up to G.C.E. (O/L)	130	59.5
up to G.C.E. (A/L)	43	19.4
Degree	6	2.8
Distance in km		
1-10	56	25.4
11-20	56	25.4
21-30	66	30.2
31-50	30	13.5
>50	12	5.4
Diagnosis		
Urinary tract infection	34	15.3
Calculi	89	40.5
Malignancies	12	5.4
Benign Prostatic Enlargement	29	13.1
Others	56	25.7
Total	220	100

performed by the care providers themselves. Hence scepticism is less likely and chances of inducing changes based on study results are more likely.

According to the study, areas where patients showed the most dissatisfaction were waiting time for registration at the clinic and consultation of a doctor and toilet facilities of the hospital. Therefore, the important areas that need to be developed are the implementation of an appointment system based on the exact time for consultations. Although medical staff starts the clinic even before the scheduled time of 8 00 am, there is no mechanism to give specific time slots for individual patients. Therefore, almost all patients arrive at the clinic well before the start time of the clinic. This leads to long waiting times for registration and consultation. Attempts at scheduling appointments faced practical difficulties as patients travel long distances and use erratic public transport of the country. This makes it difficult for them to arrive at the clinic exactly at the scheduled time. Yet, healthcare providers of the urology clinic need to look at a mechanism to reduce this waiting period as much as possible as this is the weakest area identified by the study. The majority of patients attending the urology clinic are men (78.7%) and this will ensure less time of a working day is lost. This would increase the compliance of men attending follow up visits without a miss.

Although 81.5% had to wait for more than one hour to meet the doctor since the arrival at the clinic, 62% were satisfied with the waiting time. It has been shown that dissatisfaction by patients is only expressed when extremely negative events occur [17]. This is more so in Asian countries like Sri Lanka where socio-cultural traditions are such that most patients allow a bigger margin of error before they criticize the health care system which is free of any cost at the point of delivery. To minimize this bias, the study activities like an explanation regarding the study, distribution of questionnaires and filling documents were done in a separate area of the clinic by an investigator who is not a member of the clinic staff. Nevertheless, healthcare providers of the urology clinic should not be complacent about lower rates of patient dissatisfaction.

Although only 17% were dissatisfied with the toilet facilities it is known that when it comes to physical facilities, patients compare it with what they have at home [17]. Therefore, we should consider it as an overestimation of the quality of toilet facilities and attention should be paid to improve it.

Adequacy of space is a perennial problem in tertiary care state hospitals of Sri Lanka due to the expansion of population in surrounding towns and limited availability of land. This leads to space allocation for waiting areas a low priority, when designing clinics and wards. This can be overcome by improving regional hospitals and giving more resources to upgrade the subspecialty units so that patients do not have to travel long distances for specialized services. In Sri Lanka, the state provides a free medical healthcare facility within 4.8 km of every household [9]. However, about 49 % of patients in this study cohort have travelled more than 20 km and this can be prevented by upgrading regional urology units with resources.

It is interesting to see that contribution of both doctors and other health care workers to patient satisfaction have been equally good. There is a general notion that in Sri Lanka health care assistants are recruited based on political affiliations, rather than skills-based objective assessments. This is being criticized as a negative aspect of the Sri Lankan health sector requiring a change in recruiting policy. However, the health care assistants of the urology clinic have performed well in domains like communication and empathy challenging such a notion. Whether this can be extrapolated to all health care assistants in the Department of Health is

Table 2. Patients' response to different questions

Domain	Category	Satisfied		Not satisfied		No comment	
		Number	(%)	Number	(%)	Number	(%)
Responsiveness	**Actual time duration**						
	from referral to clinic	205	(93.2)	15	(6.8)		
	Appointment for registration in the clinic	97	(44.1)	123	(55.9)		
	to meet a doctor	83	(37.7)	137	(62.3)		
	to obtain medicine	118	(53.6)	58	(26.4)	44	(20)
	Perception on time						
	to obtain a date for the clinic	218	(99)	2	(1)		
	to register at the clinic	141	(64.1)	79	(35.9)		
	to meet the doctor	138	(62.7)	82	(37.3)		
	to get laboratory tests and issuing reports	167	(75.9)	15	(6.8)	38	(17.3)
Tangibles	Space of the clinic	175	(79.5)	45	(20.5)		
	Toilet facilities	141	(64.1)	42	(19.1)	37	(16.8)
	Crowdedness	161	(73.2)	59	(26.8)		
	Staff	176	(80)	64	(20)		
Assurance	Treatment received	214	(97.3)	6	(2.7)		
	Help received to improve knowledge	208	(94.5)	12	(5.5)		
Empathy	Treated everyone equally	217	(98.6)	3	(1.4)		
	Helpfulness of the staff	218	(99)	2	(1)		
	Time taken to explain	207	(94.1)	13	(5.9)		
Reliability	Recommend to a friend/ family	212	(96.4)	8	(3.6)		

questionable. One of the strongest areas of the urology clinic is its ability to give the referred patients an appointment to see the specialist within a week. This is very important to prevent privileged patients from jumping the queue for clinic appointments. This eliminates bribery and corruption that pervades developing countries during the provision of services of state institutes [18]. Sri Lanka is ranked 93rd in the hierarchical order of countries in the world based on the corruption perceptions index – the first being the country with the least corruption [19].

Although patients have felt satisfied in most service delivery areas the proportion who rated those as very good is low in almost all domains. This has to be addressed in the future if we are to improve the quality of services further at the urology clinic. Organising staff development programmes for the health care delivery team members may be relevant in this regard to induce behavioural changes among individuals and to discuss effective means of developing a patient appointment system.

A higher level of patient satisfaction enhances the compliance of patients to treatment which could lead to positive outcomes of the disease itself [20]. This is especially relevant for long-term management of main urological illnesses like stone disease, prostate problems and cancers which had constituted 58% of the patient population at the urology clinic. Therefore, steps taken to improve patient satisfaction will lead to improved disease outcomes too. This fact is ignored by most practising clinicians who believe that medications and surgical procedures only would benefit patients. At present funds are mostly diverted for improving technical quality with little attention towards functional quality [9]. It is time we try to achieve the right balance between the two.

Results from patient satisfaction surveys might be perceived

Table 3. Patients' response in detail to some selected questions

Patient satisfactory questionnaire characteristics	Frequency	%
Time period from referral to clinic appointment		
Less than 1 week	204	92.8
1-2 weeks	9	4.1
3-4 weeks	6	2.7
More than 4 weeks	1	0.4
Time taken for registration at the clinic		
<30 min	61	27.9
30 min-1 hr	36	16.2
1-2 hrs	87	39.6
>2 hrs	36	16.2
Time taken to meet the doctor		
<30 min	7	3.2
30 min-1 hr	64	29.3
1-2 hrs	149	67.6
>2 hrs	7	3.2
Space of the waiting area		
Very good	21	9.5
Good	102	46.4
Satisfactory	53	24.3
Poor	43	19.4
Very poor	1	.5
Access to toilet facilities		
Very good	4	1.8
Good	65	29.7
Satisfactory	65	29.7
Poor	32	14.4
Very poor	6	2.7
Never used sanitary facilities	48	21.6
Time taken for registration at the clinic		
Very good	15	8.2
Good	62	34.2
Satisfactory	49	26.6
Poor	54	29.9
Very poor	2	1.1
Waiting time before meeting the doctor		
Very good	11	6.0
Good	51	27.7
Satisfactory	62	34.2
Poor	57	31.5
Very poor	1	0.5
Satisfaction on the treatment received for the illness		
Very good	14	6.3
Good	158	71.6
Satisfactory	41	18.9
Poor	5	2.3
Very poor	2	0.9
Time spent by the medical staff for explaining about the illness		
Very good	17	7.7
Good	163	73.9
Satisfactory	27	12.6
Poor	13	5.9
Satisfaction of the helpfulness of the staff in improving the knowledge on the illness		
Very good	15	6.8
Good	154	70.3
Satisfactory	39	17.6
Poor	12	5.4
Total	220	100

as distressing by health care staff [8]. Such anxiety can be prevented if the studies are conducted by the care providers themselves. The Department of health should strive and promote satisfaction surveys conducted by care providers. This can be encouraged if the hospital administrators and managers allocate more funds to improve deficiencies of units that conduct such surveys and identify service gaps objectively. A factor that may have introduced some bias in this study would have been the awareness of both the medical and non-medical staff that the study was ongoing which may have changed their behaviour. However, if such positive behavioural changes would be long lasting, that could be a bonus point for similar studies to be conducted regularly at the unit level.

Although results of patient satisfaction surveys of outpatient department (OPD) services are available, studies on service quality of speciality clinics are scarce in Sri Lanka. The study has important implications for the staff members of the urology team and clinic and for the hospital administrators as the study has correctly identified the areas to be improved to improve the quality of services. Such directed and focused actions would improve the services better than general measures based on assumptions and tradition. Although the study was confined to a single clinic of a surgical sub-speciality of a teaching hospital involving only 220 patients, there is no reason to believe that circumstances are too different in other clinics too. This study instrument can be used to determine the quality of services and to identify gaps realistically in other clinics of the same institute as well as other institutes throughout the country. This would ensure appropriate steps are taken in a focused manner to rectify the deficiencies resulting in improved quality in services of specialized outpatient clinics across the country.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Gronroos C. A service quality model and its marketing implications. Eur J Marketing 1990; 18: 36-44. https://doi.org/10.1108/EUM0000000004784
2. Chakrawarty A. Evaluation of service quality of hospital outpatient department services. Med J Armed Forces India 2011; 67: 221-224. http://doi.org/10.1016/s0377-1237(11)60045-2
3. Bopp KD. How patients evaluate the quality of ambulatory medical encounters. J Health Care Marketing 1990; 10: 6-15
4. Nabbuye-Sekandi J, Makumbi FE, Kasangaki A, Kizza IB, Tugumisirize J, Nshimye E, et al. Patients satisfaction with services in outpatient clinics at Mulago Hospital, Uganda. Int J Qual Health Care 2011; 23: 516-523. https://doi.org/10.1093/intqhc/mzr040
5. Bergenmar Mia, Nylen Urban, Lidbrink Elisabet, Bergh Jonas, Brandberg Yvonne. Improvements in patient satisfaction at an outpatient clinic for patients with breast cancer. Acta Oncol 2006; 45: 550-558. https://doi.org/10.1080/02841860500511239
6. Avis M, BondM, Arthur A. Satisfying solutions? A review of some unresolved issues in the measurement of patient satisfaction. J Adv Nursing 1995; 22: 316-322
7. Sitzia J, Wood N. Patient satisfaction: a review of issues and concepts. Soc Sci Med 1997; 45: 1829-1843. https://doi.org/10.1016/S0277-9536(97)00128-7
8. Boyer L, Francis P, Doutre E, Weil G, Labarene J. Perception and use of the results of patient satisfaction surveys by care providers in a French teaching hospital. Int J Qual Health Care 2006; 18: 359-364. http://doi.org/10.1093/intqhc/mzl029
9. De Silva A, Ranasinghe T, Abeykoon P. Universal health coverage and the health sustainable development goal: achievements and challenges for Sri Lanka. WHO South-East Asia J Public Health 2016; 5: 82-88. http://doi.org/10.4103/2224-3151.206257
10. World Health Organization. Health financing for universal coverage
11. Ambegoda ALAMC, Weligamage WAS, Ishak MCM, Gobi U, Suvendiran S, Mahadeva S. et al. A prospective study to evaluate access to elective surgical services in a urology unit of Sri Lanka. Sri Lanka J Surg 2018; 36: 5-9. http://doi.org/10.4038/sljs.v36il.8474
12. Sutharshan K, Balagobi B, Gajasinghe S, Sasikumar S, Weligamage A, Ishak M. et al., Clinocopathological profile of malignancies treated in a urology unit over a period of five years. Sri Lanka J Surg 2017; 35: 1-5 http://10.4038/sljs.v34i4.8313
13. Kalubowila KC, Perera D, Senathilaka I, Alahapperuma C, Withana RD, Kapparage PD. Patient satisfaction of services at the out-patient department of Base hospital, Panadura. J College Community Physicians Sri Lanka 2017; 23; 63-70. http://doi.org/10.4038/jccpsl.v23i2.8105
14. Rishard MHM, Kodithuwakku SS. As assessment of health service quality: A case of a teaching hospital in central province of Sri Lanka. Trop Agri Res 2008; 20: 251-259
15. Babakus E, Mangold WG. Adopting SERVQUAL scales to hospital services: an empirical investigation. Health Services Res 1992; 26; 767-786
16. Turnbull J, Hembree W. Consumer information, patient satisfaction surveys and public reports. Am J Med Qual 1996; 11: 42-45
17. Williams B, Coyle J, Healy D. The meaning of patient satisfaction: An explanation of high reported levels. Soc Sci Med 1998; 47: 1351-9 http://doi.org/10.1016/s0277-9536(98)00213-5
18. Andaleeb Syed Saad, Siddiqui Nazlee, Khanakar Shahjahan. Patient satisfaction with health services in Bangladesh. Health Policy Planning 2007; 22: 263-273 http://doi.org/10.1093/heapol/czm017
19. https://www.transparency.org/files/content/pages/2019_CPI_Report_EN.pdf (Accessed on 23 October 2020)
20. O'Connor SJ, Shewchuk RM, Trish HQ. Perceptual gaps in understanding patient expectations for health care service quality. Health Care Manag Rev 2000; 25: 7-23 https://doi.org/10.1097/00004010-200004000-00002

SCIENTIFIC ARTICLE

Supine mini percutaneous nephrolithotomy: a method worth considering as the gold standard for treating renal stones – an experience from a tertiary referral centre

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Abstract

Introduction

Mini PCNL was developed with the use of 15 - 18 F sheaths (instead of the conventional 24 - 30 F) to reduce morbidity that is seen in standard PCNL. Performing mPCNL in the supine position further adds to its many advantages including shorter operative time. This largest series evaluates the overall benefits observed in patients undergoing supine mPCNL for the treatment of renal stones in Sri Lanka.

Material and methods

Five hundred and five patients with renal and/or upper ureteric stones (in 509 kidneys) who underwent mPCNL between January 2016 - December 2020 were studied. Radiological evaluation was performed by CT scan. Holmium: YAG laser was used for stone fragmentation using a 12F nephroscope through 15 Amplatz sheath under fluoroscopic guidance. Patients clinical and treatment outcomes were evaluated in terms of stone-free rate, operative time, hospital stay and complications.

Results

Mean age was 48.85 years (14-80). There was a male preponderance. The majority (92.3%) being ASA I and II. The mean BMI was 25.32kgm-2 of whom 42.2% were overweight and 16.8% were obese. The mean stone diameter was 24.5 mm(9-45mm) and density1064Hu. The majority of stones (57.3%) had a GUYS score I while 13.4% were complete staghorn. The predominant approach was a single tract, subcostal lower pole puncture. However, multitrack PCNL was performed in 38(7.5%) patients. The complete stone-free rate achieved was 84.1%. Mean operative time was 87 min while the median hospital stay was 4 days. The overall complication rate was 21.5%(n=109), the majority of which being Clavien Dindo class I. No deaths, renal loss or conversion to open surgery were observed.

Discussion

Mini-PCNL in supine position should be considered more often for renal stone management in Sri Lanka not only due to its wide safety margin and effectiveness but also because of its rapid turnover time.

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Introduction

The management of renal stones has changed dramatically over the past four decades with the need for open surgery being reserved mainly for complex stones in abnormal kidneys. In the past extracorporeal shock wave lithotripsy, percutaneous nephrolithotomy and retrograde intrarenal surgery using ureterorenoscopy were the novel minimally invasive options available for renal stone treatment. However, the debate continues as to which modality is more superior all-around in treating renal stones.

When selecting a method for treating renal stones, especially in a low middle-income country such as Sri Lanka there should be a clear balance between its efficacy (in terms of stone-free rate), operative time, safety, cost-effectiveness and complications associated with the particular technique. PCNL is an effective technique that achieves a high stone-free rate in a single setting with a relatively shorter overall treatment time [1].

Standard PCNL is usually performed through 24-30-Fr percutaneous tracts. However, there is a reported increase in morbidity due to complications such as bleeding, postoperative pain, and potential renal parenchymal damage [2] due to the larger tracts made in standard PCNL. This led to modifications in the technique as well as diminishing the size of instruments used. The technique of using a smaller calibre working sheath (or mini-PCNL) was explored where a 15-18 Fr Amplatz sheath was developed accommodating a 12-14 Fr nephroscope. It was originally developed for the management of larger renal stones in 2-year-old pediatric patients [3]. Subsequently Jackman et al. revolutionized mini-PCNL in adults using an 11-Fr access sheath [4]. Since then mini PCNL has spread globally and has now become a popular technique in many centres where the working sheaths ranging from 11 to 20 Fr have been used [5]. Lately, Desai and colleagues introduced the smallest access tract used so far (4.8 Fr), naming it "micro perc". Unfortunately, this method has a few

Figure 1. Patient positioned for mPCNL

Figure 2. Multi tract supine mini PCNL

limitations as the stone fragmentation takes longer resulting in a high instrument failure rate. Even in the most experienced hands, the case number is limited to about 20 per single nephroscope [6]. Therefore its feasibility in a developing country such as Sri Lanka is debatable.

Indication for the use of the mini-PCNL technique has not been clearly defined as yet. However, mini-PCNL should be explored more avidly as the treatment of choice for renal stones of diameter around 2 cm in children, renal stones less than 2.5 cm in adults, cysteine stones, anatomical abnormalities inhibiting retrograde access and in patients with a narrow or a long infundibulum [7]. It is noteworthy in the present day that mini-PCNL has also gained popularity in treating larger impacted upper ureteric stones as well as staghorn calculi, having to employ a multi-track approach [8,9].

Traditionally, PCNL was performed in the prone position, and it was a well-established technique. Valdivia Uría first described the supine position in 1998 as an alternative technique highlighting the many advantages for the patients, anesthesiologists as well as the surgeon. Following large series of studies and meta-analyses of standard PCNL for patients in the supine versus prone position, found that both positions appeared to be equivalent concerning efficacy and safety despite a significantly short operative time when the procedure was done in the supine position [10,11]. This was attributed to the longer time than it took to prone a patient under anaesthesia. This advantage should be taken well into consideration in the Sri Lankan setting, where shortening the operative time is crucial to ensuring a high turnover time thus ensuring shorter waitlists for patients suffering from renal stone disease.

Material and method

Five hundred and five patients with renal and/or upper ureteric calculi who were admitted from January 2016 to December 2020 to the urological unit at Sri Jayawardenapura Teaching hospital were included. During the sixty months, a total of 509 kidneys were studied. The patients with prior pigtail catheter insertions (DJ stenting) and/or percutaneous nephrostomy insertions due to obstruction associated with urosepsis who underwent PCNL later were excluded from the study. The local institutional review board had approved the data collection procedures.

All patients in the study underwent urine analysis and culture, renal function testing, clotting profile and pre-anaesthetic assessment. CT- KUB or when relevant a CT urogram was performed, especially in patients with previous open renal surgery as a definitive investigation for analysis of the stone burden, location, density and pelvicalyceal anatomy.

All patients were positioned supine in a modified Galdakao-Valdivia position following general anaesthesia. Here, the patient is slightly tilted from the supine position with a cushion under the flank, with the ipsilateral upper limb crossing over the body, lower limb extended and contralateral leg flexed to achieve a modified lithotomy position (Fig 1).

Under fluoroscopic guidance, a 5 Fr ureteric catheter was inserted allowing injection of contrast dye to obtain a pyelogram. Using an 18G coaxial needle the desired calyx was punctured. When multi tracts were necessary, further needle punctures were made strategically especially when dealing with larger stones. (Fig 2) Then a 0.035mm hydrophilic guidewire was passed percutaneously through the needle into the pelvis. Using metal dilators, [9,12,15] FR fascial dilatation was carried out utilizing the seldinger technique. 15/16 Fr Amplatz sheath was inserted as a single or multi-tract to allow a 15Fr nephroscope to enter the collecting system. Holmium: YAG laser was used for fragmentation of the stones.

Once the burden of the stone was removed, a 14Fr Foley catheter/ nephrostomy tube was placed when appropriate.

Table 1. Patient characteristics

Male: Female	349:156	69.1%:30.9%
Age (mean/range)	48.85	14-80
ASA status		
I	210	41.5%
II	257	50.8%
III	34	6.7%
IV	4	0.7%
Comorbidity		
DM	142	28.1%
HT	168	33.2%
IHD	29	5.7%
DL	99	19.6%
CKD	36	7.1%
BMI kgm-2 (mean/range)	25.69	13.42-44.23
<18.5	10	1.9%
18.5- 24.9	196	38.9%
25-29.9	213	42.2%
30-39.9	56	11.1%
>40	30	5.7%

Next, the patient was stented using a 6/26 double pigtail stent in an antegrade manner. The clamped nephrostomy tube was removed 24-48 hrs. postoperatively depending on the stone burden treated. The urinary catheter was removed 24 hrs. after nephrostomy removal and the patient was discharged on that day.

All patients were followed up at two weeks following surgery with a urine culture report and one month later with an X-ray KUB (or CT-KUB in the case of radiolucent stones) to determine the presence of residual stones along with the stone analysis report. Stone free status was defined as the absence of any residual stones a or stones less than 4 mm in size. Patients with multiple or much bigger residual stones were managed with medical expulsive therapy, ureterorenoscopy at the time of stent removal. The double pigtail stent was removed at 4-6 weeks postoperatively using flexible cystoscopy under local anaesthesia as a day-case procedure. All patients were followed up for a minimum of three months. Postoperative complications were classified according to the modified Clavien Dindo classification system 2004.

Data collection was done based on the demography, comorbidity profile and stone characteristics. The complexity of stones was recorded according to the GUYS stone score.

It comprises 4 grades:

I. Solitary stone in mid/lower pole or solitary stone in the renal pelvis with normal anatomy

II. Solitary stone in the upper pole or solitary stone with abnormal anatomy or multiple stones with normal anatomy

III. Multiple stones in abnormal anatomy or partial staghorn

IV. Complete staghorn or stone with a patient with spinal deformity/injury

Table 2. Stone characteristics

Laterality of stones		
Right: Left	242:256	47.9%: 50.7%
Bilateral	4	0.7%
Solitary kidney	3	0.5%
GUYS score		
I-solitary stone mid/lower pole	133	26.3%
I-solitary stone pelvic	157	31%
11- solitary stone upper pole	7	1.3%
11- multiple stones in normal anatomy	57	11.2%
111- partial staghorn	22	4.3%
111- multiple stone in abnormal anatomy	4	0.7%
IV – complete staghorn	68	13.4%
Upper ureteric stone/impacted PUJ stone	57	11.2%
Stone density	1064 Hu	180-1800 Hu
Index stone size (range) mm	24.5	9-45.6
<20mm	330	65.3%
20-40	147	29.1%
>40	28	5.5%
Stone composition		
Calcium oxalate	210	62.8%
Uric acid	64	19.1%
Calcium oxalate + Uric acid	42	12.5%
Cysteine	1	0.2%
Magnesium + oxalate	8	1.6%
Ammonium + oxalate	4	0.8%
Carbon appetite	4	0.8%
Other combinations	6	1.2%

The stone analysis was done using the chemical method and infrared spectroscopy depending on the availability of the method in the private sector. The outcome of mPCNL was interpreted in terms of stone-free rate, operative time, hospital stay and complications.

Results

There was a total of 505 patients.

There was a male preponderance with a male to female ratio just above 2:1. The median age was 48.85 years with the youngest being 14 years while the oldest operated was 80 years. However, the majority of patients 360 (71.28%) were from the active working group between the ages of 30 to 60 years.

A considerable number of patients were suffering from diabetes 142(35.5%), hypertension 168(33.2%) and dyslipidemia99(19.6%) were identified in this study indicating that stone disease had an association with metabolic syndrome. Chronic kidney disease was seen in 36(7.1%) patients.

The mean BMI was 25.32 kg m-2 (13.42- 44.23) with the majority of patients being overweight 213(42.2%) or obese 86(16.8%). The majority of patients were ASA I and II accounting for 92.5% of the study group. ASA III patients

Table 3. Surgical procedure related characteristics

No of tracts		
Single: multiple	467:38	92.5%:7.5%
Calyx puncture (main puncture)		
upper pole	7	1.5%
mid pole	167	33%
lower pole	331	65.5%
Rib puncture (main puncture)		
supracostal	5	1%
subcostal	500	99%
Operative time(min)	87	32- 211
Median Hospital stay	4	3-17
Stone free rate	84.1%	
Auxiliary procedures		
Second stage PCNL	3	0.6%
Simultaneous URS	21	4.1%
Interval URS	20	3.9%

who were morbidly obese and symptomatic patients who underwent recent cardiac stenting underwent the procedure safely. However, four ASA 1V patients with poor cardiac function underwent mPCNL under spinal anaesthesia. All the rest underwent general anaesthesia for the surgery.

Stone laterality was more or less equal. However, four patients underwent bilateral mPCNL in the same setting while three patients with solitary kidneys underwent the procedure safely. The majority had renal stones while 57(11.2%) patients had impacted upper ureteric stones associated with hydronephrosis. According to the GUYS score the majority of stones were Grade 1 290(57.3%). However, there were 22(4.3%) partial staghorn and 68(13.4%) complete staghorn in the series. The mean stone size of the index stone was 24.5 mm with the largest being 45 mm. Mean stone density was over 1064 HU indicating that the stones were very hard. However, the stone density ranged from 180 HU to 1800 HU. Stone analysis later found that the majority of stones were hard calcium oxalate monohydrate and/or dihydrate 210(62.8%). The second commonest stone type was a uric acid stone which was reported in 64 (19.1%). However, there were 42(12.5%) stones were mixed with having a combination of uric acid and calcium oxalate. There were other metabolic components also reported.

The single puncture was done in the majority while multi-tracts were created in 38(7.5%) patients. The lower calyceal puncture was achieved as the access in the majority 331 (65.5%)which was the most frequent site of the targeted puncture. The subcostal approach was selected in the majority to avoid a potential pleural injury. However, the supracostal puncture was necessary only in five patients. The overall stone-free rate was above 84.1%. The mean operative time was 87 min while the median hospital stay was 4 days. Mean hospital stay was 4 days. All procedures were

Table 4. Complications according to Clavien Dindo classification

Total complications		109	21.5%
I	Fever >38 C treated without antibiotics	17	9.8%
	Prolong nephrostomy leak managed conservatively	13	
	Deranged renal functions managed conservatively	7	
	Nephrostomy site bleeding/hematoma	2	
II	Blood transfusion	6	6.9%
	Pneumonia/ atelectasis	2	
	Colon perforation managed conservatively	1	
	Symptomatic UTI treated with antibiotics	24	
	Nephrostomy site infection	2	
III	Clot retention + clot evacuation	5	3.9%
	Angio embolization	3	
	Displaced DJ stent requiring repositioning	3	
	Collecting system perforation	8	
	Infundibular/PUJ stricture	1	
IV	Pulmonary oedema needing ICU care	2	0.9%
	Heart failure requiring ICU care	1	
	Arrhythmia requiring ICU care	2	
	Nephrectomy	0	
	MODS	0	
V	Death	0	0

successful and none of the patients were converted to open surgery. However, three surgeries were done as two-stage PCNL for staghorn calculi since there was considerable difficulty in visualizing stones due to bleeding where the complete fragmentation of the stone was deferred to a later date. Twenty-one patients underwent simultaneous ureteroscopy at the same setting to achieve complete stone clearance while a similar patient number underwent interval ureteroscopy during the stent removal to deal with significant residual stones.

Post-operative complications reported were classified according to the modified Clavien Dindo 2004. Overall complications were 21.5%. The commonest complication was culture-positive UTI developed postoperatively which needed prolong the course of antibiotics. These patients were mainly diabetics with large stone burdens who underwent surgery. Of the grade II complications, blood transfusion was required in 6 patients. Two patients each developed pneumonia and surgical site infection which were managed with IV antibiotics and supportive therapy. There was one patient with a colonic injury. It was incidentally detected in a patient who underwent multi-tract PCNL for a staghorn calculus where CT was done before the second stage. It was managed conservatively with prolonging antibiotics. He recovered completely.

However, in this series there was no damage to adjacent other viscera including liver injury, splenic injury inferior vena cava or diaphragmatic injury resulting in pneumothorax, all of which have been reported in the literature.

Of the grade III complications, five patients developed secondary haemorrhage and clot retention which were managed with clot evacuation. Of them, three out of four patients underwent angioembolization while the fourth failed to demonstrate a significant bleeder on angiography. Three patients developed persistent urine leak from the nephrostomy site due to double J stent dislodgment to the ureter which was repositioned back under fluoroscopy guidance. Collecting system perforation was noted in eight patients at the time of and all were managed with a slightly longer indwelling time of the double J stents and the open nephrostomy tubes. One patient underwent laser infundibulotomy and phlebotomy to deal with infundibular and a PUJ stricture. Four ASA III and one ASA IV patient needed intensive care support postoperatively which were not directly related to the surgery. All patients recovered completely. More importantly, there were no renal losses or death reported.

Discussion

Renal calculi are a major health hazard and a burden to the health care system in Sri Lanka. Its prevalence as in the rest of the world is increasing. In an era of minimally invasive surgery, the gold standard in surgical procedure for renal stones must ensure a high stone-free rate, increased manoeuvrability, minimal risk of haemorrhage, lower postoperative pain, shorter operative time and an overall shorter hospital stay.

Many studies have reported similar stone-free rates and comparable overall complication rates between mini-PCNL and standard PCNL when renal stones are less than 2.5 cm. When the stone size was around 1 cm or less mini-PCNL mini PCNL had a better stone-free rate compared to shock wave lithotripsy. On the other hand, mini-PCNL has shown better stone-free rates for the management of larger renal stones (>2 cm) and large impacted upper ureteral stones when compared with retrograde intrarenal lasertripsy [12,13].

After analyzing 15 randomized controlled trials involving 1474 patients were found comparable results in overall complications rate and blood transfusion when supine PCNL was compared with prone PCNL [14,15].

Supine PCNL apart from having a shorter operative time due to the single-stage positioning has many other added advantages over prone PCNL. These include a needle puncture that is directed laterally away from the fluoroscopy tube; therefore, reducing accidental radiation exposure to the surgeon's hand. PCNL tract is placed in a downward direction in a more dependent position; therefore, the irrigation fluid causing intrarenal pressure rise is minimal. Therefore, pyelorenal reflux is also minimized. With the jet of saline-injected, gravity is used to ease out stone fragments with the whirlpool effect that is created. Another advantage is that simultaneous access to the upper ureter, renal pelvis and the calyceal systems can be performed using ureteroscopy by a second surgeon to facilitate greater stone clearance since the patient is in the lithotomy position rather than in the prone position. This approach by a second surgeon was advantageous in 4% of patients in our series to achieve complete stone clearance. In addition, the procedure may be performed while the surgeon is seated making it more ergonomically friendly. The nephrostomy tube was placed on the lateral aspect rather than on the back of the patient making it far more comfortable for the patient to lie on their back during the postoperative recovery period [16].

When there is a significant success rate in the standard PCNL in prone position surgeons are reluctant to explore a new

Table 5. Cases series more than 100 mPCNL

Author	Resorlu et al[17]	Zeng et al[18]	Abdehafez et al[19]	Long et al[20]	Present study
Year	2012	2013	2013	2013	2021
N(patients)	106	12482	172	163	505
Stone burden(cm^2)	2.37	14.56	2.5	1.84	2.45*
Operative time(min)	76.3	83	82.9	83.8	87
Stone free rate (%)	85.8	78.6	83.8	95.7	84.1
Auxiliary procedure					
total (%)	14.4	23.1	13.1		8.6
PCNL	3.8	17	3.7	NR	0.6
SWL	5.6	3.2	0.5	NR	-
URS	-	2.9	8.9	NR	8
Clavien Dindo total					
Complications (%)	17	25.9	23	23.1	21.5
I		16.8	12	14.6	9.8
II	17	5	5.8	8.5	6.9
III	0	3.9	5.2	0	3.9
IV	0	0.05	0	0	0.9
V	0	0	0	0	0

* mean index stone maximum diameter in cm

method such as supine mini PCNL. But mini PCNL technique has now shown more favourable outcomes in terms of high stone-free rates and fewer complications due to the smaller tract [17, 18, 19, 20]. Even the few minor complications that we encountered in this study completely resolved with time. None of the patients in our study experienced any major complications such as death, renal loss or major haemorrhage.

In our opinion, when weighing the pros and cons, supine mPCNL by far outweighs the benefits of carrying out standard PCNL for renal stone disease. Experience gained over the years has allowed us to identify some tips and tricks in supine mPCNL to optimize its outcomes while minimizing complications. In our experience changing our practice to the novel, supine mini PCNL technique for the treatment of renal calculi hasn't been overly complicated. Our learning curve has been short in mastering the technique while showing a favourable outcome. Supine mPCNL can revolutionize the management of renal stones especially at the hands of a well-experienced endourologist.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Feng MI, Tamaddon K, Mikhail A, Kaptein JS, Bellman GC. Prospective randomized study of various techniques of percutaneous nephrolithotomy. Urology. 2001 Sep;58(3):345-50. https://doi.org/10.1016/S0090-4295(01)01225-0
2. Yamaguchi A, Skolarikos A, Buchholz NP, Chomon GB, Grasso M, Saba P, et al. Operating times and bleeding complications in percutaneous nephrolithotomy: a comparison of tract dilation methods in 5,537 patients in the Clinical Research Office of the Endourological Society Percutaneous Nephrolithotomy Global Study. J Endourol. 2011 Jun;25(6):933-9. https://doi.org/10.1089/end.2010.0606
3. Helal M, Black T, Lockhart J, Figueroa TE. The Hickman peel-away sheath: alternative for pediatric percutaneous nephrolithotomy. J Endourol 1997;11:171-172. https://doi.org/10.1089/end.1997.11.171
4. Jackman SV, Docimo SG, Cadeddu JA, Bishoff JT, Kavoussi LR, Jarrett TW. The "mini-perc" technique: a less invasive alternative to percutaneous nephrolithotomy. World J Urol 1998;16:371-374. https://doi.org/10.1007/s003450050083
5. Nagele U, Schilling D, Sievert KD, Stenzl A, Kuczyk M. Management of lower-pole stones of 0.8 to 1.5 cm maximal diameter by the minimally invasive percutaneous approach. J Endourol 2008;22:1851-1853. https://doi.org/10.1089/end.2008.9791
6. Desai M R, Sharma R, Mishra S, Sabnis R B, Stief C, Bader M. Single-step percutaneous nephrolithotomy (microperc): the initial clinical report. J Urol 2011;186:140-145. https://doi.org/10.1016/j.juro.2011.03.029
7. Ferakis N, Stavropoulos M. Mini percutaneous nephrolithotomy in the treatment of renal and upper ureteral stones: Lessons learned from a review of the literature. Urol Ann 2015;7:141-148. https://doi.org/10.4103/0974-7796.152927
8. Yang Z, Song L, Xie D, Hu M, Peng Z, Liu T, et al. Comparative study of outcome in treating upper ureteral impacted stones using minimally invasive percutaneous nephrolithotomy with aid of patented system or transurethral ureteroscopy. Urology 2012;80:1192-1197. https://doi.org/10.1016/j.urology.2012.08.045
9. Zhong W, Zeng G, Wu W, Chen W, Wu K. Minimally invasive percutaneous nephrolithotomy with multiple mini tracts in a single session in treating staghorn calculi. Urol Res 2011;39:117-122. https://doi.org/10.1007/s00240-010-0308-z
10 Valdivia Uría JG, Valle Gerhold J, López López JA, Villarroya Rodriguez S, Ambroj Navarro C, Ramirez Fabián M, et al. Technique and complications of percutaneous nephroscopy: Experience with 557 patients in the supine position. J Urol. 1998;160:1975-8. https://doi.org/10.1016/S0022-5347(01)62217-1
11. Liu L, Zheng S, Xu Y, Wei Q. Systematic review and meta-analysis of percutaneous nephrolithotomy for patients in the supine versus prone position. J Endourol. 2010;24:1941-6. https://doi.org/10.1089/end.2010.0292
12. Kruck S, Anastasiadis AG, Herrmann TR, Walcher U, Abdelhafez MF, Nicklas AP, et al. Minimally invasive percutaneous nephrolithotomy: an alternative to retrograde intrarenal surgery and shockwave lithotripsy. World J Urol 2013;31:1555-1561. https://doi.org/10.1007/s00345-012-0962-6
13. Gu XJ, Lu JL, Xu Y. Treatment of large impacted proximal ureteral stones: randomized comparison of minimally invasive percutaneous antegrade ureterolithotripsy versus retrograde ureterolithotripsy. World J Urol 2013;31:1605-1610. https://doi.org/10.1007/s00345-013-1026-2
14. Falahatkar S, Moghaddam AA, Salehi M, et al.: Complete supine percutaneous nephrolithotripsy comparison with the prone standard technique. J Endourol. 2008;22(11):2513-7. https://doi.org/10.1089/end.2008.0463
15. Liangren L, Shou Z, Yong Xu, Qiang W Systematic Review and Meta-Analysis of Percutaneous Nephrolithotomy for Patients in the Supine Versus Prone Position. J Endourol. 2010 Dec;24(12):1941-6.https://doi.org/10.1089/end.2010.0292
16. Seneviratne N, Percutaneous renal stone surgery: redefining the better technique and lessons learnt in a developing country. The Sri Lanka Journal of Surgery 2018; 36(4): C 11-1 doi: http://doi.org/10.4038/sljs.v36i4.8553
17. Resorlu B, Unsal A, Tepeler A, Atis G, Tokatli Z, Oztuna D, et al. Comparison of retrograde intrarenal surgery and mini-percutaneous nephrolithotomy in children with moderate-size kidney stones: Results of multi-institutional analysis. Urology. 2012;80:519-23. https://doi.org/10.1016/j.urology.2012.04.018
18. Zeng G, Zhao Z, Wan S, Mai Z, Wu W, Zhong W, et al. Minimally invasive percutaneous nephrolithotomy for simple and complex renal caliceal stones: A comparative analysis of more than 10,000 cases. J Endourol. 2013 Oct;27(10):1203-8. https://doi.org/10.1089/end.2013.0061

19 Abdelhafez MF, Amend B, Bedke J, Kruck S, Nagele U, Stenzl A, et al. Minimally invasive percutaneous nephrolithotomy: A comparative study of the management of small and large renal stones. Urology. 2013 Feb;81(2):241-5. https://doi.org/10.1016/j.urology.2012.09.030

20. Long Q, Guo J, Xu Z, Yang Y, Wang H, Zhu Y, et al. Experience of mini-percutaneous nephrolithotomy in the treatment of large impacted proximal ureteral stones. Urol Int. 2013;90(4):384-8. https://doi.org/10.1159/000343668

SCIENTIFIC ARTICLE

Do we need a new classification for fistula-in-ano?

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Keywords: Fistula-in-ano; perianal fistula classification; Parks; Goodsall's

Abstract

Introduction

Identification of correct anatomy of the fistulous tract is important in the treatment of fistula-in-ano. Several classifications are available for this. Our objective was to identify the differences in the anatomy of fistula-in-ano in patients been treated at our hospital and compare it with commonly used classifications, namely Parks and St James University Hospital (SJUH) classifications.

Materials and Methods

Fifty one consecutive patient with diagnosed cryptoglandular fistula-in-ano were recruited from August 2017 to January 2020. All were examined under spinal or general anaesthesia by two experienced colorectal surgeons. Gentle probing with a fistula probe and injection of saline / Hydrogen peroxide was used to identify the internal opening and primary tract.

Results

There were 41 male patients and 10 female patients. Their median age was 42 years. Thirty-four (66.7%) had transsphincteric fistula, 11 (21.6%) had intersphincteric, 4 (7.8%) had superficial and only 2 (3.9%) had suprasphincteric fistula. Out of all 15 (29.4%) were high fistula-in-ano while the remaining 36 (70.6%) were low.

Discussion

Majority of tracts were transsphincteric. This is in contrast to Parks original observation where intersphincteric type made the majority. Superficial fistulae accounted for 7.8%, which were not described in Parks original study. Parks and SJUH classification have not considered the length of external anal sphincter involvement in their classifications, which is crucial in surgical decision making. In our study, 29.4% were high fistula-in-ano.

Conclusion

Majority was transsphincteric and this contradicts Parks and SJUH classification. High fistula-in-ano comprises 29.4%, where treatment modality has major implications. Parks and SJUH classification do not take this into account and the need for a new classification is stressed upon.

Introduction

Fistula-in-ano is common in surgical practice. Its prevalence is 8.6 per 100,000 population. This shows a male predominance with a male-to-female ratio is 1.8:1. The fistula tract can be defined as an abnormal communication, which connects the internal opening in the anal canal to an external opening on the perineal or buttock skin. These tracts are the chronic manifestations of the crypto glandular disease. Initial infection and abscess formation of occluded anal gland erode into skin forming a fistula tract. Secondary etiologies for fistula-in-ano include Crohn's disease, lymphogranuloma venereum, HIV infection, tuberculosis, foreign bodies, radiation proctitis and sometimes actinomycosis.

It is imperative in fistula surgery to know the exact anatomy. Most of the time external opening is obvious but finding the internal opening is challenging. It is vital to identify both openings to identify the course of the tract. Several classifications exist to guide the clinician to identify the correct anatomy of the tract. The most frequently used classification of anal fistulae is the classification described by Parks, Gordon and Hardcastle.

Goodsall's rule was introduced by David Henry Goodsall to define the route of an anal fistula. This states that, if the external opening of the fistula is located posterior to the transverse anal line, the internal opening is most probably situated in the dorsal midline, whereas if the external opening is located anterior to the transverse anal line, the tract probably connects directly to the internal opening located in the nearest crypt. This has been challenged in recent times with some conflicting data regarding predictive accuracy. [1,2, 12].

The objective of our study was to assess the anatomical distribution of perianal fistula present to the Teaching Hospital Peradeniya and compare it with commonly used

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classifications like Parks classification and St James University Hospital (SJUH) classification [3,4].

Methods

A prospective observational study was performed on patients with diagnosed cryptoglandular fistula-in-ano from August 2017 to January 2020 at Teaching Hospital, Peradeniya.

Patients above 18 years of age who were diagnosed with cryptoglandular fistula-in-ano were recruited in the study after obtaining informed written consent. Patients with recurrent fistulae and secondary fistulae due to other causes were excluded from the study.

All the patients were examined under spinal or general anaesthesia by two experienced colorectal surgeons. Gentle probing with a fistula probe and injection of saline/Hydrogen peroxide was used to identify the internal opening and primary tract. External opening, internal opening, primary tract, presence of horseshoeing, presence of abscess and other associated conditions like haemorrhoids, fissures etc. were documented.

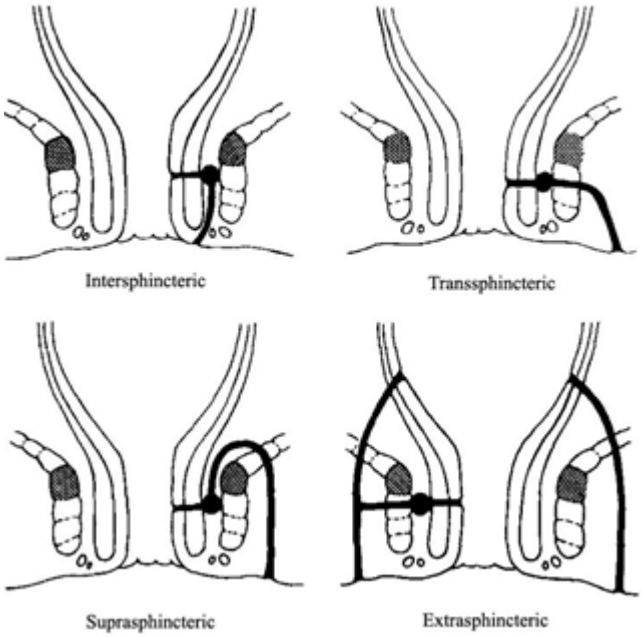

Figure 1. Types of fistulae-in-ano according to Parks classification

Table 1. Type of fistula tract

Type of fistula tract	Number (%)
Superficial / Unclassified in Parks	4 (7.8%)
Intersphincteric	11 (21.6%)
Transsphincteric	34 (66.7%)
Suprasphincteric	2 (3.9%)
Extrasphincteric	0 (0%)

Results

There were 41 male patients and 11 female patients. Their median age was 42 years (range 18 to 80 years). When Parks classification (Figure 1) is used on the study group, 66.7 % had transsphincteric fistula, 21.5% had intersphincteric, 7.8% had superficial and only 4 % had suprasphincteric fistula (Table 1).

Out of 51 fistulae, one had two internal openings the rest had only one internal opening. The majority, 32 (61.5%) were located at the 6 o'clock position in the posterior midline. Positioning of internal opening in relation to the transverse

Table 2. Positioning of the internal opening in relationship to the transverse anal line.

Position of internal opening	Number (%)
Anterior to transverse anal line	11 (21.1%)
Posterior to transverse anal line	34 (65.4%)
On the transverse anal line	7 (13.5%)

Table 3. Positioning of the internal opening in clock positions.

Clock position of internal opening	Number (%)
1	2 (3.8%)
2	2 (3.8%)
3	3 (5.9%)
4	0 (0%)
5	2 (3.8%)
6	32 (61.5%)
7	0 (0%)
8	0 (0%)
9	4 (7.5%)
10	1 (1.9%)
11	3 (5.9%)
12	3 (5.9%)

Table 4. Positioning of the external opening in relationship to the transverse anal line.

Position of the external opening	Number
Anterior to transverse anal line	18
Posterior to transverse anal line	32
On the transverse anal line	7

anal line is given in Table 2. and clock positioning is given in Table 3.

Forty seven fistulae tracts had only one external opening while two had two external openings and another two had three external openings. Most frequent (19.3%) location of external opening was at 6 o'clock position and next frequent position (17.5%) was at 5 o'clock. Positioning of external

Table 5. Positioning of the external opening in clock positions.

Clock position	Number (%)
1	4 (7%)
2	6 (10.4%)
3	4 (7%)
4	5 (8.8%)
5	10 (17.5%)
6	11 (19.3%)
7	3 (5.3%)
8	3 (5.3%)
9	3 (5.3%)
10	3 (5.3%)
11	5 (8.8%)
12	0 (0%)

opening in relationship to the transverse anal line is given in Table 4. and clock positioning is given in Table 5.

Horseshoeing of the tract was noted in 25 tracts while the rest

Table 6. Plane of horseshoeing

Plane of horseshoeing	Number (%)
No horseshoeing	26 (51%)
Intersphincteric	5 (9.8%)
Infralevator	20 (39.2%)
Supralevator	0 (0%)

Out of 51 fistulae tracts studied 22 (43.1%) had associated abscesses or cavities. Location of abscesses or cavities are shown in Table 7.

Table 7. Plane of horseshoeing

Plane of the abscess / cavity	Number (%)
No abscess / cavity	29 (56.9%)
Superficial	1 (1.96%)
Intersphincteric	4 (7.84%)
Infralevator	17 (33.3%)

Parks classification of 22 fistulae tracts which were associated with abscesses or cavities are given in Table 8.

Table 8. Parks classification of fistulae tracts which were associated with abscesses or cavities

Type of fistula according to Parks classification	Number (%)
Superficial	1 (4.5%)
Intersphincteric	3 (13.6%)
Transsphincteric	17 (77.4%)
Suprasphincteric	1 (4.5%)
Extrasphincteric	0 (0%)

St James University Hospital classification considers the presence of abscesses in relationship to the fistula tract in classification of fistulae-in-ano. (Table 9) Classification of fistulae tracts of our study group according to SJUH classification is given in Table 10.

Table 9. SJUH classification

Grade	Description
1	Intersphincteric fistula with no abscess or secondary tract
2	Intersphincteric fistula with associated abscess or secondary tract
3	Transsphincteric fistula
4	Transsphincteric fistula with associated abscess or secondary tract
5	Supralevator or translevator fistula

Table 10. Classification of fistulae tracts of our study group according to SJUH classification

SJUH classification	Number (%)
Unclassified	4 (7.8%)
Grade 1	8 (15.7%)
Grade 2	3 (6%)
Grade 3	17 (33.3%)
Grade 4	17 (33.3%)
Grade 5	2 (3.9%)

had no horseshoeing. Plane of horseshoeing is given in Table 6.

Depending on the external sphincter length involved by the fistula tract, fistulae-in-ano can be categorized as high and

Table 11. Distribution of high and low fistulae in different Parks classification groups

	Superficial	Intersphincteric	Transsphincteric	Suprasphincteric	Total
High	NA	NA	13 (25.5%)	2 (3.9%)	15 (29.4%)
Low	4 (7.8%)	11 (21.6%)	21 (41.2%)	NA	36 (70.6%)

low anal fistulae. If the external sphincter involvement is less than one third of the length of the sphincter, it is categorized as a low anal fistula and if the involved external sphincter length is more than one third, it is categorized as a high anal fistula. When this is combined with Parks classification, superficial and straightforward intersphincteric fistulae will be in the low anal fistula category while suprasphincteric and extrasphincteric categories will be in high anal fistula category. Transsphincteric category will have both high and low varieties. Table 11 shows distribution of high and low fistulae in different Parks classification groups in our study.

Table 12. Distribution of fistula tracts in relationship to the anal canal

Quadrant of the anal canal	Number (%)
Anterior right quadrant	6 (11.8%)
Anterior left quadrant	7 (13.7%)
Posterior right quadrant	12 (23.5%)
Posterior left quadrant	22 (43.2%)
Multiple quadrant involvement	4 (7.8%)

Distribution of fistula tracts in relationship to the anal canal is depicted in table 12.

Discussion

In our study majority of fistula primary tracts were transsphincteric (66.7%) and intersphincteric (21.6%) was second in place. This is in contrast to Parks original observation. According to Parks original study, the majority were intersphincteric (45%) while transsphincteric, suprasphincteric and extrasphincteric were 30%, 20% and 5% respectively [3]. Distal to the lower edge of the internal sphincter, the fibres of the lowermost portion of the subcutaneous part of the external sphincter curve in and due to this, on Endoscopic Ultrasound the lower third of the anal canal is devoid of an internal sphincter. Hence intersphincteric fistulae can cross some of these lowest fibres of the external sphincter and become transsphincteric [5]. Our findings are more in line with the findings of et al. from Spain and U Jayarajah et al. from Sri Lanka where the majority of fistulae were transsphincteric [6,7].

A significant number of patients in our study had superficial fistulae (7.8%), which was not described by Parks original study, which maybe because the emphasis was on the intersphincteric plane [3]. This is a major limitation in Parks classification. According to Mark's and Ritchie's publication on experience at St Mark's hospital, published in British Journal of Surgery, superficial fistulae comprised 16%, which is in concordant with our study [8]. Although Parks describes 20% of suprasphincteric fistulae we noted only 3.9% in our study group. According to Mark's and Ritchie's experience, it was only 3% which again tallies with our experience. In our study group, we had no extrasphincteric fistulae while Parks had 5% and Mark and Ritchie had 3%

SJUH classification uses the presence of abscesses or secondary tracts in subdividing Parks intersphincteric into grades 1 and 2 and Parks transsphincteric into grades 3 and 4. At the same time, it amalgamates Parks suprasphincteric and extrasphincteric into grade 5 [4].

Considering the management of perianal fistulae, the challenge is achieving healing of the fistula tract while preserving sphincter function. Laying open of the fistula tract can achieve good healing rates but can result in impaired sphincter function if the tract traverses the external sphincter above one-third of the sphincter length. Such fistulae are categorized as high anal fistulae. In our study out of a total of 51 examined, 15 (12.4%) were high anal fistulae. Having this knowledge during the surgery will help the surgeon in selecting the most appropriate surgical approach. Pre-operative Magnetic Resonance Imaging (MRI) and endoanal ultrasonography are useful assessment tools in this regard [6].

In summary, neither Parks nor SJUH classifications classify perianal fistula with an implication towards surgical treatment options. A classification that considers the thickness of external anal sphincter involvement would provide better guidance for surgeons in selecting appropriate surgical interventions [9].

In this study, Goodsall's rule was true 76.5% of the time (39 out of 51) and this is similar to the findings of U Jayarajah et al. from Sri Lanka [7]. Goodsall's rule was followed by 75% of fistulae with the external opening located at or posterior to the transverse anal line while 80% of fistulae with the external opening located anterior to the transverse anal line followed rule. But this difference was not statistically significant

($p>0.05$). Therefore, in our study group, there was no difference between anteriorly located fistulae and posteriorly located fistulae in following Goodsall's law. Consequently, Goodsall's law can be used to locate the internal opening and to define the path of the tract.

Most of the fistulae tracts, 22 (43.2%) in number were located in the left posterior quadrant of the anal canal. Right posterior, left anterior and right anterior had 12 (23.5%), 7 (13.7%) and 6 (11.8%) tracts respectively while 4 (7.8%) tracts were traversing more than one quadrant. V. Abeysuriya et al. has shown similar distribution earlier [10]. This might be due to the discrepancy in the distribution of anal glands, which are the source of infection in cryptoglandular perianal fistulae, in different quadrants of the anal canal as demonstrated in their study.

Conclusion

In our study majority of fistulae-in-ano were transsphincteric in type. This does not follow Parks original classification that intersphincteric type is the commonest. But our findings follow the pattern shown in previous Sri Lankan studies.

This study population had 29.4% of high anal fistulae where treatment modality has major implications on the outcome of the surgery. Parks and SJUH classification do not take this into account and the need for a new classification is stressed upon.

76.5% of fistulae examined in this study followed Goodsall's rule. This can be used as a guide, to locate the internal opening and to delineate the anatomy of the tract.

The majority of fistulae were in the left posterior quadrant of the anal canal in patients of this study group. These are due to a higher number of anal glands in this region, as pointed by a previous study in Sri Lanka.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Cirocco WC, Reilly JC. Challenging the predictive accuracy of goodsall's rule for anal fistulas. Diseases of the Colon & Rectum [Internet]. Ovid Technologies (Wolters Kluwer Health); 1992 Jun;35(6):537–42. Available from: http://dx.doi.org/10.1007/bf0205053
2. Gunawardhana PAHA, Deen KI. Comparison of hydrogen peroxide instillation with Goodsall's rule for fistula-in-ano. ANZ Journal of Surgery [Internet]. Wiley; 2001 Aug 4;71(8):472–4. Available from: http://dx.doi.org/10.1046/j.1440-1622.2001.02169.x
3 .Parks AG, Gordon PH, Hardcastle JD. A classification of fistula-in-ano. British Journal of Surgery [Internet]. Wiley; 1976 Jan;63(1):1–12. Available from: http://dx.doi.org/10.1002/bjs.1800630102
4. Ozkavukcu E, Haliloglu N, Erden A. Frequencies of perianal fistula types using two classification systems. Japanese Journal of Radiology [Internet]. Springer Science and Business Media LLC; 2011 Jun;29(5):293–300. Available from: http://dx.doi.org/10.1007/s11604-010-0556-4
5. Rickard MJFX. Anal abscesses and fistulas. ANZ Journal of Surgery [Internet]. Wiley; 2005 Jan;75(1-2):64–72. Available from: http://dx.doi.org/10.1111/j.1445-2197.2005.03280.x
6. Garcés-Albir M, García-Botello SA, Espi A, Pla-Martí V, Martin-Arevalo J, Moro-Valdezate D, et al. Three-dimensional endoanal ultrasound for diagnosis of perianal fistulas: Reliable and objective technique. World Journal of Gastrointestinal Surgery [Internet]. Baishideng Publishing Group Inc.; 2016;8(7):513. Available from: http://dx.doi.org/10.4240/wjgs.v8.i7.513
7. Jayarajah U, Samarasekera DN. Predictive accuracy of Goodsall's rule for fistula-in-ano. Ceylon Medical Journal [Internet]. Sri Lanka Journals Online (JOL); 2017 Jun 30;62(2):97. Available from: http://dx.doi.org/10.4038/cmj.v62i2.8474
8. C. G. Marks and J. K. Ritchie, "Anal fistulas at St. Mark's Hospital," Br. J. Surg., vol. 64, pp. 84-91, 1977. https://doi.org/10.1002/bjs.1800640203
9. Garg P. Comparing existing classifications of fistula-in-ano in 440 operated patients: Is it time for a new classification? A Retrospective Cohort Study. International Journal of Surgery [Internet]. Elsevier BV; 2017 Jun;42:34–40. Available from: http://dx.doi.org/10.1016/j.ijsu.2017.04.019
10. Abeysuriya V, Salgado LSS, Samarasekera DN. The distribution of the anal glands and the variable regional occurrence of fistula-in-ano: is there a relationship? Techniques in Coloproctology [Internet]. Springer Science and Business Media LLC; 2010 Oct 15;14(4):317–21. Available from: http://dx.doi.org/10.1007/s10151-010-0648-2
11. Barwood N, Clarke G, Levitt S, Levitt M. FISTULA-IN-ANO: A PROSPECTIVE STUDY OF 107 PATIENTS. ANZ Journal of Surgery [Internet]. Wiley; 1997 Feb;67(2-3):98–102. Available from: http://dx.doi.org/10.1111/j.1445-2197.1997.tb01911.x
12. Goodsall DH, Miles WE. Disease of the anus and rectum.

SCIENTIFIC ARTICLE

Evaluation of prognostic indicators for necrotizing fasciitis

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Keywords: Necrotizing fasciitis; diabetes; surgical debridement; multidisciplinary

Abstract

Necrotizing Fasciitis (NF) is a rapid spreading lethal infection of the skin, muscles and soft tissues, with progressive inflammation along tissue planes and local destruction. The varied clinical presentation often leads to misdiagnosis. Various co-morbidities can influence the clinical course of the disease. Considering the life-threatening nature of the condition, this study is undertaken to identify significant prognostic factors, which will facilitate early diagnosis and intervention for an optimal outcome. This is a prospective study of 40 cases of Necrotizing Fasciitis, for 2 years. Maximum patients were in the age group of 51 to 70 years. 55% of patients had necrotizing fasciitis of the lower limb. Pain and fever were the commonest presenting features. 58% of patients presented with clinical features of less than 7 days duration. Trauma was the aetiological factor in 28% of patients. Diabetes Mellitus was the commonest co-morbidity (65%). E. coli was the commonest isolate in culture reports. The LRINEC Score was more than 8 in 25% of patients and less than 5 in 60% cases. Two patients required amputation, 30 underwent surgical debridement and 8 were subjected to fasciotomy. Out of the 38 cases, another 3 patients required amputation subsequently. Length of hospital stay was more than 3 weeks in 63% of cases. Mortality was noted in 12.5% of patients. The hemodynamic status of the individual at the time of presentation and during the post-operative period has a significant prognostic value. Diabetes Mellitus is a common co-morbidity existing in patients with Necrotizing Fasciitis. Other co-morbidities like hepatic and renal dysfunction, hypertension, Peripheral Vascular Disease, immune-deficient states, also affect the treatment outcome. Initial surgical debridement is of extreme importance and should be a thorough one. Early diagnosis, aggressive surgical debridement, with balanced fluid resuscitation and adequate nutritional support and a multidisciplinary approach is the key to a successful outcome.

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Introduction

Necrotizing Fasciitis (NF) is a rapid spreading lethal infection of the skin, muscles and soft tissues, with progressive inflammation along tissue planes and local destruction [1]. The quick changes seen in the clinical course of the disease are attributed to the polymicrobial nature of infection and synergistic action of aerobes and anaerobes [2]. The incidence of NF is estimated at 500 -1000 cases annually with a global prevalence of 0.40 cases per 10,000 populations. The varied clinical presentation often leads to misdiagnosis. Pain, which is disproportionate to the local swelling or erythematous reaction, is a reliable sign of early NF [3]. Various conditions which can influence the clinical course of the disease include Diabetes Mellitus, immunosuppression, liver dysfunction and renal dysfunction [4]. NF is a surgical emergency, with mortality rates ranging from 9% to 29 % [5]. Various scores have been formulated for predicting mortality in Necrotizing Soft Tissue Infections. None have been sufficiently sensitive or specific to risk application in this condition [6]. Considering the life-threatening nature of the condition, this study is undertaken to identify significant prognostic factors, which will facilitate early diagnosis and intervention for an optimal outcome.

Objective

To evaluate the prognostic factors for necrotizing fasciitis concerning: Presence of co-morbidities: Diabetes Mellitus, Liver dysfunction, Hypertension, Immunodeficiency, Renal Dysfunction and Peripheral Vascular Disease; Advanced age; period between onset of disease and surgical debridement; Extent and variability of infection; Culture reports (Gram-positive vs Gram-negative infections); Intensive Care Unit (ICU) stay.

Materials and Methods

This is a prospective study of 40 patients with necrotizing fasciitis, carried out at MGM Medical College and Hospital, Navi Mumbai, India, from April 2017 to October 2018. The study was approved by the Institute Ethics Committee of the said Institution and written and informed consent was obtained from all enrolled patients. Criteria included for defining necrotizing fasciitis were: evidence of mottled skin appearance, necrotic skin and subcutaneous tissue, digital blunt dissection of adherent fascia with no evidence of any

resistance; a purulent or seropurulent discharge with a fishy odour. Following laboratory investigations were done: White Blood Cell count and Platelet Count; Blood Urea Level; Serum Creatinine level; Serum Creatinine Kinase; C-Reactive Protein; Serum electrolytes; Serum proteins; Blood Glucose Levels; Liver Function Tests. Based on these investigations, the Laboratory Risk Indicators for Necrotizing Fasciitis (LRINEC) score [7] was calculated for each patient. Plain X-ray, USG, CT SCAN/MRI were done in equivocal cases. Limb arterial Doppler studies were done in 4 patients as indicated by clinical examination.

Patients presenting with shock were aggressively resuscitated. Intravenous antibiotics including Inj. Metronidazole were administered. All patients underwent emergency surgical debridement. All wounds were left open. Tissue was obtained for histopathological diagnosis and discharge was sent for culture sensitivity examination. In the postoperative period, dressings were changed twice daily and wounds were inspected for any residual collections / progressive necrosis/septic focus. Serial debridements were done as required. Antibiotics were changed depending upon culture sensitivity reports. Skin grafting was done in cases with healthy granulation tissue, wherever possible.

Factors evaluated included, presence of comorbidities like Diabetes Mellitus (Fasting Blood sugar levels), Liver dysfunction (Serum Bilirubin and Liver enzymes), Hypertension, Immunodeficiency (HIV status, patients on chemotherapy/radiotherapy / immunosuppressive drugs), Renal Dysfunction (Serum Creatinine and Blood Urea levels), Peripheral Vascular Disease (Clinical signs and Arterial Doppler findings); Age > 50 years; the period between onset of disease and surgical debridement; Extent and variability of infection; Culture reports (Gram-positive vs Gram-negative infections); ICU stay.

Statistical analysis was done using the Chi-Square test, Student t-test and SPSS (Version 25.0)

Results

The study included 32(80%) males and 8 (20%) females. Maximum patients were in the age group of 51 to 70 years, with the mean age being 53.67 years. 22 patients (55%) had necrotizing fasciitis of the lower limb. 4 cases (10%) presented with Fournier's Gangrene. Pain and fever were the commonest presenting features, seen in 34 (85 %) and 29 (72.5 %) cases respectively. Local blisters were observed in 20 (50%) cases. 23 (58%) patients presented with clinical features of less than 7 days duration. 11 (28%) of cases were traumatic in origin. Diabetes Mellitus was the commonest co-morbidity seen in 26 cases (65%), followed by Anaemia in 15 patients (38%) and Renal dysfunction in 11 cases (28%) (Table 1). E. coli was the commonest wound isolate, seen in 19 (48%) cases. Table 2 shows the investigation findings. 24 (60%) of patients had an LRINEC score of less than 5 (Graph 1). 30 (75%) patients underwent debridement. 8 (20%) required fasciotomies and 2 (5%) had to undergo amputation. Re-debridement was required in 14 out of 38 cases and another 3 patients required amputation subsequently. 25 (63%) patients stayed for more than 3 weeks in the hospital (Graph 2). Mortality was noted in 5 (12.5%) cases in our study. 4 (80%) patients who succumbed to death were more than 50 yrs of age. Surgical intervention was done after 12 hours of presentation in 4 cases of mortality.

The culture reports showed polymicrobial infection in 1 (20%) and Gram-negative infection in 4 (80%) patients who died, which was not of statistical significance. Diabetes mellitus was present in 4 (80%) patients and renal dysfunction and immunodeficiency 2 (40%) cases. All these patients required intensive unit monitoring. The minimum LRINEC Score was 2 and the maximum was 11. The median score of the data was 5. The association between mortality and morbidity about LRINEC Scoring was not statistically significant. 4 cases (80%) out of those who succumbed, had an LRINEC Score of >8. Morbidity was noted in 2 cases with an LRINEC Score of 7 and in one case with an LRINEC Score of 8. The presence of shock, leukocytosis, renal dysfunction, Peripheral Vascular Disease, Hypertension and ICU requirements, were the significant variables in the study (Table 3).

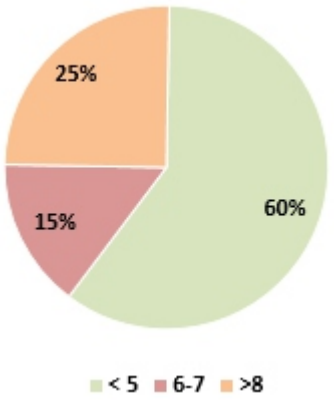
P-value for Age, Males, diabetes mellitus and site of infection was greater than that of 0.05, indicating no significant difference in the observed proportion when compared between < 6 and >= 6 LRINEC scoring. P-value for Hospital stay, was less than that of 0.05; indicating a significant difference in the observed proportion when compared between < 6 and >= 6 LRINEC scoring (Table 4).

Table 1. Co-Morbidities

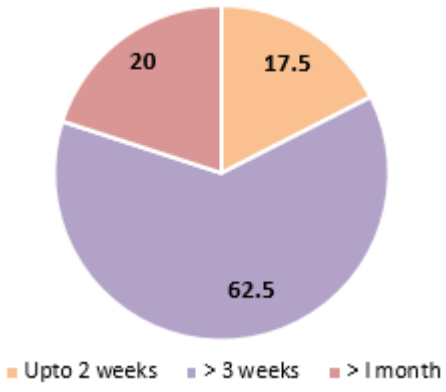
Co- morbid conditions	Number of patients	%
Diabetes mellitus	26	65
Smoking	6	15
Renal dysfunction	11	27.5
Cirrhosis	2	5
HIV	2	5
Tuberculosis	4	10
Anaemia	15	37.5
Skin Disorder	6	15
COPD	4	10

Table 2. Investigation findings

Investigations	Number of patients	%
WBC (/ mm³)		
a. 15000-25000	20	50
b. >25000	3	7.5
Haemoglobin (gm %)		
a. 11- 13.5	13	32.5
b. <11	27	67.5
Sodium levels (mmol/litre)		
a. >135	15	37.5
b. <135	25	62.5
Serum creatinine (umol/L)		
a. <1.5	29	72.5
b. >1.5	11	27.5
Blood sugar levels (mgm%)		
a. <180	28	70
b. >180	12	30



Graph 1. LRINEC Scoring



Graph 2. Hospital Stay

Table 3. Statistical significance of all variables

Variable	Total (n=40)	Survivors (n=35)	Non-Survivors (n= 5)	p value
Shock	3	0	3 (60)	0.000
Tachycardia	18	16 (45.7)	2 (40)	0.812
Fever	29	26 (74.2)	3 (60)	0.503
Leukocytosis	23	18 (51.4)	5 (100)	0.040
Anaemia	27	23 (65.7)	4 (80)	0.523
Renal Dysfunction	11	7 (20)	4 (80)	0.005
Hyponatremia	25	21 (60)	4 (80)	0.388
Liver Dysfunction	9	8 (22.8)	1 (20)	0.886
Age > 50 years	27	23 (65.7)	4 (80)	0.523
Surgical intervention >24hrs	0	0	0	No difference
Diabetes Mellitus	26	22 (62.8)	4 (80)	0.452
Immunodeficiency	2	1 (2.8)	1 (20)	0.100
PVD	4	2 (5.7)	2 (40)	0.017
Hypertension	7	4 (11.4)	3 (60)	0.008
Gram Negative Infection	28	24 (68.5)	4 (80)	0.602
ICU requirement	5	0	5 (100)	0.000

(Figures in parenthesis indicate percentages) *Chi Square test*

Table 4. Statistical significance of all variables compared with LRINEC Score

Parameter	< 6 (n=24)	>6 (n=16)	p value
Age (years)			
< 50	8 (33.3 %)	5 (31.2%)	0.890*
> 50	16 (66.6%)	11 (68.7%)	
(Mean ± SD) (Age)	(52.25±14.61)	(55.81±11.26)	0.41**
Males	21 (87.5%)	11 (68.7%)	0.146*
Diabetes mellitus	13 (54.1%)	12 (75%)	0.773*
Site of infection			
Lower Limb	11 (45.8%)	11 (68.7%)	0.102*
Perineum	3 (12.5%)	0	
Hospital stay (days)			
< 7	0	5 (31.2%)	0.003*
> 7	24 (100%)	11 (68.7%)	
(Mean ± SD) (Hospital Stay)	(25.46±7.07)	(18.75±8.68)	0.01**

**Student t test *Chi Square test

Discussion

In our study, 80% were males and 70% were more than 50 years of age. El-Menyar et al[8] reported a mean age of 48 years, with 74% males in their study. Martinschek et al[9] mentioned a median age of 48 years in their study, with 62% males and 38% females. The lower extremities were the most commonly affected in 63.2% cases in the study by Martinschek et al[9], followed by abdomen in 30.9% and perineum in 14.5%. Another study[10] reported necrotizing fasciitis in lower limbs in 56.6% cases and the perineum in 25%. Trauma was the commonest aetiological factor in our study and Diabetes Mellitus was the commonest co-morbidity (65%). A study[9] reported Diabetes Mellitus in 27.35 and Hypertension in 25.4% of cases. Another study[10] found Diabetes in 53.3%, alcohol and smoking in 18.3% of cases. Local erythema and swelling were reported in 100% of cases by Martinschek et al[9] Typical crepitation were seen in 73.6% of patients. Another study[10] mentioned pain and tenderness as the presenting features for 100% of cases, the duration ranging from 5 days to 2 years, and fever in 35%. Pain and fever were the commonest features in our study, with blister formation being evident in 50% of cases. We did not have any anaerobic infection in our study. This might be due to failure to obtain anaerobic cultures at times. The culture profile for aerobic infection is comparable with other studies[11]. The LRINEC Score was <6 in 60% and > 6 in 40% cases in our study. El-Menyar et al[8] reported a LRINEC Score of < 6 in 45% and > 6 in 55% cases. Corbin et al[12] mentioned that complications are higher in patients with an LRINEC Score of >6. Colaket al[13] observed that LRINEC Score was higher in the non-survivor group. Su et al[14], in their study of 209 patients, also observed that patients with LRINEC Score >6 have a higher rate of mortality. The median LRINEC Score in all deaths was 9 (range: 6 to 12), in a study by Swain et al[15]. A study[16] mentioned that patients with higher LRINEC Score were more likely to need mechanical ventilation and longer hospital stay.

There is no substitute for aggressive early surgical debridement for necrotizing fasciitis. Kalaivani et al[10] mentioned the need for multiple debridements in 35% of patients and amputations in 8.35 cases. Another study[17] reports immediate debridement, broad-spectrum parenteral antibiotics and repeated debridements as a treatment protocol.

Our study had a mortality of 12.5%. El- Menyar et al [8] reported a mortality rate of 15% with LRINEC <6 and 28% with LRINEC >6. Lee et al [18] mentioned 15.2 % mortality. Other studies [9,10,17] have reported a mortality rate of 16.6 %, 25 % and 29 % respectively.

Several studies have studied the significance of multiple variables affecting the clinical outcomes in their series of patients with necrotizing fasciitis. McHenry et al [17] mentioned an average time for surgical intervention as 90 hours in non-survivors versus 25 hours in survivors. Wong et al[19] concluded that advanced age, two or more associated co-morbidities and a delay of more than 24 hours for surgical intervention, had a negative impact on survival. Diabetes mellitus was an associated co-morbidity in 70.8% of their patients. Yanar et al [20] mentioned that raised serum creatinine, age more than 50 years and debridement after 24 hours were associated with a negative outcome. Diabetes has been an important factor in adverse outcomes. Kalaivani et al [10] report a death rate of 31% among diabetics and 17.9% among non-diabetics. The presence of Peripheral Vascular Disease was stated to be an important factor by McHenry et al[17] Advanced age has been mentioned as a significant factor in several studies[9,17,21].

Conclusions

Necrotizing Fasciitis is a life-threatening surgical emergency. The hemodynamic status of the individual at the time of presentation and during the post-operative period has a significant prognostic value. Diabetes Mellitus is a common co-morbidity existing in patients with Necrotizing Fasciitis. Other co-morbidities like hepatic and renal dysfunction, hypertension, Peripheral Vascular Disease, immune-deficient states, also affect the treatment outcome. Advanced age though a contributing adverse factor, cannot be taken as an individual prognostic indicator. The duration between the onset of disease and surgical intervention is extremely crucial. Less the duration, more favourable the outcome. The initial surgical debridement is of extreme importance and should be a thorough one. Proper efforts at procuring adequate and appropriate culture samples can aid in instituting evidence-based antibiotic protocols. The requirement of an intensive care unit is a part of the treatment protocol for fulminant infections. However, prolonged stay in the intensive care unit has adverse effects. Early diagnosis, aggressive surgical debridement, with balanced fluid resuscitation and adequate nutritional support and a multidisciplinary approach is the key to a successful outcome in Necrotizing Fasciitis.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Misiakos EP, Bagias G, Patapis P, Sotiropoulos D, Kanavidis P Machiaras A. Current concepts in the management of necrotizing fasciitis. Frontiers in Surgery 2014;1(36):1-10. https://doi.org/10.3389/fsurg.2014.00036

2. Levine EG, Monders SM. Life-threatening necrotizing fasciitis. Clin Dermatol 2005; 23: 144-147. https://doi.org/10.1016/j.clindermatol.2004.06.014
3. Dworkin M, Westercamp M, Park L, McIntyre A. The epidemiology of necrotizing fasciitis including factors associated with death and amputation. Epidemiol Infec 2009; 137:1609-1614. https://doi.org/10.1017/S0950268809002532
4. Lee CY, Kuo LT, Peng KT, Hsu WH, Huang TW, Chou YC. Prognostic factors and monomicrobial necrotizing fasciitis: Gram positive versus Gram negative pathogens. BMC Infectious Diseases 2011;11(5). https://doi.org/10.1186/1471-2334-11-5
5. McHenry CR, Piotrowski JJ, Petrinic D, Malangoni MA. Determinants of morbidity for necrotizing soft tissue infections. Ann Surg 1995; 221(5); 558-563. https://doi.org/10.1097/00000658-199505000-00013
6. Henry SM, Davis KA, Morrison JJ, Scalea TM. Can Necrotizing Soft Tissue Infection be reliably diagnosed in the emergency department? Trauma Surg Acute Care Open 2018;3:1-3. https://doi.org/10.1136/tsaco-2017-000157
7. Wong CH, Khin LW, Heng KS,Tan KC, Low CO. The LRINEC Score: a tool for distinguishing necrotizing fasciitis from other soft tissue infections. Crit Care Med 2004: 32:1535-1341. https://doi.org/10.1097/01.CCM.0000129486.35458.7D
8. El-Menyar, Asim M, Mudali IN, Mekkodathil A, Latifi R, Al-Thani H. The laboratory risk indicator for necrotizing fasciitis (LRINEC) scoring: the diagnostic and potential prognostic role. Scandinavian Journal of trauma, Resuscitation and Emergency Medicine 2017;25:28. https://doi.org/10.1186/s13049-017-0359-z
9. Martinschek A, Evers B, Lampl L, Gerngross H, Schnidt R, Sparwasser C. Prognostic aspects, survival rates and predisposing factors in patients with Fournier's Gangrene and Necrotizing Soft Tissue Infections: Evaluation of clinical outcome of 55 patients. Urol Int 2012;89:173-179. https://doi.org/10.1159/000339161
10. Kalaivani R, Hiremath BV, Indumathi VA. Necrotizing soft tissue infection-risk factors for mortality. J Clin Diagn Res 2013;7(8):1662-1665.
11. Bosshardt TL, Henderson VJ, Organ CH. Necrotizing Soft Tissue Infections. Arch Surg 1996;131(8):846-852. https://doi.org/10.1001/archsurg.1996.01430200056011
12. Corbin V, Vidal M, Beytout J, et al. Prognostic value of the LRINEC score (Laboratory Risk Indicator for Necrotizing Fasciitis) in soft tissue infections: a prospective study at Clermont-Ferrand University hospital. Ann Dermatol Venereol. 2010;137:5-11. https://doi.org/10.1016/j.annder.2009.12.002
13. Colak E, Ozlem N, Kucuk GO, et al. Laboratory Risk Indicators for Necrotizing Fasciitis and associations with mortality. Turk J Emerg Med. 2014;14:15-19. https://doi.org/10.5505/1304.7361.2014.55476
14. Su YC, Chen HW, Hong YC, et al. Laboratory risk indicator for necrotizing fasciitis score and the outcomes. ANZ J Surg. 2008;78:968-972. https://doi.org/10.1111/j.1445-2197.2008.04713.x
15. Swain RA, Hatcher JC, Azadian BS, et al. A five-year review of necrotizing fasciitis in a tertiary referral unit. Ann R Coll Surg Engl. 2013;95:57-60. https://doi.org/10.1308/003588413X13511609956093
16. Bozkurt O, Sen V, Demir O, et al. Evaluation of the utility of different scoring systems (FGSI, LRINEC and NLR) in the management of Fournier's gangrene. Int Urol Nephrol. 2015;47:243-248. https://doi.org/10.1007/s11255-014-0897-5
17. McHenry CR, Piotrowski JJ, Petrinic D, Malangoni MA. Determinants of mortality for Necrotizing Soft-Tissue Infections. Ann Surg 1995;221(5):558-565. https://doi.org/10.1097/00000658-199505000-00013
18. Ching-Yu Lee, Liang-Tseng Kuo, Kuo-Ti Peng, Wei-Hsiu Hsu, Tsan-Wan Huang, Ying-Chao Chou. Prognostic factors and monomicrobial necrotizing fasciitis: gram positive versus gram-negative pathogens. BMC Infect Dis 2011;11;5. https://doi.org/10.1186/1471-2334-11-5
19. Wong CH, Chang HC, Pasupathy S, Khin LW, Tan JL, Low CO. Necrotizing fasciitis: clinical presentation, microbiology, and determinants of mortality. J Bone Joint Surg Am 2003;85:1454-1460. https://doi.org/10.2106/00004623-200308000-00005
20. Yanar H, Taviloglu K, Ertekin C, et al. Fournier's Gangrene: Risk factors and strategies for management. World J Surg 2006;30:1750-1754.https://doi.org/10.1007/s00268-005-0777-3
21. Eke N: Fournier's gangrene: a review of 1726 cases. Br J Surg 2000;87:718-728. https://doi.org/10.1046/j.1365-2168.2000.01497.x

SCIENTIFIC ARTICLE

Anatomical variations of the renal vasculature and outcome of live donor nephrectomies: experience of a single surgeon

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Keywords: Renal artery variations; donor nephrectomy; kidney transplantation; complications; renal vascular anatomy

Abstract

Introduction

Renal artery [RA] variations occur in 18 % to 21%. Variations determine the side selection in kidney donors and the outcome of Kidney Transplantation. This series reports the renal vascular anatomy [RVAS] variations and associated complications encountered during live donor nephrectomies [LDN].

Methods

Consecutive LDN done by a single surgeon is included, the patient's demography, LDN side, RVAS variations and complications are recorded. The kidney with worse function and the least number of RA is selected for LDN. The RVAS is assessed by Computed Tomography Angiography and intra-operatively. Single RA and vein with the hilar division are considered normal anatomy.

Results

159 were included with 103 [64.8%] males. The mean age was 38.2 years [23-63]. 106 [66.7%] were left LDN. 136 [85.5%] had single RA of these 34 [21.4%] had early-branching [EB]. 23 [14.5%] had multiple RA [2 in 21 and 3 in 2]. Therefore variations occurred in 35.8 %. In a subgroup analysis of 123 renal veins, only 6 [6.8%] with single RA but 9 [25.7%] out of 35 with multiple arteries or EB arteries had multiple veins. This difference was statistically significant [p-0.004]. 11 [6.9%] had complications [3 renal bed haematoma]. 2 of 3 haematoma patients had EB of RA [5.9% vs. 0.8%] and underwent right LDN [3.8% vs. 0.9% / p>0.05].

Conclusions

RA variations occur in 35.8 %. Multiple arteries and EB is significantly associated with multiple veins. The complication rates in patients with EB appear to be high. However, this was not statistically significant probably due to low numbers.

Introduction

Renal transplantation is a commonly performed surgery. The variations of the renal vasculature in the donor play a major role in the outcome of both the donor and the recipient. The renal arteries [RA] arises at the level of the first lumbar [L1] to the second lumbar [L2] vertebral level from their lateral aspect of the abdominal aorta. RA are about 4 to 6 cms in length. The right RA is longer than the left RA and runs posterior to the inferior vena cava [IVC]. The RA divides into segmental branches at the renal hilum. If the artery divides outside the hilum it is called early-branching [EB]. Additional renal arteries can arise from the aorta and enter the kidney. Additional arteries are either “Hilar arteries” or “Polar arteries”. Hilar arteries arise superior or inferior to the level of the main renal artery and enter the hilum of the kidney. Whereas polar arteries arise from the aorta either superior or inferior to the level of the main renal artery and enter either the upper pole or the lower pole of the kidney outside the hilum. Multiple renal arteries are encountered at a rate of 27.0% - 31.9% [1] [2].

In addition, early branching of the renal artery [Proximal to the renal hilum] is found in 26.7% - 29.1% [1] [2]. The Kidneys are usually drained by a single renal vein [RV]. The left renal vein is about 6 to 7 cms in length and runs anterior to the aorta and drains into the inferior Vena cava [IVC]. The right renal vein is about 3 to 4 cms in length and also drains into the IVC. Both RV drains into IVC at the level of L1 to L2. The left renal vein also has a thicker wall when compared to the right vein. Variations also occur in RV anatomy. For example, multiple renal veins are found in 16.7 % of individuals [3]. The renal vein variations are more common on the right side 16.6% vs. 2.1% [3]. Variations determine the side selection of the donor. Renal vascular variations during donor nephrectomy [DN] is known to increase the surgical time and the complications in the donor [4]. This series reports the renal vascular anatomy [RVAS] variations and associated complications encountered during live donor nephrectomies [LDN].

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Methods

Consecutive open LDN did by a single surgeon were included. The patient's demography, LDN side, RVAS variations and complications were recorded. The RVAS was assessed by Computed Tomography Angiography [CTA] and intra-operatively. 3D reconstruction of the CTA images was done before interpretation. The CTA was interpreted by both the surgeon and the radiologist. Single RA and RV with hilar division were considered normal anatomy.

A preoperative Tc99m-DTPA [Diethylene Triamine Pent Acetate] scan was done in all donors to assess the relative function of the kidneys. The kidney with the lesser relative function was selected for donor nephrectomy. A split function difference of 45% to 55% was considered normal and acceptable for donation. After the split function determination, the kidney with the least number of arteries and veins was selected for donor nephrectomy. The kidneys with the least number of arteries and veins will make transplantation in the recipient easier. In addition, if there were any other abnormalities in the donor's kidneys [calculi, cysts, hydronephrosis, sluggish emptying of urine as shown in DTPA scan, etc.] the kidney with the abnormality was considered for donor nephrectomy leaving behind the healthy kidney in the donor. If all the above factors were equal in both donor kidneys, the left kidney was preferred. Because the left renal vein is longer and has a strong venous wall. Therefore the anastomosis in the recipient is easier.

Results

159 patients were included. 103 [64.8%] were males. The mean age was 38.2 years [23-63]. 106 [66.7%] were left LDN. 136 [85.5%] had a single RA of these 34 [21.4%] had early branching. 23 [14.5%] had multiple RA [2 arteries in 21[13.2%] and 3 arteries in 2 [1.2%]]. Therefore variations occurred in 35.8 %. In a subgroup analysis of 123 renal veins, only 6 [6.8%] with single RA but 9 [25.7%] out of 35 with multiple arteries or EB arteries had multiple veins. This difference was statistically significant [p-0.004].

Eleven [6.9%] patients developed complications. The complications were; wound infection in 5 [3.1%], sciatica in 2 [1.2%], pneumothorax in 1 [0.6%] and renal bed haematoma in 3 [1.9%]. The patient who developed pneumothorax was a left kidney donor. There was a small pleural tear during the surgery. The pleural tear was repaired. But in the immediate post-operative period, her peripheral SaO2 dropped to 90% to 92% while on oxygen via face mask. The left-sided chest was hyper resonant and breath sounds were reduced on the left side. Chest x-ray confirmed the pneumothorax. An intercostal drainage tube was inserted and connected to a underwater seal.

Three patients developed renal bed hematoma. These patients complained of severe pain over the surgical site. In all patients, the symptoms worsened in 48 hours from the time of surgery and they became haemodynamically unstable. There was a significant drop in haemoglobin in all patients. The hematoma was confirmed with an ultrasound scan. All 3 patients underwent re-exploration and evacuation of a haematoma under general anaesthesia. During the reoperation no particular bleeding sources were identified. Two of 3 patients, who developed a haematoma, had EB of RA [5.9% vs. 0.8%] and underwent right LDN [3.8% vs. 0.9%]. These differences were not statistically significant probably due to the small numbers [p>0.05].

Discussion

During embryonic development, series of arteries develop from the aorta i.e. mesonephric arteries, supplying the developing kidneys. During further development, most of the superior mesonephric arteries regress. The caudal mesonephric arteries [usually one] persist to supply the future metanephric [adult] kidney. The persistence of some of the mesonephric arteries results in multiple renal arteries in adults [5].

This study shows that multiple RA occurs in 14.5% of individuals. Early branching occurs in 21.4% of patients with single RA. Previous studies have shown that multiple renal arteries, multiple renal veins and early branching of the arteries are associated with increased operating time, increased bleeding during surgery, increased warm and cold ischemia times of the kidney and increased postoperative serum creatinine in the donor [6].

This study shows that 25.7% of patients with multiple renal arteries and EB have associated multiple renal veins. Awareness of this fact is important during renal surgeries especially donor nephrectomy to avoid inadvertent damage to the veins and bleeding. Unexpected bleeding during donor nephrectomy results in unexpected damage to the renal artery branches when attempting haemostasis. The complication rates in patients with EB and on the right side appear to be high.

However, this was not statistically significant probably due to low numbers. The probable reason for this is that the right renal vein and its branches are thinly walled. In addition, a significantly large number of patients with early branching of the renal arteries and multiple renal arteries have associated multiple renal veins [25.7%] as demonstrated in the current study. These multiple veins are also very thin-walled. Accidental damage to these veins can result in bleeding and haematoma formation both intraoperatively and postoperatively.

Also in cases of early branching, to get a common renal artery stump on the right side, more dissection needs to be done posterior to the inferior vena cava. This can result in prolongation of the surgery and a higher risk of bleeding.

At present, the available guidelines and consenting forms do not specifically mention the associated higher risk of complications in patients with multiple renal vessels and early branching of renal arteries. This additional risk should be separately explained to the renal donors with multiple renal vessels and early branching of renal arteries.

Small sample size is a limitation of the current study and further studies with larger cohorts are needed before recommendations can be made for donors.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Variations of renal artery in 820 patients using 64-detector CT-angiography. Gümüş H, Bükte Y, Ozdemir E, et.al. 3, 2012, Ren Fail, Vol. 34, pp. 286-90. https://doi.org/10.3109/0886022X.2011.647295
2. Study of Renal Artery Patterns in a Sri Lankan Population. Dissanayake PH, Jayasekera RW. II, 2018, Sri Lanka Anatomy Journal, Vol. 2, pp. 24-30. https://doi.org/10.4038/slaj.v2i2.5
3. Anatomical variants of renal veins: A meta-analysis of prevalence. Hostiuc S, Rusu M.C, Negoi I. 2019, Sci Rep, Vol. 9, p. 10802. https://doi.org/10.1038/s41598-019-47280-8
4. Vascular Multiplicity Should Not Be a Contra-Indication for Live Kidney Donation and Transplantation. Lafranca J. A, van Bruggen M, Kimenai H. J,et.al. 4, 2016, PloS one, Vol. 11, p. e0153460. https://doi.org/10.1371/journal.pone.0153460
5. Variations in Branching Pattern of Renal Artery in Kidney Donors Using CT Angiography. Munnusamy K, Kasirajan S. P, Gurusamy K, et.al. 3, 2016, Journal of clinical and diagnostic research, Vol. 10, pp. AC01-AC3.
6. Outcome of renal transplantation with multiple versus single renal arteries after laparoscopic live donor nephrectomy: a comparative study. Desai M.R, Ganpule A.P,Gupta R,et.al,. 2007, Urology, Vol. 69, pp. 824-827. https://doi.org/10.1016/j.urology.2007.01.026

SCIENTIFIC ARTICLE

An underrated differential diagnosis for subcutaneous lumps: 26 cases of subcutaneous Dirofilariasis

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Keywords: Worm granuloma; dirofilaria; subcutaneous lumps; human dirofilariasis

Abstract

Introduction

Even though subcutaneous dirofilariasis [worm granuloma] is an emerging zoonosis, it is not commonplace to consider it as a differential diagnosis for a subcutaneous lump even in the endemic zones. Moreover, the available literature lacks attempts to provide a unified clinical profile for it to be considered as a clinical entity.

Methods

We have retrospectively analyzed patients who were diagnosed with subcutaneous dirofilariasis at a Base Hospital in the Uva Province of Sri Lanka from February 2018 to March 2020. We evaluated patient demographics, symptomatology, clinical signs, ultrasonographic and histopathological features.

Results

Twenty-six patients with a mean age of 15.6 years [range 1 – 67 years] were analyzed. The locations of the lumps were highly variable, the commonest being the abdominal wall [34.6%]. Most [84.6%] were asymptomatic. The average diameter was 14.2mm [range 8 – 25mm]. The majority were neither tender nor warm, firm, and had ill-defined margins and a smooth surface without fluctuation, transillumination, or slipping sign. All were in the subcutaneous plane often attached to the deep fascia but without attachment to the skin. Blood investigations were unremarkable with a normal ESR and eosinophil count. The ultrasonographic finding was an echogenic tubular structure within a hypoechoic lesion. Histopathology demonstrated a worm surrounded by granulomatous inflammatory infiltrates with eosinophils and lymphocytes.

Conclusion

We emphasize the importance of regarding subcutaneous dirofilariasis as a differential diagnosis for subcutaneous lumps, especially in the highly prevalent geographical zones to minimize 'incidental diagnosis'.

Introduction

Human dirofilariasis is an emerging zoonotic infestation producing parasitic granuloma typically with subcutaneous, pulmonary, and ocular involvement [1]. Nematodes of genus Dirofilaria commonly infect wild and domestic animals, particularly canines. Out of about 40 recognized species of Dirofilaria, few of them including D. immitis, D. repens, D. striata, D. tenuis, D. ursi and D. spectans infect humans accidentally [1, 2]. Mosquitos of genera Anopheles, Aedia, Culex and Mansonia act as vectors in the transmission of the disease. In addition, fleas and ticks are also recognized as vectors. [2]

The condition is widespread involving both temperate and tropical climates around the world. Southern and Central Asia, Southern and Eastern Europe have been recognized as the highest endemic zones. Among the Asian countries, Sri Lanka is the most endemic country followed by Malaysia [1, 3]. D. repens is the commonest reported nematode responsible for subcutaneous dirofilariasis in South East Asia including Sri Lanka. Condition is manifested as subcutaneous lumps commonly affecting the exposed areas of the body. e. g. Face, upper and lower limbs. The preference for the exposed areas is believed to be due to the tendency of the granuloma to locate at the sites of mosquito bites [4, 6].

Even though there is a rising trend of incidence, it is not commonplace to consider parasitic granuloma as a differential for a subcutaneous lump among the other classic differential diagnoses. The available world literature describes parasitic and vector biology, the geographic distribution of the disease as well a retrospective series of unusual subcutaneous lumps which were diagnosed as dirofilariasis by radiology and histology. We could not observe any attempt to provide a unified clinical profile for subcutaneous dirofilariasis to be considered in the clinical diagnosis rather than being an 'unusual lump'.

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Methods

We have retrospectively analyzed patients who were diagnosed with subcutaneous dirofilariasis at Base Hospital Mahiyangana from February 2018 to March 2020 after obtaining approval from the institutional ethical review board and administration. The data were retrieved from the patients during initial and follow-up clinic visits after obtaining written informed consent.

We evaluated the data on patient demographics, clinical signs, symptomatology, ultrasonographic and histopathological features. All the patients underwent an ultrasonographic assessment on clinical suspicion and later underwent excision biopsy for histological evaluation if ultrasonographic features were compatible with the clinical diagnosis.

Results

A total of 26 patients had been evaluated over 2 years. The mean age at presentation was 15.6 years [range 1 – 67 years] and the majority [61.5%] belonged to the paediatric age group. The distribution of the location of the lumps was highly variable, most common being the abdominal wall [34.6%] followed by lower limbs [19.2%]. Two patients had lumps in unusual locations including buccal mucosa and breast.

Symptoms and signs were highly variable among the reported cases. In the paediatric group, most of the lumps were noticed incidentally by their parents during bathing. Adults were asymptomatic except for a few patients with mild pain and itching. The majority of the lumps were oval shaped with an average diameter of 14.2 mm [range 8 – 25 mm]. Skin changes were minimal except for a lump that mimicked a keloid. The majority were non-tender or mildly tender, not warm, firm in consistency and having ill-defined margins and a smooth surface without fluctuation, transillumination or slipping sign. All of them were in the subcutaneous [submucosal in the case of buccal lump] plane often attached to deep fascia but without attachment to the skin.

Blood investigations were found to be unremarkable with a normal ESR, white blood cell count and eosinophil count. The general ultrasonographic finding was an echogenic tubular structure within a hypoechoic lesion. The characteristic histological finding was the demonstration of a worm surrounded by granulomatous inflammatory infiltrates with eosinophils, lymphocytes, plasma cells and histiocytes.

Discussion

Following the available literature, we have noticed a wide age range of affected patients [1 – 67 years] depicting that a person of any age can acquire the condition. However, there is some predilection towards the pediatric age group.

The location of subcutaneous dirofilariasis is highly variable with the possibility of producing lumps in almost any location of the body. Contrary to the previously published series, we observed the commonest location as abdominal wall [34.6%] followed by lower limbs rather than on exposed areas of the body including the face [4, 6]. Sizes of the lumps are variable in the literature, many approximating 15 – 20mm [1] which is compatible with the average diameter of our series [14.2mm].

Diagnostic challenges were noticed with the signs related to the lumps when considering the other classic differential diagnoses on the particular location. However, examination with attention to detail revealed certain differences from the other common differential diagnoses.

Skin changes associated with the lumps were minimal except in one case who presented with a breast lump [figure 1a] that mimicked a keloid but without a history of local tissue damage. The majority mimicked implantation dermoid due to the subcutaneous location, firm consistency, and lack of transillumination. However, ill-defined margins, lack of fluctuation and deep attachment allowed the differentiation from a dermoid. The main differentiating features from sebaceous cyst were lack of skin attachment, absence of punctum, ill-defined margins and non-fluctuant nature. Lipoma was excluded from the differential diagnosis as the lumps were firm, non-fluctuant and absent of slipping sign. Few lumps that were located on the hand and foot could be differentiated from a ganglion by the absence of fluctuation and transillumination.

Two other patients with lumps located in less frequent sites posed issues with clinical diagnosis. A 3-year-old boy presenting with an anterior neck lump just off the midline and having attachment to the investing layer of deep fascia

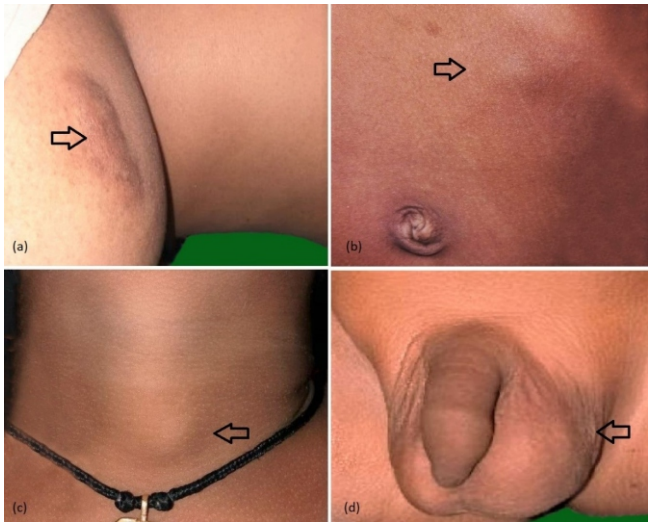

Figure 1. various location sof worm granuloma (a) right breast (b) abdominal wall (c) anterior neck (d) left hemiscrotum

resembled a thyroid nodule [figure 1c]. It was differentiated from a thyroglossal cyst by its lack of mobility with tongue protrusion. A 5-year-old boy with a lump over the left hemi scrotum which mimicked an epididymal cyst but lacked a typical 'Chinese lantern appearance' with transillumination [figure 1d].

Blood eosinophilia and elevation of inflammatory markers are rarely elevated, and they are of limited value in the diagnosis of subcutaneous dirofilariasis [3, 4]. Laboratory assessment of our series was unremarkably complying with the previous studies. Ultrasound scan aided the clinical diagnosis by demonstrating an echogenic tubular structure within a hypoechoic lesion in almost all the cases [figure 2].

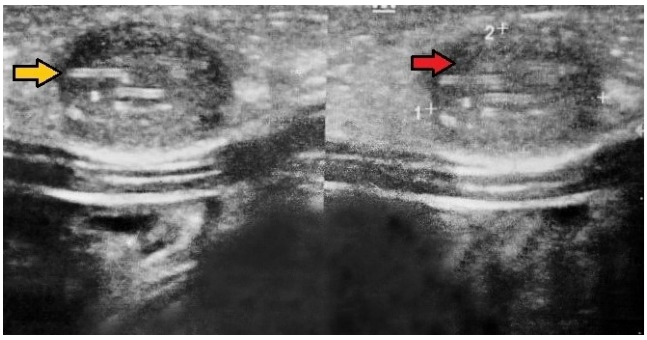

Figure 2. Ultrasonography showing an echogenic tubular structure (yellow arrow head) within hypoechoic lesion (red arrow head) in the subcutaneous tissue plane.

Since there is no migration into the bloodstream, the anthelminthic treatment is less effective, so the treatment of choice is surgical excision[7, 8]. However, treatment with a course of Ivermectin and Diethylcarbamazine [DEC] is in use if secondary lesions developed to prevent further surgical excisions [8]. However, we did not observe such recurrences in our participants during the limited follow-up.

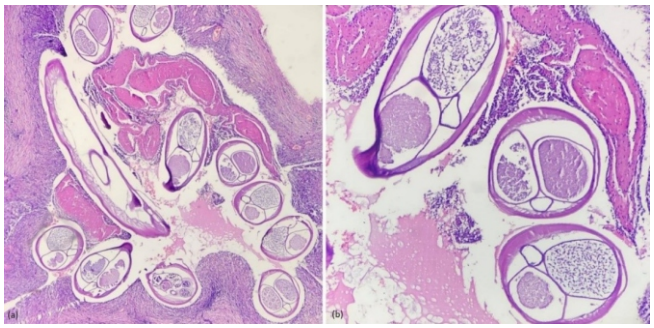

Figure 2. Tangenital and cross sections of dirofilaria worm showing well developed multi layered cuticle, alimentary canal and genital tube. The worm is surrounded by dense inflammatory infiltrate with fleets of fleets of eosinophils, lymphocytes, plasma cells and histiocytes. Haemotoxylin and eosin; magnification (a) X 40 (b) X 100.

The histological evaluation confirmed the diagnosis, demonstrating the worm surrounding granulomatous inflammation with fleets of eosinophils, lymphocytes, plasma cells and histiocytes [figure 3].

Conclusion

This article adds to the increasing body of evidence of dirofilariasis in Sri Lanka. We emphasize the importance of subcutaneous dirofilariasis in the differential diagnosis for subcutaneous lumps, especially in the highly prevalent geographical zones that minimize the diagnostic errors.

In addition, there is an increasing trend of the paediatric population being affected. Standard hygiene and vector control are to be considered to overcome this parasitic infestation.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Reddy MV. Human dirofilariasis: an emerging zoonosis. Trop Parasitol. 2013;3[1]:2-3.
2. Pampiglione S, Canestri Trotti G, Rivasi F. Human dirofilariasis due to Dirofilaria [Nochtiella] repens: a review of world literature. Parassitologia. 1995;37[2-3]:149-193.
3. Kini RG, Leena JB, Shetty P, Lyngdoh RH, Sumanth D, George L. Human dirofilariasis: an emerging zoonosis in India. J Parasit Dis. 2015;39[2]:349-354. https://doi.org/10.1007/s12639-013-0348-8
4. Joseph E, Matthai A, Abraham LK, Thomas S. Subcutaneous human dirofilariasis. J Parasit Dis. 2011; 35[2]:140-143. https://doi.org/10.1007/s12639-011-0039-2
5. Conly JM, Sekla LH, Low DE. Dirofilariasis presenting as a breast lump. Can Med Assoc J. 1984; 130 [12]:1575-1576.
6. Chandrasena TGAN, Premaratna R, Mallawaarachchi CH, et al. The Diversity of Human Dirofilariasis in Western Sri Lanka. Biomed Res Int. 2019;2019:9209240. Published 2019 Apr 18. https://doi.org/10.1155/2019/9209240
7. Acharya D, Chatra PS, Padmaraj SR, et al. Subcutaneous dirofilariasis. Singapore Med J 2012; 53[9]: 184.
8. Gunathilaka N, Siriwardana S, Wijesooriya L, Gunaratne G, Perera N. Subcutaneous dirofilariasis caused by Dirofilaria [Nochtiella] repens in Sri Lanka: A potential risk of transmitting human dirofilariasis. SAGE Open Med Case Rep. 2017;5:2050313X17701373. Published 2017 Mar 29. https://doi.org/10.1177/2050313X17701373

SCIENTIFIC ARTICLE

How "simple" is laparoscopic transperitoneal simple nephrectomy for a novice surgeon

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Keywords: Laparoscopy; nephrectomy; learning curve

Abstract

Introduction

To assess the perioperative outcome of laparoscopic transperitoneal simple nephrectomy and to see how difficult it is for a novice laparoscopic surgeon.

Materials and methods

The laparoscopic transperitoneal simple nephrectomy database between July 2012 and February 2019 was analyzed. The data of the first 50 cases performed by each of the three surgeons (group 1, 2, and 3) were divided into two subgroups- A: cases 1-25, and B: cases 26-50. Data analyzed included operative time, blood loss, conversion to open, the number of cases taken to reach a steady perioperative outcome and complications.

Results

Baseline characteristics of patients including the aetiology of the non-functioning/poorly functioning kidney were similar between the three groups. Though the mean operative time differs between the three surgeons, it decreased significantly till 20-25 cases and then remained steady thereafter among all three surgeons. The presence of hilar or perinephric inflammation secondary to pyonephrosis or stone disease was the factor associated with longer operative time and the need for conversion to open. The grade 3 or higher post-operative complications were similar between the three groups.

Conclusion

Operative time was the significant perioperative factor that became steady after approximately 20 cases of laparoscopic transperitoneal simple nephrectomy but not the other factors like blood transfusion rate or grade III complications.

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Introduction

Since the first laparoscopic transperitoneal nephrectomy was performed by Clayman et al in 1991, this procedure became increasingly popular for both simple and radical nephrectomy [1]. It is presently considered as a gold standard operative modality for both benign and malignant renal pathology. Advantages of laparoscopic nephrectomy over open nephrectomy include lesser perioperative blood loss, postoperative pain, hospitalization time and patient recovery time. Besides these, laparoscopic nephrectomy offers equivalent clinical outcomes [2]. Laparoscopic simple nephrectomy is not always a "simple" procedure, especially for beginners where the level of difficulty may change with the aetiology of a non-functioning kidney [2-5].

Laparoscopic simple nephrectomy, a proven safe and efficacious procedure, is a procedure that a novice laparoscopic surgeon usually considers approaching before proceeding for more complex laparoscopic urologic procedures [6]. Also, there is a paucity of literature regarding the learning curve of simple laparoscopic nephrectomy. We audited our laparoscopic simple nephrectomy data intending to assess the perioperative outcome and to see how difficult it is for novice laparoscopic surgeons.

Materials and methods

Patients, who underwent laparoscopic transperitoneal simple nephrectomy between July 2012 and February 2019, and satisfied the eligibility criteria, were included in this institutional ethics committee approved retrospective study. Definition of nonfunctioning/poorly functioning kidney (NFK) included a differential renal function <15% and glomerular filtration rate <10ml/min on diethylenetriamin-epentaacetic acid (DTPA) scan. Data of patients, for whom 1 monthly follow up data was not available, were excluded from the analysis. Data analyzed included the first 50 laparoscopic transperitoneal simple nephrectomies each performed by three surgeons. Before starting laparoscopic nephrectomy, all of the three surgeons had vast experience of performing open simple nephrectomy in addition to the experience of assisting in laparoscopic nephrectomy. Fifty patients of three surgeons (groups 1, 2, and 3) were divided into two subgroups: A case 1-25, and B- case 26-50.

Surgical technique

The procedures were performed under general anaesthesia with the patient in a lateral flank position. All three surgeons used the standard technique of nephrectomy. In brief, the position and number of ports were dependent on the individual surgeon choice, patients body habitus, body mass index and presence of previous surgery scar. The dissection began with mobilization of colon and ureter isolation. The ureter was dissected cranially to define the hilar structures of the kidney. The renal vein and artery were identified and doubly clipped with a Hem-o-lok® clip (Weck Closure Systems, Research Park, NC) and divided. Once the hilar vessels were divided, the kidney was removed from the renal bed preserving the adrenal gland. The ureter was divided and the kidney removed intact in an extraction bag by extending the caudal port. All the nephrectomy specimen were sent for histopathological examination.

Data analyzed included operative time (time taken from the skin incision for placement of the first trocar to the closure of last port site), blood loss, need for conversion to open, the number of cases taken to reach a steady level of perioperative outcome and complications up to 1 month follow up (complications as per Clavien-Dindo classification of surgical complications) [7].

Statistical analysis

The study parameters were arranged on a Microsoft Excel spreadsheet (Microsoft, Seattle, WA USA) and analyzed by SPSS version 21.0 (SPSS Inc., Chicago, IL) software package. All the collected data were subjected to a normality test. Those continuous data, which passed the normality test, were analyzed using a one-way ANOVA test and t-test, as applicable. Data that failed to pass the normality test were analyzed using the non-parametric Kruskal-Wallis test and Mann-Whitney test. Categorical data between the groups and subgroups were analyzed by the Chi-Square test/Fisher's exact test. P-value <0.05 was considered significant.

Results

Baseline characteristics of patients including age, body mass index, sex and side of nephrectomy were similar among the three groups (Table 1). The common causes of NFK were stone disease and PUJO. Others included renal dysplasia, vesicoureteral reflux, megaureter and idiopathic among others. None of these patients had malignant disease on histopathology. Three, 5 and 2 patients of groups 1, 2 and 3 respectively, had a history of abdominal surgery. Also, 4, 3 and 7 patients respectively, were on percutaneous nephrostomy (PCN) for at least 4 weeks for infected hydronephrosis or pyonephrosis.

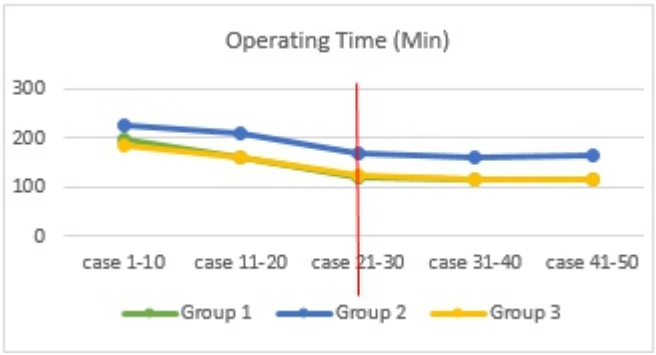

Figure 1. Operating time

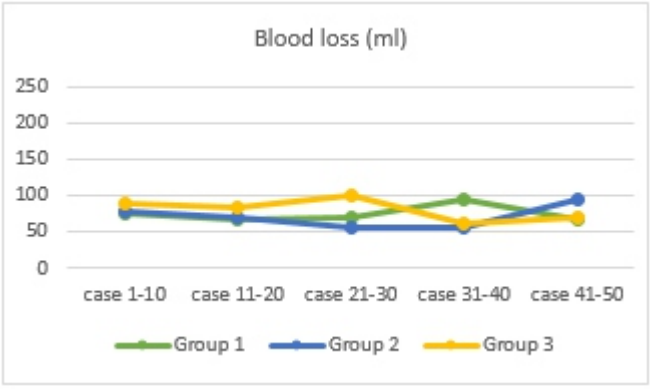

Figure 1. Blood loss

The peri-operative parameters are reported in table 2. The mean operative time of group 1 and 3 patients were significantly different from group 2 patients but no significant difference was noted between group 1 and 3 (p1 vs 2 vs 3<0.0001, p1vs2=0.0004 & p2vs3=0.0001, p1 vs3=0.77). In all the three groups, the mean operative time decreased significantly from subgroup A to B. On analyzing the data of each group in subgroups of 10 chronological cases, we observed a steady level after approximately 20 cases in all three groups. (Figure 1) Also, the operative time was significantly higher among patients with hilar or perinephric inflammatory adhesions secondary to stone or pyonephrosis. The mean blood loss among the three groups and their respective subgroups were similar with no significant difference noted between them. Throughout 50 cases in each group, the blood loss did not differ significantly between subgroups (Figure 2).

Among the three groups, three, 3 and 4 patients respectively, required conversion to open nephrectomy either due to bleeding or due to inability to proceed further. Among those 10 patients, seven had the stone disease and the rest 3 were on PCN for pyonephrosis. We could not record the exact amount of blood loss among these patients who required conversion to open. Of these, six out of 7 patients, who were converted to open due to bleeding, were transfused blood based on the decision of an anaesthetist. The grade I and II complications

Table 1. Baseline characteristics

		Group 1(n=50)	Group 2(n=50)	Group 3(n=50)	P value
Age (years)		40.94±17.83	43.42±16.16	44.10±16.08	0.61
BMI (kg/m2)		23.17±3.92	22.82±3.34	22.38±2.69	0.50
M/F		30/20	27/23	25/25	0.59
L/R		25/25	24/26	21/29	0.70
Kidney size (cm)		9.23±2.32	8.97±2.23	8.60±2.27	0.37
Etiology	Pelviureteric junction obstruction	12	15	13	0.85
	Stone	32	27	26	
	others	6	8	11	

Table 2. Perioperative parameter

		Operative time minutes(range)	Blood loss ml(range)	Conversion to open	Hospital stay days (range)	Bowel injury	Other complications
Group 1	A (1-25)	164.3 (101-216) *	72.8 (0-125) *	2	2 (1-3)	1(3b)	
	B (26-50)	116.6 (92-142) **	72.3 (0-240) **	1	2.04 (1-3)	1(3b)	
Group 2	A (1-25)	208.2 (148-278) ***	71.8 (0-250) ***	3	2.04 (1-3)		1(3a)
	B (26-50)	166.3 (142-214)	70.4 (0-180)	0	2(1-3)		
Group 3	A (1-25)	161.2 (98-224)	90.4 (50-190) ***	3	2.1 (2-3)		1(3b)
	B (26-50)	116.5 (76-142)	72.1 (0-240) **	1	2 (1-3)		1(3a)
P value 1A vs 1B, 2A vs 2B, 3A vs 3B		<0.0001	0.76, 0.66, 0.08		0.71, 0.64, 0.30		

*n=23, **n=24, ***n=22

were statistically similar between the two groups and their respective subgroups. The grade III or higher complications were reported among 2 patients in group 1 (bowel injury that required exploratory laparotomy on postoperative day 1), one patient in group 2 (post-operative collection in renal bed which required percutaneous drainage) and 2 patients in group 3 (one had a post-operative collection in renal bed which required percutaneous drainage and the other one developed pyoperitoneum secondary to pus spillage during nephrectomy, which required exploratory laparotomy on postoperative day 7).

Discussion

The word 'simple' nephrectomy implies excision of a kidney with or without Gerota's fascia leaving behind the adrenal gland. At times, the word “simple” appears to be a misnomer as the level of difficulties may increases with the presence of renal stones or inflammatory renal diseases, requiring highly skilled laparoscopic surgeons [2-5]. Thus, like any other surgical procedure, laparoscopic simple nephrectomy requires a certain learning curve to accomplish this procedure safely and successfully.

In a retrospective review, Keeley and Tolley assessed the outcome of the first 100 laparoscopic nephrectomies for various benign and malignant renal pathology. They reported a progressive and significant decline in operative time from 204 minutes in the first 20 cases to 108 minutes in the last 20 cases. However, the complication rates didn't show a similar trend with increasing experience.

Five patients, with a history of pyonephrosis, xanthogranulomatous pyelonephritis, polycystic kidney disease, previous renal surgery and staghorn calculus, required open conversion. In addition, they reported 15% and 3% minor and major complications, along with a 10% blood transfusion rate [2].

Jeon SH et al in a study, involving 50 laparoscopic radical nephrectomies by each of the 3 surgeons, reported that 15 cases are required for a novice surgeon to become competent. They reported similar post-operative complications between novice and competent groups (8.9 vs 9.5%), except for the blood loss (236.4mL vs 191.5 mL, p=0.04) and transfusion rates (17.8% vs 4.8%, p=0.02) which were significantly higher among the novice group [10].

Angerri O et al in a retrospective analysis of 96 laparoscopic transperitoneal nephrectomies reported 7.3% open conversion in cases of xanthogranulomatous pyelonephritis and pyonephrosis. They also reported 18.7% minor and 3% major complications [3].

In another review including 32 patients, Kaba M et al compared the outcome of laparoscopic transperitoneal nephrectomy in kidney with or without stone and found higher blood loss, operation time, haemoglobin change and

length of hospital stay in patients with stone disease, but it didn't reach a level of statistical significance [4]. Naghiyev R et al reported a similar outcome of laparoscopic nephrectomy among patients with or without the urinary stone disease [8].

Kurt O et al reported the outcome of transperitoneal laparoscopic nephrectomy among 22 inflammatory and 27 non-inflammatory kidneys. Though the perioperative parameters, including operation time, blood loss, haemoglobin drop and hospitalization time, were favourable in nephrectomy of non-inflammatory kidneys, it didn't reach a level of statistical significance. The only significant difference was a higher incidence of post-operative fever among patients with inflammatory kidneys (3.7 vs 22.7%) [5]. Manohar T et al reported longer operating times among patients with significant hilar scarring and altered anatomy consequent to tuberculosis and xanthogranulomatous pyelonephritis. Also, renal size >10 cm and significant hilar lymphadenopathy were found to be predictive of adverse outcomes after laparoscopy [9].

In our study, all three surgeons reached a steady level of operative time after approximately 20 cases. Though the mean operating time of the two surgeons was significantly different from the third surgeons, it did reach a plateau for each surgeon after 20 cases. The need for conversion, blood loss, Clavien grade III or higher complications did not reach a significant level between groups and their respective subgroups. The presence of hilar or perinephric inflammation secondary to pyonephrosis or stone disease was the factor associated with longer operative time and the need for conversion to open, but the number of such cases was not adequate for definitive statistical analysis.

Limitations of the study

- retrospective design, so there may be inherent selection bias,
- follow up was limited to 1 month.

Conclusion

Operative time was the significant perioperative factor that became steady after approximately 20 cases of laparoscopic transperitoneal simple nephrectomy but not the other factors like blood transfusion rate or grade III complications.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Clayman RV, Kavoussi LR, Soper NJ, Dierks SM, Meretyk S, Darcy MD, et al. Laparoscopic nephrectomy: initial case report. J Urol. 1991;146:278-282. https://doi.org/10.1016/S0022-5347(17)37770-4
2. Keeley FX, Tolley DA. A review of our first 100 cases of laparoscopic nephrectomy: defining risk factors for complications. Br J Urol. 1998;82(5):615-618. https://doi.org/10.1046/j.1464-410X.1998.00847.x
3. Angerri O, López JM, Sánchez-Martin F, Millán-Rodriguez F, Rosales A, Villavicencio H. Simple Laparoscopic Nephrectomy in Stone Disease: Not Always Simple. J Endourol. 2016 Oct;30(10):1095-1098. https://doi.org/10.1089/end.2016.0281
4. Kaba M, Pirinççi N, Taken K, Geçit I, Demiray Ö, Eren H. Laparoscopic transperitoneal nephrectomy in non-functioning inflammatory kidneys with or without renal stone. Eur Rev Med Pharmacol Sci. 2015 Dec;19(23):4457-61. PMID: 26698238.
5. Kurt O, Buldu I, Turan C, Yazici CM. Does laparoscopic transperitoneal simple nephrectomy for inflammatory and non-inflammatory kidneys differ? Springerplus.2016 Aug 17;5(1):1358. https://doi.org/10.1186/s40064-016-2945-3
6. Hsiao W, Pattaras JG. Not so "simple" laparoscopic nephrectomy: outcomes and complications of a 7-year experience. J Endourol. 2008 Oct;22(10):2285-90. https://doi.org/10.1089/end.2008.9718
7. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg. 2004; 240(2): 205-13. https://doi.org/10.1097/01.sla.0000133083.54934.ae
8. Jeon SH, Han KS, Yoo KH, Choe BK, Seo IY, Lim JS, et al. How many cases are necessary to develop competence for laparoscopic radical nephrectomy? J Endourol.2009 Dec;23(12):1965-9. https://doi.org/10.1089/end.2008.0636
9. Naghiyev R, Imamverdiyev S, Efendiyev E, Şanlı Ö. Laparoscopic transperitoneal and retroperitoneal simple nephrectomy: The impact of etiological factors of the results of surgical treatment. Turk J Urol. 2017 Sep;43(3):319-324. https://doi.org/10.5152/tud.2017.21855
10. Manohar T, Desai M, Desai M. Laparoscopic nephrectomy for benign and inflammatory conditions. J Endourol. 2007 Nov;21(11):1323-8. https://doi.org/10.1089/end.2007.9883

SCIENTIFIC ARTICLE

Neoplasms of the appendix: a retrospective analysis of 5-year data on histopathology of appendicectomy specimens in a tertiary care hospital

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Keywords: Appendiceal neoplasms; incidental neoplasms

Abstract

Introduction

Right iliac fossa pain due to appendicular disease is a common clinical presentation to a surgical casualty ward. Neoplasms of the appendix are rare but sometimes they present with acute symptoms similar to acute appendicitis. Studies on neoplasms of appendicectomy are sparse in Sri Lanka. Our objective is to study the epidemiological, demographic characteristics and histopathological data on appendicectomy specimens.

Method

A retrospective descriptive study using the database on appendicectomy specimens in the pathology department of Colombo North teaching hospital, Ragama from January 2015 to December 2019.

Results

Neoplastic lesions were noted in 16[0.82%] among 1939 appendicectomy specimens. All [n=16, 100%] were primary neoplasms and the male to female ratio was 5:11. The percentage of neoplasms was higher in the elderly population compared to the young. Six of the 16 specimens [37.5%] had associated features of acute appendicitis. The commonest neoplasm was neuroendocrine neoplasm [including goblet cell carcinoid tumour] [n=9, 56.25%]. The mean age was 33 years and comprised 0.46% of the population. Mucinous neoplasms were noted in 6 [37.5%] and comprised 0.3% of the population. The median age was 59 years. The resection margin was well away from the tumour in all [n=9] Neuroendocrine neoplasms while the tumour had involved the resection margin in 4 out of 6 [66.6%] of mucinous neoplasms.

Conclusion

Appendicular neoplasms are rare but higher in the elderly population compared to the young. Neuroendocrine neoplasms are the commonest incidental tumours and they are less aggressive at the time of diagnosis. Meticulous dissection is important with a good clearance of the resection margin in suspected mucinous appendiceal neoplasms.

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Introduction

Right iliac fossa [RIF] pain is a common presenting symptom among many admissions to a surgical casualty unit. Underlying pathology may vary and common differential diagnoses include inflammatory conditions like acute appendicitis, diverticulitis and pelvic inflammatory disease [PID].

Acute appendicitis is commoner than the other differential diagnoses. The aetiology of acute appendicitis is unclear but it is believed that the obstruction of the lumen with a faecolith or a foreign material leads to acute inflammation [1]. However, underlying neoplasms in the appendix should also be considered in the middle-aged and elderly population when they present with features suggestive of acute appendicitis [2]. The incidence of primary neoplastic lesions is about 0.7-1.7% of appendicectomy samples[3] and an increased incidence has been observed [4].

The neoplastic histology of the appendix varies from benign to malignant. Origin of primary neoplasms of the appendix is from epithelial, mesenchymal or lymphoid tissues. Epithelial and mesenchymal neoplasms are the commonest and the incidence of other tumours are less[5]. Secondary deposits are also found in the appendix of which the primary site is a different organ. It is found that the commonest neoplasm is the neuroendocrine tumour/ carcinoid tumour of the appendix [2]. The commonest malignant neoplasm is mucinous adenocarcinoma of the appendix. [6]. These figures are mainly from western countries and regional or local studies are sparse.

The WHO Classification of Tumours of the Digestive System is used to classify the tumours of the appendix. The 4th edition of WHO Classification of Tumours of the Digestive System [7] was used at our institution during the study period.

However, currently, the neoplasms of the appendix are classified using the 5th edition of it which was published in June 2019 [5]. There are several changes noticed in the new

edition. The epithelial tumours are classified broadly into serrated lesions and polyps, mucinous neoplasms, adenocarcinomas and neuroendocrine neoplasms. Goblet cell carcinoid which was considered as a neuroendocrine neoplasm is now renamed as goblet cell adenocarcinoma and considered as an adenocarcinoma. Depending on the pattern of invasion, Low grade appendiceal mucinous neoplasms [LAMN] and High grade mucinous appendiceal neoplasms [HAMN] are categorised under mucinous neoplasms and mucinous adenocarcinoma is categorised under Adenocarcinoma. Neuroendocrine tumour nomenclature remains mostly unchanged.

It is important to study the incidental neoplastic lesions in appendicectomy specimens to critically analyse the stages of each tumour at presentation/surgery and adequacy of resection. A mucinous appendiceal lesion such as low-grade appendiceal neoplasm or mucinous adenocarcinoma may progress into pseudomyxoma peritonei [PMP]. So proper workup and treatment reduce the disease morbidity and mortality.

This study will provide a better understanding of the incidental neoplasms in the appendix in the Sri Lankan context and lay a foundation to carry out further studies. Epidemiological data such as incidence and demographic data aids in taking proper clinical judgement and selecting the patients to perform pre-operative workup like CECT. Also, it helps to set forth consensus on management at the national level.

Our objective of the study was to provide epidemiological and demographical data on appendiceal neoplastic lesions and describe the pathological staging and resection margins of the neoplasms following the surgery.

Materials and methodology

A retrospective cross-sectional descriptive study was carried out using the database of appendicectomy histopathology reports in the department of pathology, North Colombo Teaching Hospital [NCTH], Ragama.

The database consists of data on all appendicectomy specimen received to the department of pathology, NCTH since 2015. This included data on gender, age, histological type of the lesion and TNM classification of received samples.

Histology of tumours was classified according to the 4th edition of WHO digestive system tumour classification [2010] [7]. TNM staging was done using the 7th edition of the American Joint Commission on Cancer [AJCC] staging system.

Inclusion criteria

All appendicectomy samples received to the pathology lab from the year 2015- 2019 were analysed. Appendixes of right hemicolectomy samples were not included in the study as the objective of the study is to analyse the proportions of neoplasms among samples that were clinically diagnosed as acute appendicitis. A 5-year data were collected from 2015-2019.

Histologically proven neoplasms were selected and detailed histology reports of selected cases were analysed from the anonymized database. Relevant data were extracted from the reports to a separate data extraction sheet. Data was stored in a confidential database accessible only to the investigators.

Frequency and percentages were used in categorical data. Continuous data such as age, size of tumours were reported using median and standard deviation. Collected data were analysed using SPSS v 23.0

Results

We analysed histology reports of 1939 appendicectomy specimens collected over a 5-year duration from 2015- 2019. The mean age of the study population was 26 years [SD- 14]. The age of the population ranged from 4 years to 84 years.

The commonest diagnosis was acute appendicitis [n=1415 [72.97%]]. Incidental neoplasms were found in 16 [0.82%] specimens of the study population [n=1939] [Table 1]. The mean age of the patients with incidental neoplasms in the appendices was 44 years [SD-19, IQR-27].

Six of the 16 specimens [37.5%] had associated features of acute appendicitis. Microscopy of all 6 specimens revealed to be neuroendocrine tumours including goblet cell carcinoid tumours.

There was a single specimen with hyperplastic polyp without dysplasia. Neoplastic lesions included both benign and malignant pathologies. All neoplasms [100%] were primary appendiceal neoplasms and arises from epithelial cells. The male, the female ratio was 5:11. The commonest type of neoplasm was the neuroendocrine neoplasm [Table 2].

The population was grouped into 3 categories according to age to analyse the proportions of neoplasms among each category [Table 3].

The percentages of neoplastic lesions were different between age categories. A higher proportion of neoplasms was noted in the elder population [Age>60 years].

There were 4 neoplastic lesions in the category of >60 years of age. Two specimens were invasive mucinous adenocarcinomas. One was a low grade mucinous append-iceal neoplasm and the TNM staging was T4a. The other specimen was a grade 2 neuroendocrine tumour.

The commonest incidental neoplasms were neuroendocrine neoplasms [n=9, 56.25%]. The proportion of neuroendocrine neoplasms out of the whole population was 0.46%. The mean age was 33 years. The male to female ratio was 1:2. According to the WHO classification of the digestive tumours 4th edition, the goblet cell carcinoid tumour of the appendix was also included in the neuroendocrine neoplasms [7].

Table 4 explains the AJCC TNM staging of neuroendocrine neoplasms found in our population. This means the staging of the neoplasm at the time of symptom occurrence. Most NETs showed symptoms at the T1a stage.

Tumour size was measured in 6/7 NET grade 1 and 2 tumours. In one specimen, the size was too small to measure and it was disregarded. From the 6 specimens, the mean size of the tumour was 4.66mm [range – 2mm-7mm], All the NET grade 1 and 2 tumours were less than 10 mm. Of the Goblet cell carcinoid tumours, the size measured was 6.6mm and 25mm in diameter respectively. Compared to Neuroendocrine tumour grades 1 and 2, Goblet cell carcinoid tumour size was larger in the appendicectomy specimen.

Resection margins were well away from the tumour in all cases [100%]. 1/9 [11%] had a macroscopic abnormality of which the appendix tip was dilated. The microscopy of the specimen with dilated tip was a goblet cell carcinoid tumour.

Mucinous neoplasms included 3 low-grade appendiceal mucinous neoplasms [LAMN] and 3 invasive mucinous adenocarcinomas [Table 5].

The proportion of mucinous neoplasms in the study population was 0.3%. The mean age of the mucinous neoplasms was 59 years. The male to female ratio was 1:2. Mucinous neoplasms included low-grade appendiceal neoplasms [LAMN] and invasive mucinous adenocarcinomas. The mean age of Invasive mucinous appendiceal carcinoma was 59.3 years and the mean age of LAMN was 58.6 years. The number of cases and TNM staging is presented in table 4. The tumours had involved the resection margins in 4 specimens [66.6%].

Mucocele is a cystically dilated appendix that contains mucin. Two specimens [33.3%] of mucinous neoplasms were macroscopically identifiable during the surgery and had features of a mucocele. Altogether there were 5 mucoceles in our population. Three specimens out of 5 [60%] of mucoceles were histologically diagnosed as retention cysts and, 2/5 [40%] mucoceles had an underlying mucinous neoplasm.

In one specimen of mucinous lesions, the histology of the resection margin was composed of a fibrofatty tissue fragment without appendiceal tissue with mucinous adenocarcinoma. The resection margin of this specimen was considered positive for the tumour. However, the staging was not given in this case.

There was a single specimen with histology of villous adenoma. It consisted of columnar epithelium with low-grade dysplasia. Lamina propria and muscle wall were preserved.

Discussion

According to the results of the study and considering the worldwide figures, appendiceal neoplasms are rare. The proportions of neoplasms in appendicectomy specimens [0.82%] is similar to the other published series in Europe and Asia [Table 6] [2,8- 9]. A female preponderance was noted in neoplastic appendicular lesions [Male: Female= 5:11].

Although the appendiceal neoplasms are rare, there is a noticeable difference in the proportions of appendiceal neoplasms between age groups. It is observed that the proportion of incidental neoplastic lesions is higher in the middle age and elder population. The chi-square test or fisher's exact test was not applied to assess the significance as the number of samples were low and are not fulfilling the criteria [table 3]. However, this percentage difference indicates that an underlying neoplasm should also be considered when a patient of middle age or old age presents with features of acute appendicitis. A high level of suspicion is necessary to consider further imaging studies before surgery.

The results of our study show that neuroendocrine neoplasms are the commonest among appendiceal neoplasms even in the current study [2]. The mean age of neuroendocrine neoplasm was 33 years which represent the middle age category. Our results showed 6/9 [66.67%] neuroendocrine neoplasms had features of acute inflammation in the wall of the appendix. This implicates that the neuroendocrine neoplasm is a possible reason to obstruct the lumen which triggers acute inflammation. Though it is common in middle age people, except for goblet cell carcinoid, most of the tumours were of T1a staging and resection margins are well away. Neuroendocrine tumours [NET] are less invasive when compared to other types of tumours at the time of diagnosis. According to the ENETS consensus guidelines for neuroendocrine neoplasms of the appendix [excluding goblet cell carcinoids], tumours <2cm can be adequately managed with appendicectomy alone provided that the margins are clear of tumour. This means even if the histology of the appendix shows incidental NETS in the young patients who presented with features of appendicitis, most NETS would be

Table 1. Histological diagnosis of specimens of the study population

Histology of the appendix	No. of cases	Percentage
Acute appendicitis	1415	72.97%
Nonspecific changes	282	14.54%
Submucosal Lympho-follicular hyperplasia	198	10.21%
Neoplasms	16	0.82%
Fibrous occlusion of appendix	14	0.72%
Parasitic infestations	5	0.25%
Retention cysts	3	0.15%
Extrauterine endometriosis	2	0.10%
Infarcted tissue	2	0.10%
Xanthogranulomatous inflammation	1	0.05%
Hyperplastic polyp	1	0.05%

Table 2. Distribution of neoplasms of appendix in the study population

Neoplasm	No. of specimens	Percentage
Neuroendocrine neoplasms	9	56.25%
Low-grade Appendiceal mucinous neoplasms	3	18.75%
Invasive Appendiceal mucinous adenocarcinoma	3	18.76%
villous adenoma	1	6.25%

Table 3. Age groups and the percentage of neoplasms in each age category

Age groups [years]	No. of specimen and Percentage population	Neoplastic lesions in each group	Percentage of neoplasms in each category
0 – 29	1286 [66.3%]	3	0.23%
30-59	589 [30.4%]	9	1.52%
>60	64 [3.3%]	4	6.25%

Table 4. Tumour staging of the neuroendocrine neoplasms [7th edition of AJCC TNM classification]

Type of Neuroendocrine neoplasm	No. of cases	Staging	No. of cases
Neuroendocrine tumour [NET] grade 1	6	T1a	5
		T3	1
Neuroendocrine tumour [NET] grade 2	1	T1a	1
Goblet cell carcinoid tumour.	2	T3	1
		T4	1

Table 5. Tumour staging of the mucinous neoplasms [7th edition of AJCC TNM classification]

Type of mucinous neoplasm	No. of cases	Staging	No. of cases	Involvement of tumour in resection margin
Low grade appendiceal mucinous neoplasm [LAMN]	3	Tis	1	Yes
		T3	1	Yes
		T4a	1	No
Invasive appendiceal mucinous adenocarcinoma.	3	T3	1	Yes
		T4a	1	No
		Staging not done	1	Yes

Table 6. Comparison of studies on neoplasms of appendicectomy specimen

Author and the country	Year	Number of patients	Number of neoplasms	Percentage of neoplasms observed among routine appendicectomy specimen
Connor - UK	1979-1994	7970	74	0.9%
Lee -South Korea	2000-2005	3744	28	0.7%
Kunduz- Turkey	2011-2017	3554	28	0.78%
Current study- A single tertiary care centre in Sri Lanka.	2015-2019	1939	16	0.82%

in the early stage and would not need a second surgery to complete management.

Goblet cell carcinoid is now classified as a separate group of tumours according to the updated WHO classification of tumours of appendix published in 2019 [5]. The mean age of the patients diagnosed with appendiceal mucinous neoplasm is 59 years. Seventy-five per cent of neoplasms found in patients over 60 years of age were mucinous neoplasms. So, it is clear that even in the Sri Lankan context, mucinous neoplasms are common among the elderly population.

Mucinous neoplasms of the appendix are associated with pseudo myxoma peritonei[PMP]. It is characterised by the growth of mucinous neoplasm within the peritoneal cavity producing peritoneal deposits and mucinous ascites which has a poor prognosis [10,11]. Even though PMP is an indolent tumour, it evolves with time and causes morbidity which needs complete cytoreductive surgery plus hyperthermic Intra-peritoneal chemotherapy later in a specialized oncosurgical unit [11]. According to our study, 33.3% of the appendiceal mucinous neoplasms are macroscopically identifiable as a mucocele and 40% of mucoceles are having underlying mucinous neoplasm [12]. Also, the tumour had involved the resection margin in 66.6% of cases of mucinous neoplasms of the appendix. It is important to be vigilant and perform a meticulous dissection when a macroscopically suspicious lesion in the appendix is noticed during the surgery to prevent the rupture of such lesion and contamination of the peritoneal cavity to avoid the development of PMP. Also, assistance from an experienced surgeon would be beneficial in these situations.

Diagnosis of appendiceal neoplasms can be done by performing imaging studies, especially mucinous type neoplasms of the appendix when it is associated with the gross appearance of a mucocele[13]. It is possible to differentiate a benign mucocele from a malignant mucocele using the contrast-enhanced CT [CECT] abdomen finding of the appendix [14]. According to this study, the elderly population is more prone to get mucinous appendiceal lesions. Hence, when an elderly patient presents with features of acute appendicitis it would be beneficial to perform a CECT abdomen. This aids a pre-operative diagnosis which helps us to offer proper management.

Unavailability of data on presenting complaints in the early years [2015-2016] was one of the limitations of the study. So, the analysis on presenting complaints was not included in the study. It is found that most of the appendicular neoplasms present with features of appendicitis or right iliac fossa pain [2]. Considering the above finding and the fact that appendicectomy is done for the patients with features of acute appendicitis and RIF pain, we assumed that all specimens we received are clinically diagnosed as acute appendicitis. It is beneficial to gather data on specific presenting complaints with imaging studies when future studies are done on this topic.

Conclusion

Appendicular neoplasms are rare. Appendicular neoplasms [malignant] should be suspected in the elderly population. A female preponderance was noted in neoplastic lesions. Neuroendocrine neoplasms are the commonest incidental tumours and they are less aggressive at the time of diagnosis. Meticulous dissection is important to achieve negative resection margins in mucinous appendiceal neoplasms to prevent future complications.

complications.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Singh J, Mariadason J. Role of the faecolith in modern-day appendicitis. Ann R Coll Surg Engl. 2013 Jan;95[1]:48-51. https://doi.org/10.1308/003588413X13511609954851
2. Connor SJ, Hanna GB, Frizelle FA. Appendiceal tumors: retrospective clinicopathologic analysis of appendiceal tumors from 7,970 appendectomies. Dis Colon Rectum. 1998 Jan;41[1]:75-80. https://doi.org/10.1007/BF02236899
3. Murphy EMA, Farquharson SM, Moran BJ. Management of an unexpected appendiceal neoplasm. Br J Surg. 2006 Jul;93[7]:783-92. https://doi.org/10.1002/bjs.5385
4. Marmor S, Portschy PR, Tuttle TM, Virnig BA. The rise in appendiceal cancer incidence: 2000-2009. J Gastrointest Surg. 2015 Apr;19[4]:743-50. https://doi.org/10.1007/s11605-014-2726-7
5. WHO. Digestive system tumours. 5th edition. Lyon: International Agency for Research on Cancer; 2019. 635 p. [World Health Organization classification of tumours]. ISBN 978-92-832-4499-8.
6. McCusker ME, Coté TR, Clegg LX, Sobin LH. Primary malignant neoplasms of the appendix. Cancer. 2002;94[12]:3307-12. https://doi.org/10.1002/cncr.10589
7. Bosman FT, World Health Organization, International Agency for Research on Cancer, editors. WHO classification of tumours of the digestive system. 4th ed. Lyon: International Agency for Research on Cancer; 2010. 417 p. [World Health Organization classification of tumours]. ISBN 978-92-832-2432-7.
8. Lee W-S, Choi ST, Lee JN, Kim KK, Park YH, Baek JH. A retrospective clinicopathological analysis of appendiceal tumors from 3,744 appendectomies: a single-institution study. Int J Colorectal Dis. 2011 May;26[5]:617-21. https://doi.org/10.1007/s00384-010-1124-1
9. Kunduz E, Bektasoglu HK, Unver N, Aydogan C, Timocin G, Destek S. Analysis of Appendiceal Neoplasms on 3544 Appendectomy Specimens for Acute Appendicitis:

Retrospective Cohort Study of a Single Institution. Med Sci Monit. 2018 Jun 27;24:4421-6. https://doi.org/10.12659/MSM.908032

10. Smeenk RM, van Velthuysen MLF, Verwaal VJ, Zoetmulder F a. N. Appendiceal neoplasms and pseudomyxoma peritonei: a population based study. Eur J Surg Oncol. 2008 Feb;34[2]:196-201. https://doi.org/10.1016/j.ejso.2007.04.002
11. Carr NJ, Bibeau F, Bradley RF, Dartigues P, Feakins RM, Geisinger KR, et al. The histopathological classification, diagnosis and differential diagnosis of mucinous appendiceal neoplasms, appendiceal adenocarcinomas and pseudomyxoma peritonei. Histopathology. 2017;71[6]:847-58. https://doi.org/10.1111/his.13324
12. Honoré C, Caruso F, Dartigues P, Benhaim L, Chirica M, Goéré D, et al. Strategies for Preventing Pseudomyxoma Peritonei After Resection of a Mucinous Neoplasm of the Appendix. Anticancer Res. 2015 Sep 1;35[9]:4943-7. PMID: 26254392.
13. Pickhardt PJ, Levy AD, Rohrmann CA, Kende AI. Primary neoplasms of the appendix: radiologic spectrum of disease with pathologic correlation. Radiographics. 2003 Jun;23[3]:645-62. https://doi.org/10.1148/rg.233025134
14. Wang H, Chen Y-Q, Wei R, Wang Q-B, Song B, Wang C-Y, et al. Appendiceal mucocele: A diagnostic dilemma in differentiating malignant from benign lesions with CT. AJR Am J Roentgenol. 2013 Oct;201[4]:W590-595. https://doi.org/10.2214/AJR.12.9260

SCIENTIFIC ARTICLE

Do we need antibiotic prophylaxis in non-reconstructive breast surgery?

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Keywords: Preoperative antibiotics; breast surgery; SSI; postoperative wound infection

Abstract

Introduction

Breast surgery is a clean surgery with variation in the reported incidence of surgical site infection (SSI) (2% to 38%) which in higher than expected in a clean surgery. Due to a higher reported incidence of SSI, there are variable protocols regarding the usage of antibiotics. Therefore, the objective of this study was to compare the incidence of infection after breast surgery with or without use of perioperative antibiotics.

Methods

This prospective study included 68 patients who underwent non reconstructive elective breast surgery and were randomized equally into two groups who received or who did not receive perioperative antibiotics. Demographic profile and factors which increase the incidence of SSI were recorded. All patients were followed until the wound healing was complete. SSI was diagnosed based on CDC criteria and wounds were graded according to Southampton wound score.

Results

Mean age, etiology of breast lesions, presence of risk factors and duration of drain kept was comparable among groups. No patient developed SSI in either group according to CDC criteria and developed only minor complications according to Southampton wound score ($p > 0.05$). In addition there was no significant interaction on two way mixed models ANOVA between use of antibiotics and on wound healing (p 0.101).

Conclusions

This study highlights that wound healing is not dependant on the use of perioperative antibiotics. Therefore, rational and effective use of antimicrobial agents for the prevention of SSI in clean breast surgeries will decrease the development of antibiotics related complications, antibiotic resistance and the cost of treatment.

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Introduction

The incidence of surgical site infection (SSI) for breast surgery is much higher (2% to 38%) than the reported incidence of SSI for other clean surgical procedures (3.4%) [1-4]. Prevalence of SSI for modified radical mastectomy has been reported as high as 36% and it has been reported in up to 53% for women who were treated for breast cancer with immediate reconstruction [2-5]. Any patient developing SSI will have delayed wound healing, prolongation of hospital stay, delay in adjuvant treatment, poor patient satisfaction, antibiotic related complications, and also increase in the total cost of treatment.

The prophylactic perioperative antibiotics in both benign and malignant breast diseases have been used in an effort to decrease the incidence of SSI. The beneficial effect of administration of prophylactic antibiotics for reducing the incidence of SSI from 14% to 3.4% in patients undergoing breast and axillary procedure has been demonstrated in various studies and is also recommended by Joint Commission of Surgical Care Improvement Project (SCIP) [6,7]. Current guidelines recommend a single dose of perioperative antibiotic prophylaxis and antibiotics in postoperative period for maximum duration of 24 hrs [8]. However, there are reports where preoperative antibiotics did not decrease the incidence of SSI following breast surgery for both benign or malignant diseases [9,10]. Hence, whether antibiotics decrease SSI following breast surgery is unanswered as SSI can also be decreased by adhering to the principles of asepsis, meticulous surgical technique, control of theatre environment and optimization of patient clinical status before surgery. Therefore, it was decided upon to study the incidence of postoperative wound infection and clinical outcome in patients who underwent elective breast surgery in a tertiary care centre with or without use of perioperative antibiotics.

Methods

A prospective study was carried out in the department of Surgery in a tertiary care centre in North India. Sixty eight patients who underwent non reconstructive elective breast surgery for various indications were included after obtaining ethical clearance from the Institute. Patients were randomized into two equal groups using the sealed envelope method.

Patients in group A were given 2 doses of Inj. Amoxycillin1000 mg + clavulanic acid 200 mg, first dose- 30 min prior to surgery and second dose- 6-8 hours' post-surgery. Patients in group B were not given antibiotics before or after the surgery.

Demographic profiles of each patient and factors which can increase the incidence of SSI were recorded. Smoking status was characterized as non smoker, current smoker, or prior smoker. Body mass index (BMI) at the time of surgery, presence of diabetes, hypothyroidism and corticosteroid use (as tablet, intravenous or inhaler) were also recorded. History of earlier breast cancer-related therapies such as prior breast surgery, neoadjuvant chemotherapy, and radiation therapy to the ipsilateral breast, was also recorded. Laboratory investigations including haemoglobin and serum protein levels were also recorded. Surgery type was defined as excision for phylloides tumor, enucleation for fibroadenoma, unilateral or bilateral mastectomy with or without axillary dissection. Duration for which the drain kept was also recorded in number of days.

All surgeries were performed by the trained surgeons under general anaesthesia following strict aseptic techniques. Wounds were irrigated with normal saline before closure with skin staples or ethilon and thereafter sterile dressing was applied which was removed after 72 hours. Wound status was assessed in outpatient clinic on postoperative day (POD) 3, 5, 7, 10, 14. Patients who had a negative suction drain after total mastectomy +/- axillary clearance; daily drain output was measured. Drain was removed once drain output was < 20 ml for two consecutive days. All patients were followed for 30 days or until the wound healing was complete, whichever was earlier. SSI was diagnosed based on CDC criteria and wounds were graded according to any complication and its extent through Southampton wound score [11,12].

Statistical analysis

All data was analysed by SPSS data processing software (Statistical Package for the Social Sciences, version 26). All quantitative variables were estimated using measures of central location (mean, median) and measures of dispersion (standard deviation and standard error). For normally distributed data, means were compared using Student's T-Test. For skewed data, Mann – Whitney U test was applied. Categorical variables were described as frequencies and proportions. Proportions were compared using Chi square test or Chi square with Yate's correction or Fisher's exact test whichever was applicable. A p value of <0.05 was considered significant. Two way mixed model ANOVA was used to observe if there was any interaction between type of intervention and Southampton healing scores at various points of time after the surgery.

Results

Of 68 patients, 34 patients received antibiotics (group A) and 34 patients did not receive antibiotics (group B). Demographic profile of both groups is shown in Table 1. Both groups were comparable in terms of etiology for which patient underwent breast surgery (Table 1). Also, presence of various risk factors for SSI such as anaemia, diabetes mellitus, hypothyroidism, and receipt of neoadjuvant treatment was comparable among two groups (Table 1).

No patient had preoperative low serum albumin (<3.5 g/dL), history of steroid intake, history of smoking or history of radiation to ipsilateral breast in either group. In group A the mean duration of drain kept after surgery was 7 days while it was 8 days in group B ($p=0.34$).

SSI comparison in both groups

No patient in either group developed SSI based on CDC guidelines. Based on Southampton wound score, minor complications (grade I&II) were present in 13 patients in group A on POD 3, 5 and 7; and in group B minor complications (grade I&II) were present in 14 patients on POD 3, in 12 patients on POD 5 and in 6 patients on POD 7. However, they were not clinically or statistically significant (Table 2, Figures 1 & 2). Wound healing was comparable among two groups on POD 14 and 30. No patients developed major complications (Grade III, IV, and V) among both groups.

There was no significant interaction on two way mixed model ANOVA between group variables i.e. the type of intervention given by antibiotic or no antibiotic in perioperative period and time after the surgery on post operative day 3, 5, 7, 14 and 30 [$F(2.132)=2.33$, $p=0.101$, $\eta 2=0.o34$]. This indicates that use of perioperative antibiotics is not significantly different when we consider the interaction on wound healing on different post operative days implying that administering or not administering antibiotic does not affect the rate of healing in any way.

Discussion

In this study, none of the 68 patients developed SSI following breast surgery for both benign and malignant indications who received or who did not receive perioperative prophylactic antibiotics. Patients in either group developed only minor complications according to Southampton wound score despite the presence of risk factors among both groups. This was in contrast to the reported SSI rate of 2-38% for clean breast surgeries in various studies [1-4].

Reported high incidence of SSI following breast surgery is usually attributed to the presence of obesity, diabetes, history of receipt of neoadjuvant chemotherapy, previous radiation

Table 1. Demographic profile and risk factors between two groups

Variables	Group A (n=34)	Group B (n=34)	Test of Comparison
Mean Age (years) mean±SD	49.03±11.51	47.79±15.70	t (66) = 0.38, p=0.71
Females (n)	34	33	Fischer's Exact value =01.00
Males (n)	00	01	
Breast lesion aetiology			
a) Infiltrating ductal carcinoma, n (%)	29 (85.30%)	29 (85.30%)	Chi square value (with Yate's Correction) = 0.12, p=0.73
b) Fibroadenoma, n (%)	02 (5.88%)	05 (14.70%)	
c) Intraductal papilloma, n (%)	01 (2.94%)	00	
d) PhyllodesTumor, n (%)	01 (2.94%)	00	
e) BRCA mutation (underwent bilateral prophylactic mastectomy), n (%)	01 (2.94%)	00	
Risk Factors			
a) Diabetes mellitus, n (%)	01 (02.94%)	04 (11.76%)	Fisher's Exact = 0.356
b) Hypothyroidism, n (%)	06 (17.64%)	02 (05.88%)	Fisher's Exact = 00.26
c) Hb (g/dL) median	11.30	11.00	Mann Whitney U Value (-00.92) =504.00, p=0.36
d) Body mass index (Kg/m^2) mean±SD	24.10±03.30	23.27±04.12	Student t value (66) =0.91, p=0.3
e) Neoadjuvant chemotherapy, n (%)	08 (23.50%)	07 (20.60%)	Fisher's Exact Value = 01.00
f) Drain duration (days) Median (IQR)	7.00 (3.00)	8.00 (3.00)	Mann Whitney U test U (0.95) =512.50, p=0.34

Table 2. Southampton wound scores at post-operative day 3, 5 and 7 in both groups

Variable	Group A Median (Interquartile range)	Group B Median (Interquartile range)	Test of comparison (Mann Whitney U test)
Southampton wound score at post operative day 3	00.00 (Q1= 0, Q3= 1.25)	00.00 (Q1= 0, Q3= 2.00)	U (0.49) = 613.00, p=0.63
Southampton wound score at post operative day 5	00.00 (Q1= 0, Q3= 06.00)	00.00(Q1= 0, Q3= 01.75)	U (-0.34) = 524.50, p=0.74
Southampton wound score at post operative day 7	00.00 (Q1= 0, Q3= 4.00)	00.00 (Q1= 0, Q3= 0.00)	U (-01.84) = 460.00, p=0.07

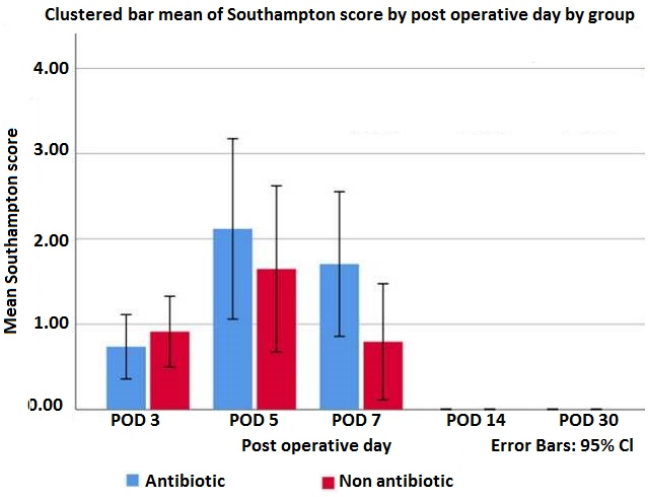

Figure 1. Clustered bar of Southampton score

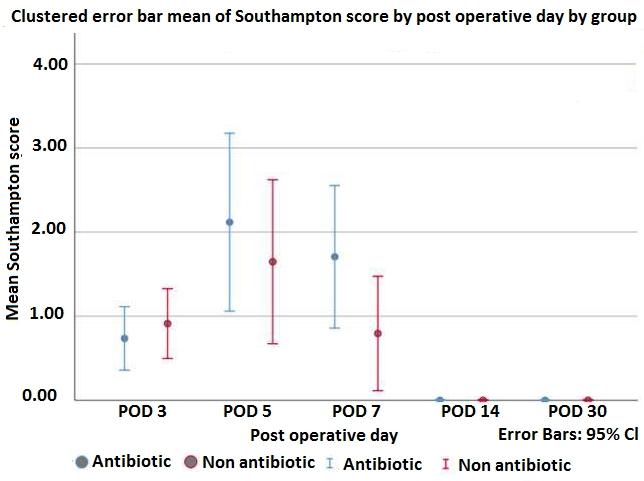

Figure 2. Clustered error bar of Southampton score

exposure, smoking or prolonged duration of drain kept following surgery. Duration of keeping the drainage tube is variable based on the drain output; longer the drain kept, more are the chances of developing bacterial colonization which also increases the incidence of SSI. Felippe et al., in a prospective study on 354 patients reported 17% incidence of SSI among women who were discharged with a drain after breast cancer surgery [3].

Bacterial colonization of the drain was found in 33% and 80.8% on POD 7 and POD 14 respectively; and Staphylococcus aureus was the most commonly isolated organism. SSI was caused by the same bacterial species which was previously isolated from the drainage fluid.

On multivariate regression analyses the authors found that bacterial colonization of the drain along with an age of 50 years and flap necrosis was independently associated with a higher incidence of SSI. It was also reported in the literature that antibiotics are prescribed to the patients till the time drain was removed. Therefore, it is the individual practice which varies among surgeons regarding the duration to continue antibiotics. Antibiotic prophylaxis can be given either perioperatively or as a routine prophylaxis after surgery for 5 to 7 days or till the time drain is present. In the present study, duration of drain kept or presence of risk factors like obesity, diabetes and receipt of neoadjuvant chemotherapy has not affected the outcome or increased the incidence of infection in either group.

In a study conducted by Edward et al., involving 425 breast cancer patients who underwent various non reconstructive breast procedures it was observed that SSI was significantly less likely to develop with administration of postoperative prophylactic antibiotics as compared to those receiving only perioperative antibiotics (3.4% and 14%, respectively) [6]. They reported that patients who were diabetic or obese or had previous radiation or chemotherapy exposure or among cases where the drain stayed for > 14 days were not at risk of SSI; though smoker and elderly females were at increased risk of SSI if they did not receive antibiotic prophylaxis. In the present study none of the patient in either of the group was a smoker and a mean age was 49.03± 11.51 years and 49.03± 11.51 years in groups A and B respectively. Conversely, Crawford et al., concluded in a retrospective analysis that SSI rate did not decrease with and without use of antibiotic prophylaxis; increased risk of SSI was associated with BMI >25 kg/m2[13]. However, in this study relation of BMI with SSI was not detected.

The optimal use of antibiotics in patients undergoing surgery is essentially important as misuse of potent antimicrobial agents may lead to allergic reactions, drug toxicity, super infections with Clostridium difficile, increase in healthcare cost and colonization by highly resistant strains of bacteria [14]. The risks of developing adverse events with drug prophylaxis are more frequently observed with a prolonged course of therapy as compared to a single dose of administered perioperative antibiotic. In congruence to this statement, Throckmorton et al., observed a 0% antibiotic therapy related complications among patients who had received merely a single preoperative antibiotic dose after breast surgery in comparison to 5.5% patients who had received postoperative prophylactic antibiotics [15].

Therefore, prolonged usage of antibiotics should be discouraged until there is a specific clinical indication to continue therapy. The risk of postoperative wound infection is the lowest after clean surgical procedures and prophylactic systemic antibiotics are not indicated for patients undergoing clean surgeries. However, majority of surgeons still use prophylactic antibiotics in clean surgical procedures because of undue fear of infection which prevails in their mind.

It is not only the antibiotics use which prevents SSI; there are other factors which decrease the occurrence of SSI such as aseptic techniques, meticulously performed surgery, operating theatre environment, instruments, and patient's own microbial flora. Skin flora (Streptococcous species, Staphylococcus aureus, Coagulase negative staphylococci) is the main source of SSI in clean surgeries [16]. Poor compliance with infection control practices is a significant cause for SSI; therefore, use of antiseptic techniques in the operating room plays a crucial role. Meticulously performed procedures following aseptic techniques are vital in decreasing the incidence of SSI in clean surgeries.

A small sample size is a limitation of this study. Though, results of the current study cannot influence the current practice but it does suggest a change to the existing clinical practice. A prospective study with larger patient numbers is required to further establish the actual benefit of prophylactic antibiotics in breast surgery which will help to identify the indications for selective antibiotic use.

Conclusion

This study highlights that wound healing was not dependant on the use of perioperative antibiotics. Therefore, rational and effective use of antimicrobial agents for the prevention of SSI in clean breast surgeries will decrease the development of antibiotic related complications, antibiotic resistance and the cost of treatment.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Throckmorton AD, Baddour LM, Hoskin TL, Boughey JC, Degnim AC. Microbiology of surgical site infections complicating breast surgery. Surg Infect 2010; 11: 355-359. \https://doi.org/10.1089/sur.2009.029
2. Vilar-Compte D, Jacquemin B, Robles-Vidal C, Volkow P. Surgical site infections in breast surgery: casecontrol study. World J Surg 2004; 28: 242-246. https://doi.org/10.1007/s00268-003-7193-3
3. Felippe WA, Werneck GL, Santoro-Lopes G. Surgical site infection among women discharged with a drain in situ after breast cancer surgery. World J Surg 2007; 31: 2293-2301. https://doi.org/10.1007/s00268-007-9248-3
4. Vazquez-Aragon P, Lizan-Garcia M, Cascales-Sanchez P, Villar-Canovas MT, Garcia-Olmo D. Nosocomial infection and related risk factors in a general surgery setting: a prospective study. Journal of Infection 2003; 46: 17-22. https://doi.org/10.1053/jinf.2002.1073
5. Pittet B, Montandon D, Pittet D. Infection in breast implants. Lancet Infectious Diseases 2005; 5: 94-106. https://doi.org/10.1016/S1473-3099(05)70169-9
6. Edwards BL, Stukenborg GJ, Brenin DR, Schroen AT. Use of prophylactic postoperative antibiotics during surgical drain presence following mastectomy. Ann Surg Oncol 2014; 21: 3249-3255. https://doi.org/10.1245/s10434-014-3960-7
7. Liu Z, Dumville JC, Norman G, Westby MJ, Blazeby J, McFarlane E et al Intraoperative interventions for preventing surgical site infection: an overview of Cochrane Reviews. Cochrane Database Syst Rev 2018;2:CD012653 https://doi.org/10.1002/14651858.CD012653.pub2
8. Baghaki S, Soybir GR, Soran A. Guideline for Antimicrobial Prophylaxis in Breast Surgery. J Breast Health 2014; 10: 79-82. https://doi.org/10.5152/tjbh.2014.1959
9. Gupta R, Dinnett D, Carpenter R, Preece PE, Royle GT. Antibiotic prophylaxis for post-operative wound infection in clean elective breast surgery. Eur J SurgOncol 2000; 26: 363-366. https://doi.org/10.1053/ejso.1999.0899
10. Throckmorton AD, Boughey JC, Boostrom SY, Holifield AC, Stobbs MM, Hoskin T et al. Postoperative prophylactic antibiotics and surgical site infection rates in breast surgery patients. Ann Surg Oncol 2009; 16: 2464-2469. https://doi.org/10.1245/s10434-009-0542-1
11. Berríos-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz RR, et al. Centers for disease control and prevention guideline for the prevention of surgical site infection, 2017. JAMA Surg. 2017; 152:784-791. https://doi.org/10.1001/jamasurg.2017.0904
12. Bailey IS, Karran SE, Toyn K, Brough P, Ranaboldo C, Karran SJ. Community surveillance of complications after hernia surgery. BMJ 1992; 304:469-471. https://doi.org/10.1136/bmj.304.6825.469
13. Crawford CB, Clay JA, Seydel AS, Wernberg JA. Surgical site infections in breast surgery: the use of preoperative antibiotics for elective, non reconstructive procedures. Int J Breast Cancer. 2016; 2016: 1645192. DOI: 10.1155/2016/1645192 . https://doi.org/10.1155/2016/1645192
14. Davies J, Davies D. Origins and evolution of antibiotic resistance. Microbiol Mol Biol Rev 2010; 74: 417-433. https://doi.org/10.1128/MMBR.00016-10
15. Throckmorton AD, Hoskin T, Boostrom SY, et al. Complications associated with postoperative antibiotic prophylaxis after breast surgery. Am J Surg 2009; 198: 553-6. https://doi.org/10.1016/j.amjsurg.2009.06.003
16. Hidron AI, Edwards JR, Patel J, Horan TC, Sievert DM, Pollock DA et al. NHSN annual update: antimicrobial-resistant pathogens associated with healthcare-associated infections: annual summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2006-2007. Infect Control Hosp Epidemiol 2008; 29: 996-1011. https://doi.org/10.1086/591861

SCIENTIFIC ARTICLE

Comparing short-term outcomes after hepatic resection: is there a difference between then and now?

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Keywords: Hepatic resection; outcome; morbidity; mortality

Abstract

Introduction

Despite numerous advances, hepatic resection remains a challenging surgical procedure in developing countries. The objective of our study was to review the short term outcome of recent 75 cases of hepatic resection at our centre and compare the results with our previously published data.

Methods

All the patients who underwent a formal hepatic resection at Aga Khan University Hospital, Karachi between 2016 and 2018 were included in the current study. Group comparison was made between our previously published data [Group A] and the current results [Group B].

Results

The mean age of the patients in the current study was 54 years and there were 40 [53%] males. Hepatic resection was performed for hepatobiliary malignancies in 42, metastatic malignancy in 18 and symptomatic benign conditions in 15 patients. Major hepatic resection [>3 segments] was performed in 24 [32%] patients and the mean estimated blood loss was 643 millilitres. Post-operative complications were observed in 21 [28%] patients, while 30-day and 90-day mortality were 2.6% and 4%, respectively.

Group comparison with the previous data revealed that the estimated blood loss [$p < 0.048$] and transfusion requirements [$P < 0.000$] were significantly lower in group B. Group B also showed a trend towards lower postoperative complications, 30-day and 90-day mortality than Group A.

Conclusions

Despite small numbers in our study, there was a trend towards lower estimated blood loss, fewer transfusion requirements, and improved outcomes in the recent patients.

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Introduction

Once considered a highly morbid procedure, hepatic resection has since been established as a curative procedure for primary hepatic malignancies and various metastatic liver tumours including colorectal metastases [1, 2]. Post resection outcomes have significantly evolved over the years and procedure-related mortality has improved from > 20% to < 5% in the experienced centres [3]. Morbidity from hepatic resections continues to be high, with data from the American College of Surgeons – National Surgical Quality Improvement Program [ACS – NSQIP] reporting overall morbidity rates for partial, hemi- and extended hepatic resections at 20.6%, 25.2% and 32.8%, respectively [4]. Despite the significant advances made in hepato-biliary surgery in the Western world, hepatic resections are yet to move under the 5% mortality rate mark in the developing world [5].

Very few centres in Pakistan perform hepatic resections, which translates to a low number of published reports demonstrating the various outcomes following hepatic resections in our country [6]. We published the short-term outcomes following hepatic resection of the first 75 cases over 8 years from 2008 to 2015 at our centre, which is a tertiary care hospital with no liver transplant facilities [7]. The next 75 cases were operated in a mere 3 years, from 2016 to 2018, depicting an increasing case volume trend at our facility.

The impact of hospital case volumes and surgeon's practical experience on the morbidity and mortality of a particular surgical procedure has been a much-debated issue and numerous studies have tried to explore this association for hepatic resections. A study from Taiwan with a large number of patients who underwent liver surgery for various benign and malignant pathologies over five years reported that the factors influencing the early outcome after surgery were largely related to hospital and surgeons' case volumes. The number of procedures performed by a particular surgeon influenced the patient mortality independent of the hospital volumes. The combination of high volume surgeons and high volume hospitals had the most beneficial outcome from the patients' perspective [8].

Despite being a low volume centre for liver surgery, we have performed progressively increasing numbers of hepatic resections at our hospital. The objectives of our study were to review the short-term outcomes of hepatic resections at Aga Khan University Hospital and to compare our recent results with the previously published study from our centre and evaluate any differences in trends of the outcomes.

Materials and methods

This was a retrospective chart review of 75 adult patients, in succession, who underwent elective hepatic resection at Aga Khan University Hospital from January 2016 onwards, while patients with liver resections secondary to trauma were excluded. All hepatic resections were performed by a single hepatobiliary surgeon who has experience of around 15 years now and the procedure as well as the perioperative care were standardized for all the patients. The basic resources and technical support for liver resection and post-surgical management, including a well-equipped intensive care unit [ICU], are available at our tertiary care university hospital.

The data for the study were collected from the patient charts, clinic notes, surgical operative notes and discharge summaries onto a structured questionnaire. The information gathered in the study included details about patient demographics [age, gender]; and the pre-operative assessments comprising of patient history and clinical examination findings and any known co-morbidities, the laboratory diagnostic tests including liver function tests and the calculated Child-Pugh scores, computerized tomography [CT] scan findings and the admitting diagnosis. The diagnosis of cirrhosis was based on a range of parameters including positive viral serology, Child-Pugh score, evidence of portal hypertension in terms of low platelets and/or endoscopic diagnosis of varices and imaging findings on ultrasound and CT scan. Fibro scan was performed in selected patients and liver biopsy was not routinely performed in our patients. The operative particulars included the indication[s] for surgery, the type of hepatic lesion [neoplastic versus non-neoplastic], the American Society of Anesthesiologist [ASA] score, the variant of liver resection, the duration of the procedure, estimated blood loss [EBL] during the procedure, the need for transfusion of blood products intraoperatively and any procedures additional to the primary surgery. Post-operative data comprised of all surgical complications [surgical site infections, bile-leaks, intra-abdominal collections and post-operative bleeding], systemic complications [liver decompensation and pulmonary infections], post-operative care and recovery, the total length of hospital stay [LOS] and 30-day and 90-day patient morbidity and mortality.

All patients undergoing hepatic resections received general anaesthesia with invasive monitoring intraoperatively and selective epidural analgesia for postoperative pain relief. An intraoperative low CVP was preferred with selective use of inotropes if required. The open approach was used for all patients with staging laparoscopy in selected cases only. Intraoperative ultrasound was routinely performed to detect intrahepatic metastasis / new lesions and to define the relationship of tumours with hepatic inflow pedicles and hepatic veins. Parenchymal transection was performed using a combination of a harmonic scalpel and cavitron ultrasonic surgical aspirator [CUSA]. Pringle manoeuvre was not used routinely and employed only when significant bleeding was encountered. After transection, bleeding and bile leak from the cut surface was repaired with fine sutures. Fibrin glue was used to seal the raw surface and drains were not routinely used. Postoperatively, patients were monitored in a high dependency unit and pain control was provided by epidural analgesia or patient-controlled analgesia. Oral feeding and mobilization were encouraged as early as possible. Patients were discharged once stable and were followed up in outpatient clinics. The same standardized protocol was used for all the patients over the years with minor variations based on the individual patient needs.

Statistical analysis was performed using the Statistical Package for the Social Sciences [SPSS] version 22. Mean and standard deviations were utilized to express categorical data and the Chi-square test or Fisher's exact test was run to compare the categorical variables. Frequencies were used to present quantitative data and the comparison of continuous variables was performed using a t-test when normally distributed. In all the tests, $p < 0.05$ was regarded as significant at a 95% confidence interval.

Information regarding the same variables was available from the previous study and the current results were compared with the results of the past study to determine any significant difference in outcomes. The previously published study at our institution had also investigated short-term outcomes following hepatic resections in 75 patients over 8 years, starting from January 2008 to December 2015 [6]. A comparison between the groups with the previously published data considered Group A and the current results labelled as Group B.

Results

Out of 75 patients from the recent data [Group B], 40 patients were males and the mean age of the study population was 54±15 years. Almost half [49.3%] of the patients had at least one comorbid condition and an American Society of Anesthesiology [ASA] score of III; hypertension [40%] was the most common comorbidity followed by diabetes mellitus [29%]. Seventeen [22.6%] patients had underlying liver cirrhosis, as shown in Table-1.

Common indications for resection included hepatobiliary malignancies and metastatic disease from various primary tumours. In addition, 15 patients [20%] underwent hepatic resections for various symptomatic benign conditions. Five patients with xanthogranulomatous cholecystitis presented with the features suggesting gallbladder malignancy with gallbladder mass. Three of the patients also had clinical features of obstructive jaundice and weight loss. Imaging features were strongly suggestive of gallbladder malignancy and the final histopathology was a diagnostic surprise. Similarly, two patients in each group had preoperative imaging suggestive of hepatocellular carcinoma and final histopathology revealed focal nodular hyperplasia. Details of indications are given in Table-2.

Major hepatic resections were performed in 24 [32%] patients while 51 [68%] patients underwent minor hepatic resections. The mean operating time was 264±97 minutes, estimated blood loss was 643±49 millilitres and 28 [37%] patients required perioperative packed cell volume blood transfusions. Details are shown in table 3. Postoperative complications were seen in 21 [28%] patients and more than half of the complications were classified as Clavien-Dindo class III. The mortality rate at 30 days was 2.7% while mortality at 90 days was 4% [Table-3 and 4].

All the relevant variables in our current data were compared with the previously published data [group A] [6] as shown in Tables 1 – 3. The two groups were comparable in terms of baseline parameters including demographics, comorbid conditions and laboratory parameters. Despite this, the overall distribution of primary and secondary hepatic malignancies was comparable in the two groups. The number of patients with underlying cirrhosis was significantly higher in group A [$p < 0.034$], but the proportion of patients with an ASA score of III was significantly higher in group B [$p < 0.012$]. The mean size of the resected lesion and the margin of resection at the histopathology report were comparable in the two groups.

Type of hepatic resection and the mean duration of surgery was comparable in the two groups, however, there were a significantly greater number of patients in group B undergoing procedures with operative time <300 minutes [$p < 0.009$]. Estimated blood loss during surgery [$p < 0.048$] and the number of intraoperative transfusions [$p < 0.000$] was significantly lower in group B. There was no statistically significant difference in the overall morbidity [$p = 0.168$], 30-day mortality [$p = 1.000$] and 90-day mortality [$p = 0.719$] in the two groups, but the absolute numbers reflected a downward trend in group B.

Discussion

Liver resection has become more prevalent over the past several decades due to progressive improvements in survival for primary hepatic malignancies and liver metastasis from various organs. Once considered a high-risk procedure, the outcomes after liver resection has dramatically improved over the years due to better patient selection, modern anaesthetic management and advancements in surgical techniques and post-operative care. A trend over time study by Cloyd et al [9] studied the impact of various factors on the complications and outcomes after liver surgery over three distinct periods. Their results indicated that there was a significant improvement in blood loss and transfusion requirements over time despite increasing volumes and complexity of the procedures. The overall number of complications remained high at 40%, but the overall mortality remained low at around 2% with a decreasing trend over time.

Despite consistently improving outcomes of liver surgery in the developed world and the Far Eastern region [8], the development of this speciality has been slow in developing countries. Low volumes due to poor referral systems, resource restrictions and scarcity of modern technology have contributed to high morbidity and mortality rates compared to high case volume centres of the developed world [5]. We are a tertiary care university hospital in Pakistan where liver surgery was formally initiated in 2008. Our audit of the first 75 cases performed over 8 years was published in 2017. The next 75 cases were operated on in only 3 years depicting the progressive increase in the numbers of patients seeking care for hepatic pathologies at our centre. Patient outcomes are linked to hospital patient volumes and published literature from both Western and Asian countries has proven a significant inverse relationship between hospital patient volumes and morbidity and mortality after hepatic resections [8,10,11,12].

In our study, there was no considerable difference in the baseline characteristics of the study population between the two groups [Group A and B]. There were significantly more patients in the recent study with an ASA score of III, stipulating that the anaesthetic management has improved over the years to optimize high-risk patients intraoperatively. Several documented anaesthetic techniques improve the outcomes of patients undergoing liver surgery including the use of anaesthetic drugs that do not alter the hepatic blood flow, reduction of central venous pressure to reduce intraoperative bleeding and use of vasoactive drugs to avoid hypotension [11]. This also explains the reduction in estimated blood loss and a decline in the need for intraoperative transfusions in group B. Although the overall

Table 1. Group Comparison* of Baseline Characteristics

Table 1. Group Comparison* of Baseline Characteristics

Demographics	**Group A**	**Group B**	**p valve**
Male/Female(n)	43/32	40/35	0.743
Age (years, mean ± SD)	52±14	54±15	0.653
Co-morbid Conditions	40(53.3%)	37(49.3%)	0.744
Hypertension (n, %)	31(41%)	30((40%)	1.000
Diabetes Mellitus (n, %)	23(31%)	22(29.3%)	1.000
Pulmonary Disease (n, %)	5(7%)	6(8%)	1.000
ASA Level I/II/III	6/47/22	7/31/37	**< 0.028**
Status of Disease and Liver			
Number of lesions ❖ Single lesion ❖ More than one lesion	 63(84%) 12(16%)	 70(93.3%) 5(6.66%)	 0.120
Mean size of lesion (cm, mean±SD)	5.48±4.4	5.84±4.3	0.854
Underlying Cirrhosis of Liver	30(40%)	17(22.6%)	**< 0.034**

*Group A= 2008 – 2015; Group B = 2016 – 2018
ASA: American Society of Anesthesiology, SD: Standard Deviation

Table 2. Group Comparison - Indications for Surgery and Underlying Pathology

	Group A	**Group B**	**p value**
Malignant Hepatic and Biliary Pathology (n, %)	46(61.3%)	42(56%)	0.185
Primary Hepatocellular Carcinoma	37(49.3%)	24(32%)	
Adenocarcinoma of Gallbladder	6(8%)	13(17.3%)	
Hilar Cholangiocarcinoma	2(2.7%)	5(6.6%)	
Embryonal Sarcoma	1(1.3%)	0	
Sarcomatoid Carcinoma	0	1(1.3%)	
Metastatic Malignancy (n, %)	18(24%)	18(24%)	0.441
Colorectal Malignancy	10(13.3%)	9(12%)	
Neuroendocrine Tumor	2(2.7%)	1(1.3%)	
Renal Cell Carcinoma	2(2.7%)	0	
Ovarian Carcinoma	0	3(4%)	
Others*	4(5.3%)	5(6.7%)	
Benign Diseases (n, %)	11(14.6%)	15(20%)	0.931
Focal Nodular Hyperplasia	2(2.7%)	2(2.7%)	
Giant Haemangioma	2(2.7%)	2(2.7%)	
Xanthogranulomatous Cholecystitis	2(2.7%)	3(4%)	
Hepatic Cystadenoma	1(1.3%)	3(4%)	
Primary Hepatic Adenoma	1(1.3%)	1(1.3%)	
Primary Paraganglioma of Liver	1(1.3%)	0	
Hepatolithiasis	1(1.3%)	1(1.3%)	
Other benign conditions	1(1.3%)	3(2.7%)	

*Others include metastatic breast cancer, adrenocortical carcinoma, endometrial carcinoma, germ cell tumor, gastric cancer and unknown primary

Table 3. Group Comparison – Intraoperative events

Intraoperative Variables	Group A	Group B	p value
Major Hepatic Resections (≥ 3 segments)	30(40%)	24((32%)	0.395
Minor Hepatic Resections (≤2 segments)	45(60%)	51(68%)	
Additional procedures	15(20%)	17(22.6%)	
Operating time (minutes, mean ± SD)	300±138	264±97	0.051
Operating time ≤ 300mins >300mins	 32(43%) 43(57%)	 49(65%) 26(34%)	< 0.009
Estimated blood loss (ml, mean ± SD)	665±580	643±494	< 0.048
Blood transfusion requirement	45(60%)	28(37%)	< 0.000
Margin of resection on pathology (mm, mean+SD)	13.48±15	12.89±23	0.628

Table 4. Postoperative outcomes

	Group A	Group B	P value
Overall Morbidity (n, %)	30(40%)	21(28%)	0.168
Wound Infection	12(16%)	5(6.7%)	0.120
Intraabdominal collection	8(10.6%)	8(10.6%)	1.000
Pulmonary infection	7(9.3%)	8(10.6%)	1.000
Ascites	5(6.7%)	3(4%)	0.719
Bleeding	2(2.7%)	0	0.497
Myocardial infarction	1(1.3%)	0	1.000
Clavien-Dindo classification (I/II/III/IV/V)	9/4/9/5/3	1/7/11/0/2	
Length of hospital stay	9.51±3.16	9.67±6.5	0.763
30-day Mortality	3(4%)	2(2.7%)	1.000
90-day Mortality	5(6.7%)	3(4%)	0.719

amount of blood loss in our recent data was still higher than that reported from the high volume centres of the developed world [9], the general trend in our study population reflects a significant improvement in this parameter. Progressive improvement in surgical techniques, the expertise of associated operating room staff, use of novel devices for parenchymal transection like Harmonic and Cavitron Ultrasonic Surgical Aspirator [CUSA] at our centre might be the other contributing factors to decreased the intraoperative blood loss and transfusion requirement in our recent patients.

Our overall morbidity rates have improved over the years. The morbidity rate has dropped down to 28% from 40% which is comparable to high volume centres in the developed world. There was a reduction in both the surgical and systemic complications associated with hepatic resection. One of the most important risk factors associated with morbidity after liver resection is cirrhosis [13] and its incidence in our recent study population was lower which has possibly contributed to the reduction in overall morbidity rates. A recent report from Japan suggests that the mortality rate after hepatic resection may be less than 1% in high volume centres, but rates of 3 to 4% have been reported at low volume centres [14]. We had a 30-day mortality of 4% [2008-2015] which has reduced to 2.7% [2016-2018], and 90-day mortality has reduced from 6.7% to 4%, respectively, which is comparable to low volume centres elsewhere [14].

Over the last two decades, technical innovations in liver surgery have shifted the paradigm towards a laparoscopic approach [15]. The Second International Experts' Consensus Conference in 2014, suggested that a laparoscopic approach is advantageous in terms of reduced blood loss, decreased postoperative morbidity and a shorter hospital stay [16], which has been further substantiated in the recent reviews [17,18, 19]. Improvement in overall outcomes of hepatic resection at our centre over time is encouraging enough for us to start exploring the laparoscopic approach for minor liver resections and develop expertise with time to undertake major liver resections with this approach.

In conclusion, despite the small number of total cases, an increase in the number of cases being operated has resulted in a trend towards lower estimated blood loss, fewer transfusion requirements, and overall improved morbidity and mortality in the recent patients.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Orcutt ST, Anaya DA. Liver resection and surgical strategies for management of primary liver cancer. Cancer Control. 2018 Jan 11;25[1]:1-15. https://doi.org/10.1177/1073274817744621
2. Heinrich S, Lang H. Hepatic resection for primary and secondary liver malignancies. Innov Surg Sci. 2017 Mar 1;2[1]:1-8. https://doi.org/10.1515/iss-2017-0009
3. Kaneko H, Otsuka Y, Kubota Y, Wakabayashi G. Evolution and revolution of laparoscopic liver resection in Japan. Ann Gastroentero Surg. 2017 Apr;1[1]:33-43. https://doi.org/10.1002/ags3.12000
4. Kneuertz PJ, Pitt HA, Bilimoria KY, Smiley JP, Cohen ME, Ko CY, et al. Risk of morbidity and mortality following hepato-pancreato-biliary surgery. J Gastrointest Surg. 2012;16[9]:1727-35. https://doi.org/10.1007/s11605-012-1938-y
5. Marwah S, Mustafizur Rahman Khan M, Chaudhary A, Gupta S, Singh Negi S, Soin A, et al. Two hundred and forty-one consecutive liver resections: an experience from India. HPB. 2007;9[1]:29-36. https://doi.org/10.1080/13651820600985259
6. Bhatti H, Bakar A, Dar FS, Waheed A, Shafique K, Sultan F, et al. Hepatocellular carcinoma in Pakistan: national trends and global perspective. Gastroenterol Res Pract. 2016. https://doi.org/10.1155/2016/5942306
7. Begum S, Khan MR. Short-term outcomes after hepatic resectionperspective from a developing country. J Pak Med Assoc. 2017;67[8]:1242-47. https://pubmed.ncbi.nlm.nih.gov/28839312/
8. Chang CM, Yin WY, Wei CK, Lee CH, Lee CC. The combined effects of hospital and surgeon volume on short-term survival after hepatic resection in a population-based study. PLoS One. 2014;9[1]. e86444. https://doi.org/10.1371/journal.pone.0086444
9. Cloyd JM, Mizuno T, Kawaguchi Y, Lillemoe HA, Karagkounis G, Omichi K, Chun YS, Conrad C, Tzeng CD, Odisio BC, Huang SY. Comprehensive Complication Index Validates Improved Outcomes Over Time Despite Increased Complexity in 3707 Consecutive Hepatectomies. Ann Surg. 2020; 271[4]:724-31. https://doi.org/10.1097/SLA.0000000000003043
10. Dixon E, Bathe OF, McKay A, You I, Dowden S, Sadler D, Burak KW, McKinnon JG, Miller W, Sutherland FR. Population-based review of the outcomes following hepatic resection in a Canadian health region. Can J Surg. 2009 Feb;52[1]:12-17. PMID: 19234646
11. Bonofiglio FC. Anesthesia in Liver Resections: Review. J Anesth Crit Care: Open Access. 2017;8[5]:00318. https://doi.org/10.15406/jaccoa.2017.08.00318
12. Dimick JB, Cowan JA, Knol JA, Upchurch GR. Hepatic resection in the United States: indications, outcomes, and hospital procedural volumes from a nationally representative database. Arch Surg. 2003 Feb 1;138[2]:185-91. https://doi.org/10.1001/archsurg.138.2.185
13. Hackl C, Schlitt HJ, Renner P, Lang SA. Liver surgery in cirrhosis and portal hypertension. World J Gastroenterol. 2016 Mar 7;22[9]:2725-35. https://doi.org/10.3748/wjg.v22.i9.2725
14. Yamazaki S, Takayama T. Management strategies to minimize mortality in liver resection for hepatocellular carcinoma. Jpn JClin Oncol. 2017 Jul 19;47[10]:899-908. https://doi.org/10.1093/jjco/hyx104
15. Jia C, Li H, Wen N, Chen J, Wei Y, Li B. Laparoscopic liver resection: a review of current indications and surgical techniques. Hepatobiliary Surg and Nutr. 2018 Aug;7[4]:277-288. https://doi.org/10.21037/hbsn.2018.03.01
16. Ciria R, Cherqui D, Geller DA, Briceno J, Wakabayashi G. Comparative short-term benefits of laparoscopic liver resection: 9000 cases and climbing. Ann Surg. 2016 Apr 1;263[4]:761-77. https://doi.org/10.1097/SLA.0000000000001413
17. Ciria R, Gomez-Luque I, Ocaña S, Cipriani F, Halls M, Briceño J, Okuda Y, Troisi R, Rotellar F, Soubrane O, Hilal MA. A Systematic Review and Meta-Analysis Comparing the Short- and Long-Term Outcomes for Laparoscopic and Open Liver Resections for Hepatocellular Carcinoma: Updated Results from the European Guidelines Meeting on Laparoscopic Liver Surgery, Southampton, UK, 2017. Ann Surg Oncol. 2019 Jan 15;26[1]:252-63. https://doi.org/10.1245/s10434-018-6926-3
18. Wang ZY, Chen QL, Sun LL, He SP, Luo XF, Huang LS, Huang JH, Xiong CM, Zhong C. Laparoscopic versus open major liver resection for hepatocellular carcinoma: systematic review and meta-analysis of comparative cohort studies. BMC cancer. 2019;19[1]:1047. https://doi.org/10.1186/s12885-019-6240-x
19. Bouras AF, Liddo G, Marx-Deseure A, Leroy A, Decanter G. Accessible laparoscopic liver resection performed in low volume centers: Is it time for democratization?. J Visc Surg. 2019 Oct 24. https://doi.org/10.1016/j.jviscsurg.2019.10.003

SCIENTIFIC ARTICLE

Hybrid ZOOM ward classes for clinical learning during COVID 19 pandemic; is it feasible? experience from a university surgical Unit

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Keywords: Hybrid clinical teaching; Covid 19; post graduate surgical teaching

Abstract

With the rising numbers of COVID – 19 patients, universities are moving toward virtual teaching platforms. It is acceptable for lectures and discussions. But conducting ward classes in virtual platforms is practically difficult. We initiated hybrid ZOOM ward classes with a simple method of using mobile phones at the University Surgical Unit of the Colombo South Teaching Hospital. Feasibility and the student's perception of the effectiveness of such teaching were evaluated. Clinical teaching using hybrid ZOOM is feasible. Mobile phones provide satisfactory audio and video experience. The majority of the students are satisfied with the hybrid ZOOM ward classes.

Introduction

COVID 19 pandemic has taken the world by surprise. It has made people explore new entities to practice "new normals". One key principle of COVID 19 preventive measures is adherence to social distancing. Most countries have been implementing restrictions on social gatherings in the form of lockdown or imposing curfew.

This has lead to significant compromising of both undergraduate and post-graduate education programs worldwide. Universities are moving into virtual teaching platforms and distance education in this difficult time. Distant education is defined as "institution-based, formal education where the learning group is separated, and where interactive telecommunications systems are used to connect learners, resources, and instructors" [1]. Virtual learning is defined as "learning that can functionally and effectively occur in the absence of traditional classroom environments" [1]. Kaup et al have discussed possible electronic resources and approaches that can be used in distant learning. Their main suggestions are virtual classrooms, e-seminars, case-based discussions, journal clubs, discussions on surgical techniques and webinars [2].

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The feasibility and effectiveness of distance education are debatable. One study on distance education during COVID 19 outbreak among medical students in Jordan has shown that the majority preferred "traditional face-to-face teaching" over solo online teaching. Students are also recommended to convert online teaching into more integrated educational systems [3].

With the rising numbers of COVID 19 patients, health systems are going into a crisis. New adaptations have been made like cutting down routine surgeries. The number of routine patient admissions is dropping as well. Medical students cannot come towards during curfew and lockdown periods. Even when no travel restrictions are gathering a large number of students at a given time is not allowed. All these factors have noticeably led to the compromising of ward work and clinical learning [4]. Therefore solutions should be made to overcome this deficit by utilizing available limited resources.

It is more challenging when ward classes and bedside teachings are considered. It has been replaced by video demonstrations and case-based discussions in many universities [5]. But the soft skills and hands-on experience cannot be given with those methods.

The circumstances of Sri Lankan medical students are no different. Clinical appointments of medical students of the Faculty of Medical Sciences of the University of Sri Jayewardenepura were temporarily withheld during the curfew period. After the curfew, professorial appointments and other clinical appointments have been re-activated with adherence to the guidelines of minimal gatherings. One professorial appointment group was subdivided into 3 groups and are allowed to come towards at separate times. These groups are advised not to mix and to adhere to the concept of a bio-secure bubble. As an example, the surgical professorial unit receives about ten students per day.

Though few students from the group attended ward work daily, we aimed to conduct ward teachings for the entire group by initiating hybrid-ward classes using ZOOM software. Feasibility and the student's perception of the effectiveness of such teaching were evaluated.

Methodology

Hybrid ward classes were conducted utilizing the ZOOM platform using smart phones. Few patients for short case discussions were selected. (Patient 1 – examination of a colostomy, Patient 2 – examination of an intercostal tube, Patient 3 – examination of an external fixator, Patient 4 – inguinal hernia examination). Patients were thoroughly explained about the process, and consent was obtained to take part in the class and for video transmission.

Ten students were present at the ward and 20 would join online. Zoom link was set up. One volunteer student was asked to examine the patient. Two mobile phones at the ward end were connected via ZOOM with the online students. . Tutor's phone was used as the main connector for both audio and video transmissions. The tutor captured the video of the student examining the patient while sharing it with all online students. The tutor used hands free set/Bluetooth buds for better audio experience.

One ward student's phone was used as the second active phone. It was connected to ZOOM and kept with the students to connect them with the online group during the discussion. Only the audio was kept-on, in that phone and it was kept in speaker mode. The ward students and the online group communicated effectively through this zoom connection. Approximately 40 minutes were taken for a class. Image 1 shows a model setting of the hybrid bedside ward class.

Feedback form was developed to assess students' perception of the suitability of mobile phones for virtual ward classes, the quality of audio and video transmission, overall satisfaction of the experience and invite them to comment about the experience and suggestions. This form was distributed via Google Forms and responses were analyzed anonymously.

Figure 1. Model hybrid bedside ward teaching

Results

Ninety percentage [27/30] of the students were satisfied with the audio and video quality of the connection. Everyone agreed that using a mobile phone camera was effective. All students said the effects of background noise at the ward end was manageable. Ninety-six percent of these online students felt that they had actively participated in the sessions while 86.7 % were satisfied with the overall experience of the hybrid ZOOM class and the rest were neutral. All wanted to continue this hybrid method forward teachings.

When they were openly invited to comment, the following responses were recorded.

"Could not gain the 3D experience, but this was good"

"With two active mobile phones, better experience was gained as we heard the students' responses clearly"

"Please cover all short cases in this manner"

Discussion

Clinical learning is a key element in the undergraduate curriculum. It gives the students firsthand experience of ward work and clinical decision making while improving their soft skills and communication skills [6]. Therefore it is hard to substitute by formal classroom teaching.

As universities are moving into virtual platforms, many online teaching methods have been utilized during the recent past [2, 7] and new technology has been used innovatively [8]. Those can be effective to replace traditional classroom teachings [9]. Some institutes have planned to deliver the entire curriculum online during this pandemic [2, 5]. Conducting hybrid practical assessments in postgraduate exams are also described [10]. But it is difficult to replace clinical teaching with only online lectures for obvious reasons.

Andrew et al have described that to overcome this difficult time in medical education, educators will have to optimize available training experiences and introduce new technology [11].

Many studies have been done to assess the satisfaction and effectiveness of online lectures. One study conducted among medical students in South Korea had reported that the students were generally satisfied with the online courses and there was no change in the student satisfaction on individual lectures compared to previous years. According to the student responses, the strength of online learning was the schedule flexibility it provided; the ability to learn from anywhere, whenever they want[12]. But studies done on hybrid bedside ward teaching and clinical teaching are scarce.

Hybrid ward teaching which we adopted gave the online students the feeling of active participation. One objective of

this is to involve the entire group in a particular bedside teaching session. That is because with the limited numbers of patients coming to surgical wards during this pandemic and also the rostered attendance of students, each student will not get the opportunity to see the "regular number" of patients.

This method is simple and doesn't need hi-tech equipment. Two mobile phones with network connections are used with the ZOOM platform. Bluetooth buds or a microphone with a phone headset and a selfie stick or tripod are optional. We have even conducted few hybrid virtual ward rounds with the same technique. The same method has been currently utilized for postgraduate surgical teaching at our unit as well.

Though the ideal ward experience cannot be given with this method, the overall satisfaction of the students was high. They wanted this to be continued for all ward teachings. The effectiveness of this method of teaching with regards to gaining knowledge, skills and attitudes has not been evaluated in this study and is an opportunity for future studies.

Conclusions

Clinical teaching using the hybrid ZOOM method is feasible. Mobile phones provide a satisfactory audio and video experience. Using two mobile phones at the ward end – one for the tutor and the other for the students to respond – provides a better sense of student participation. The majority of the students are satisfied with the hybrid ZOOM ward classes.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Schlosser L, Simonson M. Distance education: Definition and glossary of terms [2nd Editio.]. Bloomington: Association for Educational Research and Technology. 2006.
2. KaupS, JainR, Shivalli S, Pandey S, Sustaining academics during COVID-19 pandemic: the role of online teaching-learning. Indian Journal of Ophthalmology. 2020 Jun;68[6]:1220. https://dx.doi.org/10.4103%2Fijo.IJO_1241_20
3. Sindiani AM, Obeidat N, Alshdaifat E, Elsalem L, Alwani MM, Rawashdeh H, Fares AS, Alalawne T, Tawalbeh LI. Distance education during the COVID-19 outbreak: A cross-sectional study among medical students in North of Jordan. Annals of Medicine and Surgery. 2020 Nov 1;59:186-94. https://doi.org/10.1016/j.amsu.2020.09.036
4. Sahi PK, Mishra D, Singh T. Medical education amid the COVID-19 pandemic. Indian pediatrics. 2020 Jul;57[7]:652-7. https://doi.org/10.1007/s13312-020-1894-7
5. Soliman M, Aldhaheri S, Neel KF. Experience from a medical college in Saudi Arabia on undergraduate curriculum management and delivery during COVID-19 pandemic. Journal of Nature and Science of Medicine. 2021 Apr 1;4[2]:85. https://doi.org/10.4103/jnsm.jnsm_146_20
6. Nordquist J, Hall J, Caverzagie K, Snell L, Chan MK, Thoma B, Razack S, Philibert I. The clinical learning environment. Medical teacher. 2019 Apr 3;41[4]:366-72. https://doi.org/10.1080/0142159X.2019.1566601
7. HilburgR, PatelN, Ambruso S, Biewald MA, Farouk SS. Medical education during the COVID-19 pandemic: learning from a distance. Advances in Chronic Kidney Disease. 2020 Jun 23. https://doi.org/10.1053/j.ackd.2020.05.017
8. Goh PS, Sandars J. A vision of the use of technology in medical education after the COVID-19 pandemic. MedEdPublish. 2020 Mar 26;9. https://doi.org/10.15694/mep.2020.000049.1
9. Singh K, Srivastav S, Bhardwaj A, Dixit A, Misra S. Medical education during the COVID-19 pandemic: a single institution experience. Indian pediatrics. 2020 Jul;57[7]:678-9. https://doi.org/10.1007/s13312-020-1899-2
10. Rao S, Chowdhury N, Naithani M, Singh A, Singh N, Gupta AK, Kathrotia R. Alternative strategy adopted in practical assessment for pathology postgraduate certification examination amidst COVID-19 nationwide lockdown: an Indian experience with a novel hybrid method of assessment. Advances in medical education and practice. 2021;12:1. https://doi.org/10.2147/AMEP.S286423
11. Hall AK, Nousiainen MT, Campisi P, Dagnone JD, Frank JR, Kroeker KI, Brzezina S, Purdy E, Oswald A. Training disrupted: practical tips for supporting competency-based medical education during the COVID-19 pandemic. Medical teacher. 2020 Jul 2;42[7]:756-61. https://doi.org/10.1080/0142159X.2020.1766669
12. Kim JW, Myung SJ, Yoon HB, Moon SH, Ryu H, Yim JJ. How medical education survives and evolves during COVID-19: Our experience and future direction.PloSone.2020 Dec 18;15[12]: e0243958. https://doi.org/10.1371/journal.pone.0243958

SCIENTIFIC ARTICLE

Laparoscopic continuous ambulatory peritoneal dialysis (CAPD) catheter insertion: a modified technique in low resource settings and early outcome

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Keywords: Chronic kidney disease; peritoneal dialysis; CAPD; laparoscopy

Abstract

Chronic kidney disease [CKD] has become a major health issue worldwide. In Sri Lanka, the prevalence of CKD has increased rapidly in the recent past. The definite treatment is kidney transplantation. However, due to a variety of reasons, transplantation is either delayed or not possible. Dialysis is the management modality for those patients. Peritoneal dialysis is traditionally done via temporary lines for in-ward patients in Sri Lankan hospitals. There is an increasing trend to use CAPD catheters in major renal centres. CAPD lines are inserted by several techniques. In most centres in Sri Lanka CAPD is inserted by open surgery. Laparoscopic insertion is relatively new to local patients. In this article, a novel modified technique is described, and the early outcome is analyzed.

Introduction

Renal replacement therapy is needed to maintain homeostasis in patients with stage 4 chronic kidney disease[1]. They need either haemodialysis or peritoneal dialysis. Each of these modalities has its advantages and disadvantages. Haemo-dialysis is hospital-based while peritoneal dialysis could be performed in the community. CAPD has gained popularity worldwide[2]. The catheter insertion is mostly done laparoscopically in most other countries. In Sri Lanka, CAPD is being utilized increasingly[3,4]. CAPD has gained more popularity among patients, caregivers and healthcare personnel with appropriate counselling and training[3].

Peritoneal dialysis is the preferred mode for motivated patients and patients with significant co-morbidities such as severe cardiac illness, widespread peripheral and central venous disease, and peripheral arterial disease[5]. For community peritoneal dialysis, it is important to provide them with safe, reliable, and trouble-free permanent access to the peritoneum. Modern CAPD catheters are capable of providing the above requirements.

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A variety of CAPD catheters are available in different sizes in modern healthcare facilities. The size and the shape of the catheter to be inserted depend on the physique of the patient's abdomen. The largest possible size should be used as it provides better inflow and outflow of the dialysate as well as better long term patency.

Insertion of CAPD catheter is performed by open, blind or laparoscopic methods.

At our institute, the CAPD programme was started recently within the paediatric and adult nephrology units. We use laparoscopy for the implantation of the CAPD catheter. Although it is performed under general anaesthesia unlike the blind technique, it has several advantages. Being a minimally invasive procedure, post-operative pain is minimal. Loops of the small bowel and large bowel can be moved away from the pelvis and space for the tip of the catheter can be created. The catheter is placed in the pelvis under direct vision. Since all the steps are done with direct vision, bleeding, bowel and bladder injuries could be minimized[7]. This study is aimed to analyze the initial outcome and safety of the technique.

Methodology

All the patients referred to the surgical unit for CAPD catheter insertion were included in this study. This series describes the catheter implants done from July 2020 to February 2021. First, the patient and guardian/caregiver were counselled. Informed written consent was taken from the patient or the guardian after excluding contraindications [Table 1]. One patient was excluded as he had extensive adhesions due to multiple laparotomies. Home visits were done to make sure that there is adequate infrastructure and advice was given for further modifications.

We commonly use standard, double cuff Tenckhoff catheters with either straight or coiled tips [Figure 1]. The catheter has four parts: extra-abdominal, subcutaneous, transmural, and intra-abdominal.

A micro-enema was inserted a few hours before the operation. This manoeuvre helps to get rid of excess solid faeces in the large bowel and thereby enhances the handling ease of the large intestine during insertion [5].

The exit site was marked in the anterior abdominal wall above or below the belt line depending on the patient's stature. In addition, the subcutaneous tract and entry point were also surface marked [Figure 2].

In the technique described in the literature, once the pneumoperitoneum is created a laparoscopic port sufficiently large enough [7mm] to pass the CAPD catheter is tunnelled into the peritoneum from the exit site or in between. There are no suitable ports available at our institution for this purpose; it is impossible to pass the catheter through a 5 mm port and the 10 mm port is too large to be used as described in the standard technique. Hense the modified technique had to be adapted for laparoscopic implantation of CAPD.

The patient was placed supine on the table with hands-on on either side. The pneumoperitoneum was created using either an open technique or using Veress needle. Two 5mm laparoscopic ports were placed right side of the midline. These ports were placed within 5cm of the level of the umbilicus. Care was taken to avoid the proposed incision if a future transplant was planned. A 30-degree telescope was used for the visualization. Either port could be used as the camera port or instrument port.

One to two cm above the apex of the subcutaneous loop, a transverse incision was made to accommodate a 10 mm port. Then subcutaneous tissue was dissected up to the apex of the loop. Using a sharp trochar a 10 mm port was advanced along the medial half of the loop to the entry point in the midline. The linea alba was pierced by rotational movements of trochar both clockwise and anticlockwise. However, care was taken not to pass the whole trochar through the abdominal wall. An instrument via the other port was used to support the abdominal wall. The entry of trochar to the peritoneum was visualized through the laparoscope. Once the tip of the port traverses the parietal peritoneum, the trochar was withdrawn while keeping the port pushed against the abdominal wall so that tip of the port remains inside the peritoneum.

In the meantime, the catheter was prepared by soaking both the cuffs in normal saline. The tip of the catheter was grasped by a Marylands forceps and advanced through a 10 mm port. Once the catheter entered the peritoneal cavity, it was grasped by another instrument and the Marylands forceps was withdrawn. The catheter was pulled further into the peritoneal cavity by the second instrument. This was done until the deep cuff was partially seen through the peritoneum. At this point, the 10 mm port was withdrawn.

This phase can be carried out using a 7 mm port which allows the free passage of the catheter with its cuff. We use this modified technique since we do not have a suitable 7 mm port]

The head end of the patient table was lowered, and the bowel is allowed to fall into the upper abdomen. This was facilitated by bowel grasping forceps via the second port. Then the tip of the catheter or the curled part was grasped and placed in a recto-vesical or recto-vaginal pouch in the pelvis.

A 5 mm trocar was inserted from the entry site of the 10 mm port. It was advanced infero-laterally following the lateral half of the marked loop. A tiny incision was made at the exit site and the tip of the trochar was taken out. A 5mm port was advanced retrogradely over the trochar, and trochar was withdrawn. The distal end of the catheter was fed into the 5 mm port as much as possible. The port was then withdrawn. The superficial cuff should be placed 2 cm away from the exit site [Figure 4].

After ensuring that the catheter tip was properly placed in the pelvis and the deep cuff was just external to the peritoneum, pneumoperitoneum was reversed, and ports are withdrawn under direct vision. The catheter was anchored to the skin in selected cases to prevent it from being pulled out during the early postoperative period. The incisions were closed subcuticular, and local anaesthetic infiltrated. Finally, a low volume dialysis cycle was carried out on the operating table. The position of the catheter was confirmed later by an abdominal X-ray[6] [Figure 5].

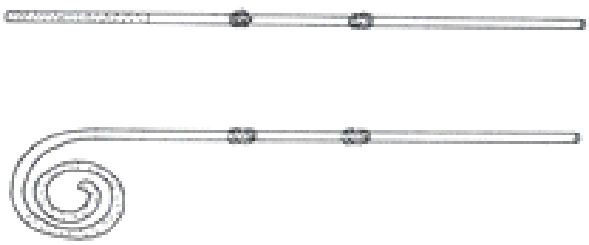

Figure 1. Common configurations of CAPD catheters

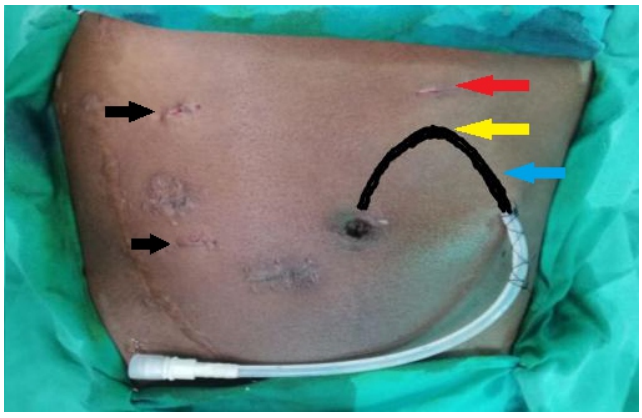

Figure 2. Port sites and subcutaneous loop is marked

Red Arrow : 10 mm port

Yellow Arrow: Subcutaneous loop

Blue Arrow : Superficial cuff

Black Arrows: 5 mm ports

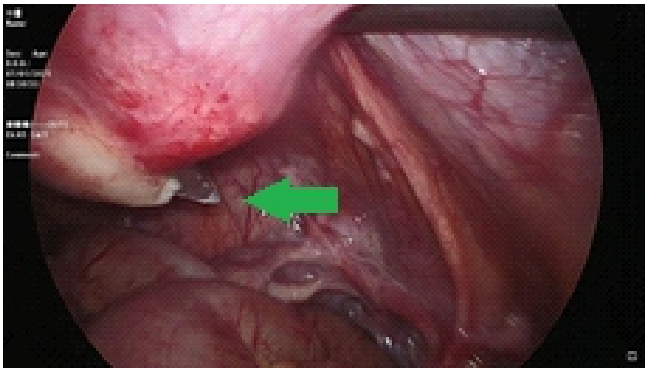

Figure 3. Only tip of 10mm trochar was inserted

Figure 4. End of catheter was retrogradely inserted in to a 5 mm port

Figure 5. X-ray confirming the position of the catheter

Results

A total number of 13 catheters were inserted in 8 patients, the details of whom are summarised in Table 2. The youngest age at insertion was 2 years while the oldest was 61 years. The mean age was 16 years. The majority of patients were females [n=10]. We used 4 different sizes of catheters depending on the body habitus of patients. All the procedures were done under general anaesthesia. Postoperative pain was minimal and was managed with simple oral analgesics. The majority of patients [n=11] had a trouble-free procedure. Two patients developed complications, namely cuff extrusion and catheter displacement.

Patient number 5 pulled her catheter out accidentally, resulting in superficial cuff extrusion. She developed exit site infection. Ultimately the catheter was removed after a month.

Patient number 3 experienced difficult dialysis after 3 months. An abdominal X-ray showed that the catheter was displaced to the upper abdomen. This is the commonest complication associated with CAPD lines [7]. She underwent a laparoscopy. It revealed that the omentum was wrapped around the catheter causing an obstruction. The omentum was freed, and the catheter was repositioned in the pelvis. She did not have further complications.

Discussion

CAPD is well established among renal patients who are being dialyzed. The principal advantages of PD are that it is home-based treatment, vascular access is not required, there is less cardiovascular stress in patients with poor cardiac function and quality of life may be better for many older patients [5]. The catheters are placed in the peritoneum under strict aseptic conditions by one of three techniques, open, blind or laparoscopic.

The efficacy and safety of laparoscopic and open insertion of PD catheters have been studied in both randomized and non-randomized studies. Although earlier studies showed that there is no significant difference, recent studies are in favour of the laparoscopic technique. The laparoscopic technique is associated with higher one-year catheter survival and less migration, which would be clinically relevant [9]. Further refining of the laparoscopic method and wider incorporation of the technique will help in improving patient outcomes [10].

Being minimally invasive, the laparoscopic procedure is associated with minimum peri-operative pain. This is an added advantage when managing children with ESRF. The catheter can be placed in the pelvis after moving the bowel away from the pelvic cavity. However, it has to be done under general anaesthesia.

Table 1. Exclusion criteria [contraindications] for CAPD catheter insertion

Absolute contraindications	• Extensive intra-abdominal adhesions that limit dialysate flow
	• Sepsis of the anterior abdominal wall
	• Encapsulating peritoneal sclerosis
	• Surgically uncorrectable mechanical defects
Relative contraindications	• Fresh intra-abdominal foreign bodies [4-month wait after abdominal vascular prosthesis, recent ventricular-peritoneal shunts]
	• Peritoneal leaks
	• Inflammatory, ischaemic bowel disease or frequent episodes of diverticulitis
	• Large polycystic kidneys
	• Stomas

Table 2. Details of patients who underwent laparoscopic CAPD insertion at Teaching Hospital, Peradeniya. [GA = General Anaesthesia]

Patient ID	Age	Gender	Anaesthesia	Catheter size	Entry site	Complications
1	8y	F	GA	37	Infra-umbilical	Nil
2	14y	F	GA	37	Infra-umbilical	Nil
3	15y	F	GA	62	Infra-umbilical	Obstruction, displacement
4	31y	F	GA	62	Infra-umbilical	Nil
5	2y	F	GA	32	Supra-umbilical	Cuff extrusion
6	61y	F	GA	65	Infra-umbilical	Nil
7	16y	F	GA	37	Infra-umbilical	Nil
8	9y	M	GA	62	Supra-umbilical	Nil
9	2y 3m	F	GA	32	Supra-umbilical	Nil
10	8y	F	GA	37	Infra-umbilical	Nil
11	17y	M	GA	65	Infra-umbilical	Nil
12	11y	F	GA	62	Infra-umbilical	Nil
13	15y	M	GA	65	Infra-umbilical	Nil

In Sri Lanka, CAPD is done only in tertiary hospitals where there are renal units. All these centres have laparoscopic facilities. Even though equipment availability is limited, this article highlights that the standard technique can be modified to resource-poor settings with success. All the patients tolerated the procedure well. Only oral simple analgesics were required for pain relief.

Early complications of CAPD insertion include haemorrhage, perforated viscus, wound infection, catheter obstruction and displacement, and dialysate leakage. Late complications are exit-site and tunnel infections, subcutaneous cuff extrusion, obstruction, peri-catheter leaks and hernia, and encapsulated peritoneal sclerosis. In this series, external cuff extrusion and migration were the complications encountered so far. After that, we anchored the catheter to the skin temporarily in children until the superficial cuff is fibrosed although it is not advocated in the literature.

Conclusion

Laparoscopy is a safe, reliable mode of CAPD catheter implantation. It is feasible to achieve good results even in low resource settings with technical modifications. However, it should be further evaluated with larger studies although early results are encouraging.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Levin A, Hemmelgarn B, Culleton B, Tobe S, McFarlane P, Ruzicka M, et al. Guidelines for the management of chronic kidney disease. Canadian Medical Association Journal [Internet]. Joule Inc.; 2008 Nov 18;179[11]:1154–62. Available from: http://dx.doi.org/10.1503/cmaj.080351
2. 2017 USRDS Annual Data Report: Executive Summary. American Journal of Kidney Diseases [Internet]. Elsevier BV; 2018 Mar;71[3]:S1–S8. Available from: http://dx.doi.org/10.1053/j.ajkd.2018.01.003
3. Wazil A, Nanayakkara N, Mahanama R, Basnayake B. Continues Ambulatory Peritoneal Dialysis: A single Center Experience in A Rura CKDu Endemic area in Sri Lanka. Indian Journal of Peritoneal Dialysis 2019; 19-23.
4. Rope R, Nanayakkara N, Wazil A, Dickowita S, Abeyeskera R, Gunerathne L, et al. Expanding Capd in Low-Resource Settings: A Distance Learning Approach. Peritoneal Dialysis International: Journal of the International Society for Peritoneal Dialysis [Internet]. SAGE Publications; 2018 Sep;38[5]:343–8. Available from: http://dx.doi.org/10.3747/pdi.2017.00251
5. Davies AH, Gibbons CP, editors. Vascular access Simplified; 2nd Ed: 2007. P 179-186. ISBN 978-1-903378-52-6

6. Bammens B, Peeters D, Jaekers , Claes K J , Evenepoel P , Kuypers D, et al. Postimplantation X-ray parameters predict functional catheter problems in peritoneal dialysis. Kidney International [Internet]. Elsevier BV; 2014 Nov;86[5]:1001–6. Available from: http://dx.doi.org/10.1038/ki.2014.203
7. Prabhakar N, Aljamal YN, Saleem HY, Baloul MS, Nyberg SL, Farley DR. Outcomes of laparoscopic and open CAPD catheter placement: A single-center experience. Surgery Open Science [Internet]. Elsevier BV; 2019 Jul;1[1]:20–4. Available from: http://dx.doi.org/10.1016/j.sopen.2019.05.003
8. Qiao Q, Zhou L, Hu K, Xu D, Li L, Lu G. Laparoscopic versus traditional peritoneal dialysis catheter insertion: a meta analysis. Renal Failure [Internet]. Informa UK Limited; 2016 Mar 4;38[5]:838–48. Available from: http://dx.doi.org/10.3109/0886022x.2015.1077313
9. Hagen SM, Lafranca JA, Steyerberg EW, IJzermans JNM, Dor FJMF. Laparoscopic versus Open Peritoneal Dialysis Catheter Insertion: A Meta-Analysis. Mandell MS, editor. PLoS ONE [Internet]. Public Library of Science [PLoS]; 2013 Feb 15;8[2]:e56351. Available from: http://dx.doi.org/10.1371/journal.pone.0056351
10. Cox TC, Blair LJ, Huntington CR, Prasad T, Kercher KW, Heniford BT, et al. Laparoscopic versus open peritoneal dialysis catheter placement. Surgical Endoscopy [Internet]. Springer Science and Business Media LLC; 2015 Jun 20;30[3]:899–905. Available from: http://dx.doi.org/10.1007/s00464-015-4297-4

REVIEW ARTICLE

Fifty liver transplants: a single centre experience of haemodynamic management in liver transplantation for cirrhosis [part 1]

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Keywords: Liver transplantation; cirrhosis; non-alcoholic fatty liver disease; alcohol related liver disease

Abstract

Cirrhosis with end stage liver disease (ESLD) is a leading cause of non-communicable disease related deaths in Sri Lanka. Liver transplantation is the only curative treatment for patients with ESLD. The complex multisystem involvement and unique cardiovascular profile characteristic of ESLD present formidable challenges during liver transplantation. Management of the rapid and varied hemodynamic changes during surgery requires an in depth understanding of the physiological effects of each intervention. Based on the current literature and the experience gained at our center during the management of 50 liver transplants, we present optimization strategies and perioperative hemodynamic interventions which we use to 'Fast track' recovery following liver transplantation.

Introduction

In recent years' cirrhosis with end-stage liver disease [ESLD], has been recognized as a leading cause of non-communicable disease-related deaths in Sri Lanka [1]. Nonalcoholic fatty liver disease [NAFLD] and alcohol-related liver disease [ARLD] are the principal cause of ESLD and hepatocellular carcinoma in Sri Lanka [2]. The increase in the prevalence of Non-alcoholic liver disease among urban Sri Lankan adults from 32.6% to 61.5% over 7 years indicates the magnitude of the health care burden [3]. Globally an estimated one million deaths annually are caused by complications of cirrhosis and an additional one million deaths occur due to viral hepatitis and hepatocellular carcinoma [4]. Liver transplantation is the only curative treatment option for patients with end-stage liver disease due to cirrhosis, acute liver failure, certain malignant tumours of the liver, and acute chronic liver failure [ACLF].

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The multisystem dysfunction associated with ESLD adds to the complexity of perioperative care in liver transplantation in these patients [5]. With the rising prevalence of diabetes and obesity, the need for liver transplantation is likely to increase dramatically.

At present, only a handful of liver transplants are performed annually in Sri Lanka [2]. There is a dire need to develop a sustainable liver transplant program in the country. This requires a commitment from multiple stakeholders including the state and the health care workers. Developing the legal framework, infrastructure, organ procurement process and multidisciplinary human resources for such a transplant program requires much foresight and a broad vision. Subspecialties related to transplant surgery and medicine are already well established in Sri Lanka. Considering the key role of the anaesthetist in the multidisciplinary transplant team, the training program leading to board certification of specialist anaesthetists with a special interest in Transplant Anaesthesia and Critical care was established by the Board of Study in Anaesthesiology, Postgraduate Institute of Medicine, University of Colombo in 2018.

1. Evolution of liver transplant surgery

The first successful orthotopic human liver transplant surgery was carried out in 1963 on a child with biliary atresia at the University of Colorado, USA, by a team led by Thomas Starzl, surgeon and Tony Aldrete, anaesthetist - a legendary duo. The protocols developed for renal transplantation and immune suppression were adapted for liver transplantation. The liver transplant failed due to a massive intraoperative haemorrhage. Repeated failures prompted a self-imposed moratorium. After much research on animal models, the transplant program recommenced [6]. The impressive progress made in the field of liver transplantation since then has been made possible due to advances in the fields of surgery, anaesthesia, critical care, hepatology, immune suppression, coagulation management, nursing, and the evolution of machine perfusion [7]. Currently, almost thirty thousand liver transplants are performed globally every year.

In Sri Lanka, the first successful cadaveric liver transplant was carried out in 2010 [8]. The team from the Colombo North Centre for Liver disease carried out the first live donor liver transplant in 2012 followed by the first liver transplant for acute liver failure in 2017 [9]. In 2018 the first liver transplant without using blood products was 'fast tracked'[10]. The same team performed the first successful paediatric live donor liver transplant in 2020 [11].

2. Grading of End-stage liver disease and selection for transplant

Globally, a liver transplant is hampered by a shortage of donor organs. Donor liver grafts that would have been considered unsuitable previously are now being utilized with an excellent outcome. To overcome the shortage of organs, an equitable, needs-based allocation system was developed.

The Child-Pugh-Turcotte score has limited use for prioritizing patients for liver transplants [12, 13]. The introduction of the Model for End-Stage Liver Disease [MELD] score in 2002, followed by the MELDNa score provided an objective ranking system of potential recipients and a transparent system for allocation of donor organs [14, 15]. The utility of a frailty score to further shorten waitlist time is under consideration. The Paediatric End-Stage Liver Disease [PELD] score is used to predict waitlist mortality and to prioritize children with ESLD awaiting liver transplantation [16]. The mean MELD score at the time of listing for liver transplantation at the Colombo North Centre for Liver Disease [CNCLD] in 2017 was 17 and scores ranged from 15-20 [17]. A cirrhotic with a MELD score of less than 14 is usually not listed for liver transplantation since the risk associated with liver transplants outweigh the benefit.

3.Organ dysfunction in ESLD and impact on haemodynamics

Organ dysfunction and deterioration of quality of life in cirrhotics are typically relentless; progressing from a compensated stage to early and late decompensated cirrhosis [18]. Decompensated cirrhosis carries a dismal prognosis without liver transplantation [19]. Acute chronic liver failure [ACLF] in cirrhotics is characterized by the presence of acute multiple organ failure typically triggered by alcohol consumption or infection. The severity of multi-organ involvement in ACLF is defined by the CLIF-Consortium [C] ACLF score [18]. The indications for a liver transplant in acute liver failure and ESLD are well defined. The underlying pathophysiology of multi-organ dysfunction stems from deranged hepatocellular synthetic, immune, and metabolic clearance and portal hypertension. Dysfunction of *Kupffer* cells contributes to impaired immune function. Deranged flow dynamics in hepatic sinusoids, angiogenesis and nitric oxide-dependent vasodilatation contribute to elevated portal venous pressure and portosystemic shunt [13, 20]. Ischemia resulting from thrombosis of the portal vein could prime the tissues for ischemia-reperfusion injury in the setting of liver transplantation [21].

4.Cardiovascular Assessment

Cardiac risk management by the anaesthetist is vital for the success of a liver transplant. Acute perioperative changes superimposed on deranged cardiopulmonary function, systemic, pulmonary, and portal circulation and coagulation, can result in a life-threatening haemodynamic disturbance in the perioperative period. Cardiopulmonary complications are a principal cause of death in the perioperative period. Metabolic syndrome and asymptomatic moderate coronary artery stenosis are common in patients with NAFLD listed for liver transplantation. The presence of Nonalcoholic steatohepatitis [NASH] and renal dysfunction are predictors of critical coronary stenosis. Appropriate pre-transplant coronary revascularization can reduce perioperative haemodynamic instability and mortality associated with coronary artery disease [22]. Cytokines especially TNF-α contribute to nitric oxide overproduction in the splanchnic arterial circulation in ESLD [20]. This chronic vasodilatory state may mask underlying cardiac dysfunction. The limited coronary flow reserve could contribute to the increased risk of acute perioperative cardiac events.

Cirrhotic cardiomyopathy is characterized by the blunted inotropic and chronotropic response to stress, altered diastolic relaxation and electrophysiological abnormalities including QT interval prolongation. Cirrhotic cardiomyopathy usually resolves following liver transplantation. An ejection fraction of 40% is considered the minimum required for a liver transplant [22]. Porto-pulmonary hypertension is associated with portal hypertension in ESLD. The risk of right ventricular failure particularly during reperfusion needs to be considered. The reversibility of raised pulmonary arterial pressure, pulmonary vascular resistance and control of mean right atrial pressure are important determinants of the outcome following a liver transplant [23]. An irreversible mean pulmonary arterial pressure exceeding 40mmHg is considered a contraindication for liver transplantation in our unit. Non-invasive investigations for assessment of ischemic heart disease in candidates for liver transplant is of limited value. Though the inability to achieve the target heart rate is limited due to impaired chronotropic, exercise stress testing and dobutamine stress echocardiography provides useful information regarding the existence of inducible ischemia and left ventricular outflow tract obstruction associated with cirrhosis [24]. A reduced aerobic capacity on cardiopulmonary exercise testing is a predictor of poor outcome following liver transplant [25]. The 6-minute walk test [6MWT], which is easily performed even in low resource

settings, is a predictor of cardiac and pulmonary outcome in the perioperative period. A 6-minute walk distance of fewer than 250 meters is associated with an increased risk of waitlist mortality in liver transplant candidates. An improvement in 6MWT distance translates to improved survival [26].

The 6MWT has been included as a screening test in our preoperative assessment protocol. Invasive coronary angiography can be carried out despite the presence of renal dysfunction and the risk of bleeding [27]. In our unit, potential recipients with renal dysfunction undergo multidisciplinary risk assessment with input from nephrology, cardiology, and transplant team to determining the utility of coronary angiography. The use of dual antiplatelet therapy in the perioperative period is described in case reports. In the absence of specific recommendations, the unit guideline reflects the guidance relating to the use of dual antiplatelet therapy in major abdominal surgery [28].

5. Phases of liver transplantation surgery and haemodynamic management

Pre-anhepatic phase

During this phase surgeons painstakingly ligate intraperitoneal varices and prepares for the explant of the native liver. Compression of the inferior vena cava due to manipulation of the liver, drainage of ascites, incessant blood loss due to portal hypertension and cirrhotic coagulopathy contribute to significant hypotension. A central venous pressure below 5mmHg is targeted to minimize blood loss due to venous backflow. The use of the rapid fluid infuser-warmer and forced air warmers helps to maintain normothermia. Severe coagulopathy, acidosis, hypoglycemia and bacteremia are potential complications during this phase. Optimal hemostatic therapy guided by viscoelastic testing [VET] is possible only when a point of care testing facility is available in the theatre. Careful titration of intravenous fluid and vasopressors is required to counter hypotension due to cross-clamping of the portal vein and the inferior vena cava at the onset of the anhepatic phase [29, 30].

Anhepatic phase

Cross clamp of the portal vein, the hepatic artery, side clamping of the inferior vena cava and explant of the liver marks the onset of the anhepatic phase. The use of the 'Piggyback' technique is associated with less haemodynamic instability than the 'caval replacement' technique. Porto-caval shunts and veno-venous bypass are utilized to decompresses the splanchnic circulation and to achieve haemodynamic stability in selected patients. Progressive lactic acidosis, coagulopathy and hypoglycemia characterize this phase. Coagulopathy is monitored with VET. Though a decline in plasma fibrinogen is commonly observed during this phase, correction is not warranted in the absence of significant bleeding. Cryoprecipitate or factor concentrates are used to restore hemostasis in the presence of bleeding and abnormalities in VET. Fluid loading in anticipation of sudden haemorrhage could lead to congestion of the inferior vena cava, impaired hepatic outflow, congestion and dysfunction of the grafted liver. Under filling contributes to the relative hypovolemia and hypotension at reperfusion. Goal-directed use of intravenous fluids, vasopressors, inotropes, calcium, VET guided optimization of coagulation and correction of metabolic derangements during the anhepatic phase are aimed at minimizing haemodynamic derangement at reperfusion [29, 30].

Reperfusion and neo hepatic phase

This phase begins with reperfusion of the graft with the restoration of blood flow in the inferior vena cava and portal vein. Reperfusion hypotension is defined as a 30% drop of baseline mean arterial pressure, lasting more than a minute within five minutes of reperfusion. Severe haemodynamic instability during the reperfusion phase could be protracted and is usually due to a prolonged anhepatic phase, poor graft quality, preservation injury of graft and ischemia and reperfusion injury. Impaired cardiac contractility, arrhythmia, coagulopathy and bleeding, acidosis and hyperkalemia contribute to the instability. Multiple organ dysfunction mediated by inflammatory mediators and reactive oxygen species could result from reperfusion injury. Coordination between the anaesthetist and surgeon is vital to control the degree of hypotension at reperfusion. Calcium gluconate, boluses of adrenaline, blood products and intravenous fluids are used to restore stability. Haemodynamic stability and satisfactory graft function permit rapid weaning of vasopressors and inotropes and the resolution of lactic acidosis, coagulopathy and production of bile [29, 30].

Sustained hypotension with a mean arterial pressure [MAP] below 50 mmHg and fluctuation exceeding 25% of baseline MAP are independent haemodynamic predictors of 30-day mortality and graft failure [31]. Anticipating haemodynamic changes unique to each phase and intervening appropriately to mitigate the haemodynamic instability is vital to ensure a good outcome.

The haemodynamic management for liver transplantation carried out at the Colombo North Centre for Liver Disease will be discussed under the following headings in part 2 of this article [Volume 3 Issue 39].

1.Haemodynamic monitoring

2.Intravenous fluids

3.Haemodynamic management

4.Rebalanced Coagulation in cirrhosis and assessment of hemostasis

5.Transfusion of blood products

6.'Fast track' recovery

7.Lessons learnt

8.Annexure 1 - The guidance on haemodynamic management in Liver transplantation at the Colombo North Centre for Liver Disease

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Annual Health Statistics 2019 Sri Lanka, [2021].
2. Senanayake SM, Niriella MA, Weerasinghe SK, Kasturiratne A, de Alwis JP, de Silva AP, et al. Survival of patients with alcoholic and cryptogenic cirrhosis without liver transplantation: a single center retrospective study. BMC research notes. 2012;5[1]:1-10. https://doi.org/10.1186/1756-0500-5-663
3. Niriella MA, Pathmeswaran A, De Silva ST, Kasturiratna A, Perera R, Subasinghe CE, et al. Incidence and risk factors for non-alcoholic fatty liver disease: A 7-year follow-up study among urban, adult Sri Lankans. Liver International. 2017;37[11]:1715-22. https://doi.org/10.1111/liv.13478
4. Asrani SK, Devarbhavi H, Eaton J, Kamath PS. Burden of liver diseases in the world. Journal of hepatology. 2019;70[1]:151-71. https://doi.org/10.1016/j.jhep.2018.09.014
5. Byrne CD, Targher G. NAFLD: a multisystem disease. Journal of hepatology. 2015;62[1]:S47-S64. https://doi.org/10.1016/j.jhep.2014.12.012
6. Starzl TE. The puzzle people: memoirs of a transplant surgeon: University of Pittsburgh Press; 1992. https://doi.org/10.1176/appi.ajp.2011.11010008
7. Keegan MT, Kramer DJ. Perioperative care of the liver transplant patient. Critical care clinics. 2016;32[3]:453-73. https://doi.org/10.1016/j.ccc.2016.02.005
8. Wijeyaratne S, Gunawansa N, Cassim M, Abayadeera A. The first successful liver transplant in Sri Lanka. The Ceylon medical journal. 2011;56[2]:81-2. https://doi.org/10.4038/cmj.v56i2.2381
9. CNCLD. Evolution of North Colombo Transplant Service from 2011. Colombo North Center for Liver Disease 2019 [Available from: https://medicine.kln.ac.lk/units/cncld/index.php/evolution-of-north-colombo-transplant-service.
10. S. H. Fast track extubation following liver transplantation without blood products - A case report. Master Class in Liver Disease, Chennai: Poster presentation, 2018.
11. Faculty of Medicine UoK. The first successful paediatric liver transplant in Sri Lanka [Living-donor liver transplant] 2020 Available from: https://medicine.kln.ac.lk/index.php/news-and-events/917-the-first-successful-paediatric-liver-transplant-in-sri-lanka.html.
12 Child CG. Surgery and portal hypertension. The liver and portal hypertension. 1964:50-2. PMID: 4950264.
13. De Wolf A, Martin P, Tan H-H. Liver disease: epidemiology, pathophysiology, and medical management. Oxford Textbook of Transplant Anaesthesia and Critical Care. 2015:183. https://doi.org/10.1093/med/9780199651429.001.0001
14. Kamath PS, Wiesner RH, Malinchoc M, Kremers W, Therneau TM, Kosberg CL, et al. A model to predict survival in patients with end-stage liver disease. Hepatology. 2001;33[2]:464-70. https://doi.org/10.1053/jhep.2001.22172
15. Kim WR, Biggins SW, Kremers WK, Wiesner RH, Kamath PS, Benson JT, et al. Hyponatremia and mortality among patients on the liver-transplant waiting list. New England Journal of Medicine. 2008;359[10]:1018-26. https://doi.org/10.1056/NEJMoa0801209
16. McDiarmid SV, Anand R, Lindblad AS. Development of a pediatric end-stage liver disease score to predict poor outcome in children awaiting liver transplantation1. Transplantation. 2002;74[2]:173-81. https://doi.org/10.1097/00007890-200207270-00006
17. Gunetilleke B. Early experience of a liver transplant team in Sri Lanka. Critical Care Medicine Workshop 2017, : Georgian Academy of Sciences and Third world academy of science, 2017.
18. Jalan R, Perricone G, Moreau R, Arroyo V, Williams R. Acute-on-Chronic Liver Failure: A New Disease or an Old One Hiding in Plain Sight? Clinical liver disease. 2020;15[Suppl 1]:S45. https://doi.org/10.1002/cld.859
19. Harrison PM. Management of patients with decompensated cirrhosis. Clinical medicine. 2015;15[2]:201. https://doi.org/10.7861/clinmedicine.15-2-201
20. Langer DA, Shah VH. Nitric oxide and portal hypertension: interface of vasoreactivity and angiogenesis. Journal of hepatology. 2006;44[1]:209-16. https://doi.org/10.1016/j.jhep.2005.10.004
21. Dar WA, Sullivan E, Bynon JS, Eltzschig H, Ju C. Ischaemia reperfusion injury in liver transplantation: cellular and molecular mechanisms. Liver International. 2019;39[5]:788-801. https://doi.org/10.1111/liv.14091
22. VanWagner LB, Harinstein ME, Runo JR, Darling C, Serper M, Hall S, et al. Multidisciplinary approach to cardiac and pulmonary vascular disease risk assessment in liver transplantation: an evaluation of the evidence and consensus recommendations. American Journal of Transplantation. 2018;18[1]:30-42. https://doi.org/10.1111/ajt.14531
23. Hollatz TJ, Musat A, Westphal S, Decker C, D'Alessandro AM, Keevil J, et al. Treatment with sildenafil and treprostinil allows successful liver transplantation of patients with moderate to severe portopulmonary hypertension. Liver Transplantation. 2012;18[6]:686-95. https://doi.org/10.1002/lt.23407
24. Maraj S, Jacobs LE, Maraj R, Contreras R, Rerkpattanapipat P, Malik TA, et al. Inducible left ventricular outflow tract gradient during dobutamine stress echocardiography: an association with intraoperative hypotension but not a contraindication to liver transplantation. Echocardiography: A Journal of Cardiovascular Ultrasound and Allied Techniques. 2004;21[8]:681-5. https://doi.org/10.1111/j.0742-2822.2004.03068.x

25.Ow MM, Erasmus P, Minto G, Struthers R, Joseph M, Smith A, et al. Impaired functional capacity in potential liver transplant candidates predicts short-term mortality before transplantation. Liver Transplantation. 2014;20[9]:1081-8. https://doi.org/10.1002/lt.23907

26.Carey EJ, Steidley DE, Aqel BA, Byrne TJ, Mekeel KL, Rakela J, et al. Six-minute walk distance predicts mortality in liver transplant candidates. Liver Transplantation. 2010;16[12]:1373-8. https://doi.org/10.1002/lt.22167

27.Azarbal B, Poommipanit P, Arbit B, Hage A, Patel J, Kittleson M, et al. Feasibility and safety of percutaneous coronary intervention in patients with end-stage liver disease referred for liver transplantation. Liver Transplantation. 2011;17[7]:809-13. https://doi.org/10.1002/lt.22301

28.Bezinover D, Dirkmann D, Findlay J, Guta C, Hartmann M, Nicolau-Raducu R, et al. Perioperative coagulation management in liver transplant recipients. Transplantation. 2018;102[4]:578-92. https://doi.org/10.1097/TP.0000000000002092

29. Klinck JR, De Wolf A. Liver transplantation: anaesthesia and perioperative care. Oxford Textbook of Transplant Anaesthesia and Critical Care. 2015:223. https://doi.org/10.1093/med/9780199651429.001.0001

30 Massicotte L, Lenis S, Thibeault L, Sassine MP, Seal RF, Roy A. Effect of low central venous pressure and phlebotomy on blood product transfusion requirements during liver transplantations. Liver transplantation. 2006;12[1]:117-23. https://doi.org/10.1002/lt.20559

31.De Maria Jr S, Nürnberg J, Lin H, Contreras-Saldivar A, Levin M, Flax K, et al. Association of intraoperative blood pressure instability with adverse outcomes after liver transplantation. Minerva anestesiologica. 2013;79[6]:604-16. PMID: 23511361

TECHNICAL NOTE

Safe access to the peritoneal cavity in obese patients

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Keywords: Safe Access; laparoscopy; veress needle; optical port

Introduction

Laparoscopic access to the peritoneal cavity is challenging, particularly entry of the first port can carry the risk of visceral injury of nearly 0.3%-0.5% [2]. Access always needs to be in balance between safety and benefit. Commonly used techniques are Hasson's open technique, Veress needle gas insufflation and the optical port entry. Based on available statistics, neither technique is superior in terms of safety [3]. Every technique carries the risk of visceral damage.

Obesity and multiple previous surgical scars compound the difficulty in access.

In bariatric operations, all ports are placed in the upper abdomen (well above the umbilicus), therefore open access in obese patients results in an unacceptably large scar which finally can be a cause for incisional hernia. Furthermore, open access results in CO2 leakage making the procedure technically difficult.

Technique

The new technique is a combination of the Veress needle and the optical port entry. An adequate sized incision (roughly 1cm -1.2 cm) is made over the proposed site of port entry. As the technique is used for obesity surgery and incisional hernias, the entry site is usually Palmer's point. Kocher's type of tissue forceps is used to lift the rectus sheath expecting to leave some space between the Abdominal wall and the viscera. However, the Society of Obstetricians and Gynecologists of Canada (SOGC) guidelines do not recommend lifting of the fascia as a safety measure simply due to paucity of evidence [1]. The Veress needle is then connected to the gas insufflation tube and piercing the rectus sheath is commenced while gas insufflation is turned on. (Sense of two clicks at the manoeuvre).

Indication of the CO2 insufflator pressure indicator of a value less than 10 mmHg is a sensitive indicator of successful peritoneal entry [1].

Usually, the intraperitoneal pressure value (IPPV) is less than 5 mmHg. Pressure value gives reassurance to the operator that a low value reflects the correct placement of the needle tip.

Once the desired pressure is reached (12 mmHg -15 mmHg), both Veress and Kocher's forceps are removed and the operator prepares for optical port entry using the zero degrees camera.

While manoeuvring the optical port, the surgeon can see the endo-view of the anterior abdominal wall (Fig 1-3). All bariatric procedures were performed using 12mm Xcel EndopathTM (Johnson and Johnson) or 12 mm VersaportTM (Covidien) ports.

Once the port is successfully deployed, proper entry into the peritoneum is confirmed before insufflation of the cavity. Hence further damage is prevented even if there is inadvertent visceral damage by the port.

Figure 1. Lifting of the Rectus with Kocher's forceps.

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Figure 2. Gas insufflator value gives a reassurance of the position of Veress

Figure 3. Endoview of the Anterior Abdominal wall

Results

This novel modification had been used for over 120 laparoscopic procedures since October 2016 to date with no adverse events.

Out of the 120 cases over 60 were for Bariatric operations. The majority of the balance cases were incisional hernia, however, the technique was used in other procedures like Cholecystectomy, Fundoplication, Splenectomy and few Gynecological procedures. Table 1 details the breakdown.

Out of the patient cohort who underwent bariatric procedures, two patients (both were male) had a BMI above 50 (super obese), 24 patients (21 female) had a BMI between 41-50. Thirty-one patients (30/31 female) had a BMI between 35-39 and the balance 3 patients (all female) had a BMI above 30.

Table 1. Breakdown of the procedures

Bariatric procedures	Incisional hernia	Splenectomy	Other operations
60	48	01	12

All the attempts were time-efficient and most of the entry attempts were successful in the first pass of the Veress needle. However, the exact duration was not recorded.

Discussion and Conclusion

Although access to the abdominal cavity seems to be a small part of a laparoscopic operation, most inadvertent visceral injury occurs at the time of first port placement. (83% vascular and 75% bowel) [6]. These figures were Veress needle-related injuries. Wu shun Felix Wong reported his series with zero complications with optical port entry with using the surgeon's hand to lift the anterior abdominal wall to counteract the pressure exerted with the port and the telescope. However, many published data report even optical port entry associated with life-threatening injuries, particularly during first port placement [5]. We used the Kocher's tissue forceps to lift the fascia while inserting the Veress. This manoeuvre probably mitigates the risk of visceral injury. Since insufflation keeps the viscera away from the anterior abdominal wall, it does not require lifting the abdominal wall manually. However, this is not possible in patients with previous abdominal operations. Nevertheless, we did not encounter such difficulty in our series, most likely due to Palmer's point used as the site of the entry.

This novel technique is a combination and modification of the Veress and optical port entry techniques. Our results suggest that this technique is effective and safe.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Laparoscopic entry: a review of technique, technologies and complications. SOGC clinical practice guidelines 2007
2. Three spectra of Laparoscopic entry access injuries. James G Chandler et al J Am Coll Surg 2001;192:478-490. https://doi.org/10.1016/S1072-7515(01)00820-1
3. Use of the optical access trocar for safe and rapid entry in various Laparoscopic procedures. A,String ,E.Berber et al Surg Endosc (2001) 15: 570-573. https://doi.org/10.1007/s004640080056
4. A safe optically guided entry technique using Endopath Xcel Trocars in laparoscopic surgery: A personal series of 821 patients Wu Shun Felix Wong Gynecology and Minimally Invasive Therapy 2 (2013) 30e33.
5. Aortic injuries during laparoscopic gastric bypass for morbid obesity in Sweden 2009-2010: A nationwide survey. *Magnus Sundbom et al* Surgery for Obesity and Related Diseases 10 (2014) 203–209. https://doi.org/10.1787/itcs-v2009-4-9-en-fr
6. Serious trocar accidents in laparoscopic surgery: (a French survey of 103,852 operations). Champault G, Cazacu F, Taffinder N. Surg Laparosc Endosc. 1996 Oct; 6(5):367-70

CASE REPORT

A rare cause of recurrent neck abscess: melioidosis

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Keywords: Melioidosis; abscess; neck

Introduction

Melioidosis is an emerging recent infectious disease in Sri Lanka caused by a Gram-negative, oxidase-positive bacillus Burkholderia pseudomallei [1]. The clinical manifestation varies from severe septicemic illness to chronic infection, with high mortality and morbidity among untreated cases [2]. The best clinical assessment and focused microbiological investigations are the cornerstone factors to detect early diagnosis and prompt treatment of melioidosis to prevent mortality and morbidity. Here, we report a case of melioidosis in a young lady who presented with recurrent neck abscess in the Kilinochchi district.

Case Report

A 24-year-old lady presented with fever and right side of the neck swelling for constitutional symptoms of two weeks. She denied any other systemic symptoms, and she had no history of tuberculosis or diabetes mellitus. She was not actively involved in cultivation. However, she had a history of muddy exposure. Upon examination, she had a tender neck swelling without any palpable cervical lymphadenopathy. Her pulse rate was 80/minute regular and her blood pressure was 110/70mmHg. Further systemic examination was unremarkable. Her full blood count showed mild leucocytosis with predominant neutrophils, normochromic normocytic anaemia, normal platelets. Her renal and liver profile was normal. Her erythrocyte sedimentation rate (80 mmHg/1st hour) and C reactive protein (12.2mg/dL) were elevated, indicating an acute inflammatory process. Her chest x-ray was normal. Her ultrasound imaging of the neck favoured the diagnosis of neck abscess. Initially, she was managed with co-amoxiclav 1.2g intravenous three times daily for 10 days along with incision and drainage of the abscess. The pus culture showed no growth. However, she had a persistent fever and neck abscess following a course of antibiotics therapy. Her repeated ultrasound imaging of the neck showed the residual neck abscess. She had persistent leucocytosis with predominant neutrophils and elevated inflammatory markers (ESR-126 mmHg/1st hour and CRP- 10.2 mg/dL). Furthermore, she was managed with intravenous piperacillin-tazobactam 4.5g three times daily along with incision and drainage of the abscess. Furthermore, the trial of antituberculosis treatment was initiated due to persistent fever with high inflammatory markers after expert opinion. However, her X pert (MTB/RIF) for tuberculosis; WHO recommended Rapid Diagnostic (WRD,) using in Sri Lanka (Manufacture details: Cepheid gene Xpert system; GXMTB/RIF-10, Serial no:698209) was negative. On review two weeks and one month later, she had no improvement with therapy. Subsequently, incision and drainage of neck abscess were carried out. The direct smear showed Gram (-) ve, oxidase (+) bacilli and Burkholderia pseudomallei was isolated from pus culture. The melioidosis antibody titre was > 10,240. Melioidosis was the definitive diagnosis and was managed with intravenous Mereponem 1g thrice daily and Cotrimoxazole 1920mg twice daily for two weeks as intensive therapy. She had improved with therapy. Cotrimoxazole 1920mg twice daily for three months was continued with close monitoring of full blood count and liver enzymes every week for one month and then twice monthly for a two-month duration. She recovered with the course of antibiotic treatment for a three-month duration.

Discussion

Melioidosis is a pyogenic infection presenting as acute or chronic infection in humans following percutaneous inoculation which is caused by the Burkholderia pseudomallei. The endemic areas of melioidosis were noted in tropical and subtropical zones of South East Asia and Northern Australia. In 1927, the first case of melioidosis was reported in Sri Lanka by a European tea broker [3]. It is recently noted as an emerging infection in Sri Lanka including Northern Sri Lanka even though Sri Lanka has been considered non-endemic for melioidosis, probably due to an increase in international travel to endemic areas. Diabetes mellitus is a common risk factor for melioidosis which has a positive correlation of 76%. The recognized risk factors for melioidosis are alcohol use, chronic lung disease, chronic renal disease, malignancy, immunosuppression and thalassemia [2]. Our patient had no obvious risk factors for

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melioidosis. The clinical presentations vary from a severe septicaemic illness to chronic progressive infections which include pneumoniae, septicaemia, arthritis, abscess [4]. Pulmonary involvement and deep-seated abscess are the common clinical manifestations. Our patient presented with a recurrent neck abscess. Isolation of the causative bacterium, Burkholderia pseudomallei, in culture is the gold standard for the diagnosis [5]. Isolation of Burkholderia pseudomallei in pus culture favoured the diagnosis of melioidosis in our case. The blood culture may be negative in some cases which may be due to the initiation of antibiotics before blood culture. The melioidosis antibody titre is useful in culture-negative cases. Meropenem is the drug of choice of melioidosis in intensive therapy [6].

However, the combination of Meropenem and Co-trimoxazole is the recommended treatment with a successful outcome in systemic melioidosis. Our patient was managed with intravenous Mereponem 1g thrice daily and Cotrimoxazole 1920mg twice daily for two weeks during intensive therapy. After intensive therapy, the patient should continue on oral cotrimoxazole as the maintenance therapy to prevent relapse for three to six months depending on clinical improvement [6]. Cotrimoxazole 1920mg twice daily for three months was continued for three months duration in our patient. She improved clinically with the course of antibiotics therapy. Several studies have shown the fatalities even after initiation of therapy or due to late diagnosis or presentation.

The delayed diagnosis due to the nonspecific presentation is a clinical challenge to physicians which causes high mortality and morbidity of patients. The best clinical assessment and focused microbiological evaluation are the cornerstone for early diagnosis of melioidosis. Surgeons and physicians are aware of identifying different clinical patterns of melioidosis which is a current and future emerging infection in Northern Sri Lanka.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Cheng AC, Currie BI. Melioidosis: Epidemiology, pathophysiology and management. Clin Microbiol Rev. 2005;18:383-416.
Available: https://www.ncbi.nlm.nih.gov/pub med/15831829
2. Corea E, Dharshan de Silva A, Thevanesam V. Melioidosis in Sri Lanka. Trop. Med. Infect. Dis. 2018;3:22.
Available: https://www.mdpi.com/2414- 6366/3/1/22
3. Denny CR. Melioidosis in a European. Cey J Sci. 1927;2:37-40.
Available:
https://www.cabdirect.org/cabdire ct/abstract/19272701945
4. Corea E, Thevanesam V, Perera S, Jayasinghe I, Ekanayake A, Masakorala J, Inglis T. Melioidosis in Sri Lanka: An emerging infection. Sri Lankan J Infect Dis. 2012;1:2–8. Available: https://sljid.sljol.info/articles/10.4 038/sljid.v2i1.3801/
5. Inglis TJ, Rolim DB, Rodriguez JL. Clinical guideline for diagnosis and management of melioidosis. Rev. Inst. Med. Trop. São Paulo. 2006;48:1–4.
Available: https://www.ncbi.nlm.nih.gov/pub med/16547571

Learning Points:

- Clinical judgment and focused microbiological investigations are very important key factors for early identification of indexed cases of melioidosis.
- Surgeons should think possibility of melioidosis as one of important differential diagnosis among patient presenting with recurrent abscess in clinical practice as it is an emerging recent infection in Sri Lanka.

CASE REPORT

Incidentally detected renal oncocytoma

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Keywords: Renal oncocytoma; renal cell carcinoma; partial nephrectomy

Introduction

Renal oncocytoma is a benign renal epithelial neoplasm. In this case report, we present a case of incidentally detected renal oncocytoma which was treated with nephrectomy.

Case presentation

A 53-year-old unmarried fisherman presented with the complaint of left side loin pain for two months. He complained of intermittent dull aching type pain of moderate severity, lasting half an hour. He had no associated hematuria or dysuria and did not give a history of fever. His bowel habits were normal and there were no dyspeptic symptoms. He had hypertension and diabetes mellitus and was on treatment. Cardiovascular and respiratory system examinations were unremarkable. Abdominal examination revealed no palpable masses.

Routine serum investigations were all within the normal range. Serum creatinine was 96µmol/L. An ultrasound scan of the abdomen revealed a rounded heterogeneous mass in the superior pole of the right kidney. Further characterization with contrast-enhanced computer tomography revealed a heterogeneously contrast-enhancing lesion measuring 7.2×6.8×5.7cm in size with no extension beyond Gerota's fascia. Renal hilum was not involved and there was no vascular invasion. No synchronous lesions were noted in the ipsilateral or contralateral kidney. There was no evidence of distant metastasis.

A nephrectomy, removal of the right kidney, perirenal fat and right adrenal gland was performed with an upper midline laparotomy incision (Fig 1). Post-operative recovery was uneventful, and the patient was discharged on postoperative day four. On follow up visit he complained of minor discomfort on the operated side, and his serum creatinine was elevated to 130 µmol/L. The histology confirmed the diagnosis of oncocytoma. Further, follow up with the oncologist and nephrologist was arranged.

Figure 1. Cross section of the tumour

Discussion

Renal oncocytomas are classified as benign renal cell tumours accounting for 3-7% of primary epithelial renal neoplasms. [1] Frequently they are incidentally detected. It may be difficult to distinguish between oncocytomas and renal cell carcinomas through imaging [2]. Therefore, oncocytoma and renal cell carcinoma must be included in the differential diagnosis. the lesion being near the hilum of the kidney made it difficult to perform a partial nephrectomy in this case [3]. Preserving the healthy renal parenchyma as much as possible would have been beneficial as the patient was having both diabetes mellitus and hypertension which are risk factors for chronic kidney disease. The pathological assessment revealed a circumscribed unencapsulated tumour with solid nests of round cells with moderately enlarged round nuclei and abundant deeply eosinophilic cytoplasm. A central satellite scar was present in the tumour. The tumour cells showed no perinuclear halo or raisinoid nuclei. No clear cells were present. There were no papillary structures. No tumour emboli were noted within the renal vein. Characteristically oncocytomas present as well-circumscribed tumours with a mahogany brown colour, and with a central scar. They lack necrotic and hemorrhagic areas present in renal cell carcinoma. But in a small cohort of cases, a diagnostic

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uncertainty may arise due to remarkable similarity to chromophobe renal cell carcinoma. But the majority of renal oncocytomas have distinct cytoarchitectural features as mentioned above that allow accurate diagnosis [4].

Conclusion

The renal oncocytomas are renal epithelial tumours with an excellent prognosis. Imaging studies often cannot differentiate between oncocytoma and renal cell carcinoma. Partial nephrectomy is the standard treatment modality that provides comparable oncological outcomes to that of nephrectomy while preserving healthy renal parenchyma. Histological assessment in the majority of the cases can confirm the diagnosis.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Moch H, Cubilla AL, Humphrey PA, Reuter VE, Ulbright TM. The 2016 WHO Classification of Tumours of the Urinary System and Male Genital Organs—Part A: Renal, Penile, and Testicular Tumours. European Urology. 2016;70(1):93–105. https://doi.org/10.1016/j.eururo.2016.02.029
2. Millet I, Doyon FC, Hoa D, Thuret R, Merigeaud S, Serre I, et al. Characterization of small solid renal lesions: Can benign and malignant tumors be differentiated with CT? American Journal of Roentgenology. 2011 Oct;197(4):887–96. https://doi.org/10.2214/ajr.10.6276
3. van Poppel H, da Pozzo L, Albrecht W, Matveev V, Bono A, Borkowski A, et al. A Prospective Randomized EORTC Intergroup Phase 3 Study Comparing the Complications of Elective Nephron-Sparing Surgery and Radical Nephrectomy for Low-Stage Renal Cell Carcinoma{A figure is presented}. European Urology. 2007 Jun;51(6):1606–15. https://doi.org/10.1016/j.eururo.2006.11.013
4. Dvorakova M, Dhir R, Bastacky SI, Cieply KM, Acquafondata MB, Sherer CR, et al. Renal oncocytoma: a comparative clinicopathologic study and fluorescent in-situ hybridization analysis of 73 cases with long-term follow-up [Internet]. Vol. 5, Diagnostic Pathology. 2010. Available from: http://www.diagnosticpathology.org/content/5/1/32 https://doi.org/10.1186/1746-1596-5-32.

Learning Points:

- Renal oncocytoma is a benign renal epithelial tumour
- Imaging studies cannot reliably differentiate between oncocytoma and renal cell carcinoma.
- Partial nephrectomy is the standard modality of treatment.
- Histological assessment confirms the diagnosis.

CASE REPORT

Gossypiboma presenting as a non-healing post-operative wound: an atypical presentation of a rare surgical complication

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Keywords: Gossypiboma; surgical sponge; retained foreign bodies; nonhealing wound; foreign bodies/surgery

Introduction

A 30-year-old lady presented to the outpatient department with complaints of a non-healing lower abdominal caesarean wound for the past 2 months. She had no history of comorbidities, and, underwent a lower segmental caesarean section for her third pregnancy 4 months back in a private hospital with an indication of breech presentation. After the caesarean surgery, she had an uneventful postoperative course and was discharged. She was asymptomatic for 2 months following the surgery when she noticed a serosanguinous discharge from the caesarean scar. The amount of discharge increased gradually and it became seropurulent with an associated foul smell. There was no history of any fever, vomiting, jaundice, per rectal or per vaginal discharge.

As she was not symptomatically improving and discharge was persisting, she consulted our outpatient department. She was admitted and evaluated for the above complaints. Her physical examination was unremarkable and abdominal examination revealed a nonhealing lower abdominal surgical wound with active pus discharge from two sites. Mild erythema and tenderness were surrounding the wound [Fig.1].

Figure 1. Showing non-healing lower abdominal surgical wound with 2 points of active pus discharge.

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Her routine laboratory investigations revealed a normal picture. She was further evaluated for the causes of the nonhealing nature of the surgical wound. MRI study revealed a collection at post-operative scar site with linear tract reaching up to a lower abdominopelvic collection of 9x8x6 cm with a suspicious communication of adjacent sigmoid colon loop. Possibility of gossypiboma with fistulous communication with bowel was suggested given the previous history of caesarean surgery. The patient was taken for an explorative laparotomy and on opening the abdominal cavity intertwined small bowel loops forming a mass was noted. The sigmoid colon was found adherent below the scar. Bowel adhesions were released and a surgical mop was found transmigrating into the ileal lumen. The faecal stained surgical mop of 15x15 cm was removed from the ileal lumen [Fig.2] along with the adhered and unhealthy ileal segment.

Sigmoid colon adhesions were released and the ends of the ileum after segmental resection were taken out as double barrel ileostomy. The patient had an uneventful postoperative course and was discharged on postoperative day 5 with a functioning stoma and a healthy wound.

Figure 2. Showing removal of surgical mop that has transmigrated to ileal lumen.

Discussion

Gossypiboma, also known as textiloma, is the inadvertent textile material left behind after surgeries thereby, causing foreign body reaction. It is estimated that foreign bodies are inadvertently left behind in 0.001%-0.01% of post-operative cases, 80% of which are surgical mops, making gossypiboma the most common cause of iatrogenic foreign body [1].

Though it is estimated to happen in every 1/1500-1/1000 surgeries [2], its true incidence is unknown owing to the under-reporting of cases probably because of medico-legal implications and the embarrassment for the surgical team associated with these cases.

A wide variety of presentations of gossypiboma are reported in the literature. They can be asymptomatic or with symptoms like abdominal pain, abdominal lump, vomiting, diarrhoea, bleeding per rectum or haematuria [3]. Very rarely, an atypical presentation like a non-healing postoperative wound can also be the presenting complaint as in our case. There is only a single similar case reported in the literature so far [4]. A postoperative non-healing wound with an active discharge can have a variety of causes like infection, vascular insufficiency, immunocompromised state as in diabetes, smoking, obesity etc. and this atypical presentation demand a high index of suspicion to be maintained while evaluating postoperative patients. Two pathological mechanisms are suggested for gossypiboma formation [3]. The first one is a transudative mechanism, where a mild inflammatory process ensues fibrin production causing encapsulation and adhesions resulting in mass formation. The second mechanism is an exudative process, characterised by internal or external fistula formation or abscesses. Transmural migration of gossypiboma into bowel lumen is also reported in rare circumstances.

Gossypibomas are most commonly reported after an open cholecystectomy followed by caesarean section [2]. The factors associated with an increased incidence of gossypiboma are emergency surgery, unplanned changes during surgery, severe blood loss, changes in medical and surgical staff during the procedure, failure to count instruments and mops at the end and high body mass index [5]. The treatment of gossypiboma is the surgical removal of the material where it may necessitate an explorative laparotomy via the previous incision. Gossypiboma is a preventable event and can have catastrophic outcomes to both patient and surgical team and hence efforts should be done in all possible means to prevent its occurrence. These include multiple levels of counting of all surgical mops and instruments, adherence to checklists and best surgical practices and encouraging use of radio-opaque mops for all surgeries. To add to the already existing complexity, it has been observed that 88% of gossypiboma happened despite a reported correct counting [1]. To tackle this problem, some centres have advised strategies like routine usage of an intraoperative radiograph just before closure [5]. It is also important that and there should be legal provisions in the health systems like 'the principle of the duty of candour' in the United Kingdom which mandates a transparent and open discussion with the patients regarding such incidents. This should also be professionally conveyed to the original team so that they can take preventive measures to avoid such incidents in future. These type of incidents carries medico-legal significance and hence thorough documentation, discussion with patients regarding the whole scenario and utmost professionalism are needed while handling such cases.

Conclusion

Gossypiboma is a rare surgical complication with a myriad of presentations. Very rarely gossypiboma can present with a nonhealing postoperative wound as the sole symptom. The importance of this finding is including gossypiboma also as one of the differentials while evaluating for such wounds.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Singhal PM, Vats M, Neogi S, Agarwal M. Asymptomatic gossypiboma with complete intramural migration and ileoileal fistula. BMJ Case Rep. 2019;12[6]. https://doi.org/10.1136/bcr-2018-228587
2. Zhang H, Jiang Y, Wang Q, Liu J. Lower abdominal gossypiboma mimics ovarian teratoma: a case report and review of the literature. World J Surg Oncol. 2017;15[1]:6. https://doi.org/10.1186/s12957-016-1082-3
3. Silva SME, Sousa JB de. [Gossypiboma after abdominal surgery is a challenging clinical problem and a serious medicolegal issue]. Arq Bras Cir Dig ABCD Braz Arch Dig Surg. 2013;26[2]:140-3. https://doi.org/10.1590/S0102-67202013000200015
4. Mansoor A, Shaukat R, Saeed H, Chaudhary AN, Saeed H. Migratory Gossypiboma: An Unusual Presentation Of A Rare Surgical Complication. J Ayub Med Coll Abbottabad JAMC. 2018;30[4]:617-9.
5. Gawande AA, Studdert DM, Orav EJ, Brennan TA, Zinner MJ. Risk Factors for Retained Instruments and Sponges after Surgery. N Engl J Med. 2003;348[3]:229-35. https://doi.org/10.1056/NEJMsa021721

Learning Points:

- Gossypiboma is a rare surgical complication with a myriad of presentations, including a non-healing postoperative wound.
- Surgical removal of the gossypiboma via the previous incision is the mainstay of management.
- Multiple levels of counting, adherence to checklists, radio-opaque mops etc. can be used as preventive strategies.

CASE REPORT

Small bowel obstruction caused by multiple malignant strictures : an unusual presentation of malignancy of pancreaticobiliary origin

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Keywords: Pancreatic-biliary malignancy; malignant strictures; small bowel obstruction

Introduction

Malignancies causing small bowel obstruction [SBO] are rare [1]. Adhesions, inflammatory strictures and hernias are considered as common causes for SBO [2]. Although primary malignancy in the large bowel often presents with colonic obstruction, almost all malignant small intestinal obstructions reported are secondary to metastatic intussusception [3]. We report a rare case of acute small intestinal obstruction due to multiple metastatic jejunal strictures secondary to a malignancy of possible pancreatic-biliary origin.

Case presentation

A 65-year-old man, who has had abdominal discomfort and change of bowel habits for one month, presented with severe colicky central abdominal pain for three hours, with repeated vomiting. On examination, he was ill-looking, tachypneic and tachycardic. The abdomen was distended and was slightly tender. There were no palpable masses and bowel sounds were exaggerated. His rectum was empty. The patient was kept nil by mouth and NG tube decompression along with fluid resuscitation was initiated based on a tentative diagnosis of SBO.

Initial baseline blood investigations were essentially normal. Abdominal USS and CECT revealed dilated small bowel due to possible obstruction. Emergency exploratory laparotomy revealed two short segments of small bowel strictures at the distal jejunum with proximally distended bowel loops and a small amount of free fluid in the abdomen [Figure 1]. The rest of the abdominal organs appeared normal. A short segment of the small bowel with two strictures was removed and primary side to side stapler anastomosis was done. A specimen of resected small bowel segment was sent for histology. Post-operative recovery was uneventful. Upper and lower GI endoscopies and repeat CECT study of chest, abdomen and pelvis with the aim of locating the primary site were normal.

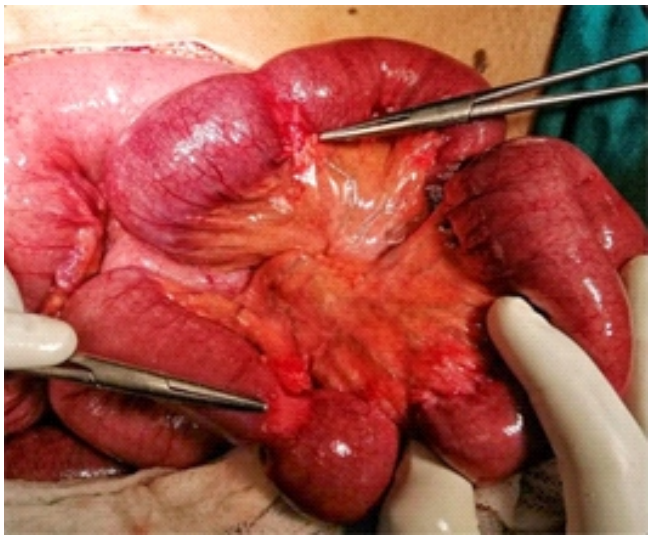

Figure 1. Intra-operative picture showing Jejunum with two strictures

Microscopically, the bowel wall at the stricture site showed an infiltrating tumour with submucosal fibrosis, sub-serosal congestion and vascular emboli. [Figure 2b] Malignant cells with multiple mitotic figures were noted within the cell nests. [Figure 2a] Mucosa over the stricture segment was normal. Lamina propria showed dense mixed inflammatory cell infiltrate favouring distant tumours infiltrating into small

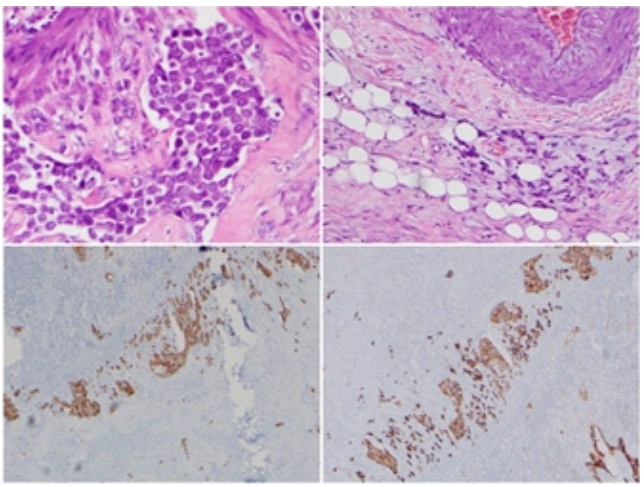

Figure 2. Histological appearance of stricture site [a] cells with pleomorphic irregular nucleoli and mitotic figures, [b] Congested sub-serosa tissue with vascular emboli, [c] Cells showing strong CK 7 positivity, [d] Cells showing strong CK19 positivity

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bowel forming strictures. Immunohistochemistry [IHC] showed strong diffuse cytoplasmic positivity for cytokeratin [CK] 7 and CK 19 and negative staining for CK 20, Thyroid transcription factor-1 [TTF 1] and prostate-specific antigen [PSA] [Figure 2c and d]. The morphological appearances and IHC profiles were suggestive of metastatic carcinoma with pancreatic-biliary primary.

Discussion

Three fourth of the SBO are due to adhesions, mostly secondary to past surgeries [2]. Malignancies causing SBO mostly occur as a part of peritoneal involvement with generalized spread of the disease. The commonest primary causes for malignant SBO include small bowel adenocarcinoma secondary to Crohn's disease, familial adenomatous polyposis, and peutz-jegher's syndrome [4]. However, cervix uteri, cutaneous melanoma and kidneys are identified as potential primary sites for small bowel metastasis [5].

Pancreatic - biliary cancer causing bowel metastasis and obstruction is rare. Literature reports, several cases of large intestinal metastasis secondary to pancreatic-biliary cancers. Bellows C et al reported a case of a 45-year-old man who underwent a right hemicolectomy for adenocarcinoma found to be having colonic metastasis from a primary pancreatic adenocarcinoma which is diagnosed pathologically by a panel of specific immune-histochemical stains [6]. However, Patients presenting with acute intestinal obstruction secondary to malignant small bowel strictures from the pancreatic-biliary primary was not reported in the literature.

Possible routes of small bowel metastasis involve direct extension, peritoneal seeding, lymphatic spread and haematogenous spread. 25% of the patients with colorectal cancer and 20 to 50% of patients with ovarian cancer can develop malignant large bowel obstruction [7].

Our reported case of small bowel obstruction secondary to secondary malignant stricture of the jejunum from pancreatic-biliary primary was detected by immunohistochemical assays. The stricture site showed strong cytoplasmic positivity for CK19 and CK7 with negative CK20, TTF1 and PSA. Pancreatic ducts are frequently positive for CK7 and CK19 [8].But neuroendocrine tumours of the pancreas are often negative for CK7 and CK 20 [9].

Differential diagnoses for CK7+ with CK20- profile include lung adenocarcinoma, ductal carcinoma of the breast, biliary and pancreatic adenocarcinoma [8]. Colorectal malignancies and their secondaries show consistent expression of CK20 with negative CK7 [10, 11]. Immunohistochemical profile of positive CK7 and CK19 with negative CK20 can exclude the possibility of primary bowel malignancy [12]. Furthermore, CK19 is normally expressed in gastrointestinal, pancreatic and hepato-biliary tracts [12]. It is known to show strong immune-reactivity in pancreatic-biliary malignancies [8]. The primary site of pancreatic-biliary cancers can be differentiated from its metastasis by using a pannel of immune markers will help to identify the origin pancreatic biliary adenocarcinoma with 98 percent specificity. However, the distinction between pancreatic and bile duct origin adenocarcinomas often lead to incorrect predictions because of the similar immune profiles.

Thyroid transcription factor 1 [TTF-1] is frequently used in the search for the primary origin of metastatic endocrine tumours and is found mainly in lungs while PSA immune-staining has high specificity for the prostate with great prognostic significance [13, 14]. Negative results for both aforementioned stains exclude the possibility of metastatic endocrine tumours, lung and prostate malignancies in our patient.

In summary, we report a 65-year-old patient who presented with acute small intestinal obstruction secondary to multiple malignant small bowel strictures. He was found to have a primary malignancy of possible pancreatic-biliary origin which was detected by a specific panel of immune-histochemical stains. Patients presenting with signs of small bowel obstruction without prior laparotomy, inflammatory strictures or abdominal hernia are high-risk candidates for malignant intestinal obstruction. Such possibility should always be considered early by clinicians to have an accurate plan of management.

Declaration of patient consent:

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Cheng AC, Currie BI. Melioidosis: Epidemiology, 1. Sonika U, Saha S, Kedia S, Dash NR, Pal S, Das P, et al. Predictive factors for malignancy in undiagnosed isolated small bowel strictures. Intestinal research. 2017;15[4]:518. https://doi.org/10.5217/ir.2017.15.4.518
2. Reddy SRR, Cappell MS. A systematic review of the clinical presentation, diagnosis, and treatment of small bowel obstruction. Current gastroenterology reports. 2017;19[6]:28. https://doi.org/10.1007/s11894-017-0566-9

3. Potts J, Al Samaraee A, El-Hakeem A. Small bowel intussusception in adults. The Annals of The Royal College of Surgeons of England. 2014;96[1]:11-4. https://doi.org/10.1308/003588414X13824511650579
4. Durmush D, Kaffes AJ. Small bowel strictures. Current opinion in gastroenterology. 2019;35[3]:235-42. https://doi.org/10.1097/MOG.0000000000000531
5. Minardi Jr AJ, Zibari GB, Aultman DF, McMillan RW, McDonald JC. Small-bowel tumors. Journal of the American College of Surgeons. 1998;186[6]:664-8. https://doi.org/10.1016/S1072-7515(98)00092-1
6. Bellows C, Gage T, Stark M, McCarty C, Haque S. Metastatic pancreatic carcinoma presenting as colon carcinoma. Southern medical journal. 2009;102[7]:748-50. https://doi.org/10.1097/SMJ.0b013e3181a8fad7
7. Castro P M, Vargas L, Mancheño A, Utrilla S M, Pascual F, Romero I, et al. Malignant bowel obstruction in relapsed ovarian cancer with peritoneal carcinomatosis: an occlusive state. International Journal of Gynecologic Cancer. 2017;27[7]. https://doi.org/10.1097/IGC.0000000000001049
8. Jain R, Fischer S, Serra S, Chetty R. The use of cytokeratin 19 [CK19] immunohistochemistry in lesions of the pancreas, gastrointestinal tract, and liver. Applied Immunohistochemistry & Molecular Morphology. 2010;18[1]:9-15. https://doi.org/10.1097/PAI.0b013e3181ad36ea
9. Chan ES, Alexander J, Swanson PE, Jain D, Yeh MM. PDX-1, CDX-2, TTF-1, and CK7: a reliable immunohistochemical panel for pancreatic neuroendocrine neoplasms. The American journal of surgical pathology. 2012;36[5]:737-43. https://doi.org/10.1097/PAS.0b013e31824aba59
10. Alexander J, Krishnamurthy S, Kovacs D, Dayal Y. Cytokeratin profile of extrahepatic pancreaticobiliary epithelia and their carcinomas: diagnostic application. Applied Immunohistochemistry and Molecular Morphology. 1997;5[4]:216-22. https://doi.org/10.1097/00022744-199712000-00002
11. Wildi S, Kleeff J, Maruyama H, Maurer CA, Friess H, Büchler MW, et al. Characterization of cytokeratin 20 expression in pancreatic and colorectal cancer. Clinical cancer research. 1999;5[10]:2840-7.
12. Hayata Y, Nakagawa H, Kurosaki S, Kawamura S, Matsushita Y, Hayakawa Y, et al. Axin2+ peribiliary glands in the periampullary region generate biliary epithelial stem cells that give rise to ampullary carcinoma. Gastroenterology. 2021;160[6]:2133-48. e6. https://doi.org/10.1053/j.gastro.2021.01.028
13. Ordóñez NG. Value of thyroid transcription factor-1 immunostaining in tumor diagnosis: a review and update. Applied Immunohistochemistry & Molecular Morphology. 2012;20[5]:429-44. https://doi.org/10.1097/PAI.0b013e31825439bc
14. Sakai H, Yogi Y, Minami Y, Yushita Y, Kanetake H, Saito Y. Prostate specific antigen and prostatic acid phosphatase immunoreactivity as prognostic indicators of advanced prostatic carcinoma. The Journal of urology. 1993;149[5]:1020-3. https://doi.org/10.1016/S0022-5347(17)36285-7

Learning Points:

- Multiple malignant strictures causing small bowel obstruction could be a bizarre presentation of malignancy of pancreatic-biliary origin.
- Patients presenting with signs of small bowel obstruction without prior laparotomy, inflammatory strictures or abdominal hernia are high risk candidates for malignant intestinal obstruction.
- Clinicians should have high degree of suspicion to have early diagnosis of patients with malignant small bowel obstruction to plan out their management accurately.

CASE REPORT

Amyand's hernia presenting as an acute scrotum

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Keywords: Amyand's hernia; acute scrotum; funiculitis; orchidectomy; acute appendicitis; inguinal hernia

Introduction

Amyand's hernia is an inguinal hernia that contains the vermiform appendix. According to older studies, Amyand's hernia occurs in 1% of all inguinal hernias, while appendicitis in an Amyand's hernia accounts for 0.1% of all appendicitis. More recent studies suggest an even smaller prevalence, with Amyand's hernia occurring in 0.4-0.6% of all inguinal hernias [1]. Preoperative diagnosis presents a clinical challenge due to non-specific symptoms and signs, and a lack of distinct radiological features. This condition is commonly diagnosed during surgery, and it is often clinically misdiagnosed as irreducible inguinal hernia. Mortality of Amyand's hernia ranges from 14-30% and was due to peritonitis and sepsis. Sharma et al. reported a mortality rate of only 5.5%. They attributed this to early appropriate treatment and good postoperative care [2]. We present a case of a 68-year-old male who had an Amyand's hernia.

Case presentation

A 68-year-old obese male (BMI-32), with Diabetes mellitus and hypertension, presented with right-sided scrotal pain and swelling for 4 days. He had only one testis (on the right side), for which he had not been investigated previously. His symptoms were of acute onset, and he had not noticed any inguinoscrotal lumps before this. He had not opened bowels for 2 days but had passed flatus. There was no abdominal pain or vomiting. On examination, his right scrotum was swollen and red with scrotal wall cellulitis. Gentle palpation revealed a very tender and swollen testis and epididymis suggestive of epididymal-orchitis with possible abscess formation. Above the testis, the spermatic cord was very tender and swollen suggestive of associated funiculitis. There was no apparent swelling or expansile cough impulse in the right groin. His left scrotum was underdeveloped and the testis was absent and there was no swelling or tenderness on the left side. The abdomen was soft and not distended. Bowel sounds were normal. He was afebrile. He had a pulse rate of 95/minute, blood pressure of 159/77, and a respiratory rate of 18/minute.

He was started on intravenous antibiotics after sending urine for culture and blood for routine investigations. He was given adequate pain relief and scrotal support. He had a white cell count of 15.2 x 109/L, with 82% neutrophils. C-reactive protein level was 139mg/L. Other blood investigations were normal.

However, an ultrasound scan of the abdomen and scrotum was suggestive of a right inguinoscrotal hernia, containing omentum and a small hydrocele. There was no detectable undescended testis on the left side.

Considering the findings of the scan, a decision was made to explore the right groin under general anaesthesia. Using a right groin crease incision, the inguinal canal was opened. A grossly oedematous and inflamed spermatic cord was seen with a narrow indirect inguinoscrotal hernia. The hernia sac was carefully opened into and contained an inflamed appendix with the ruptured tip lying in the scrotum. The sac also contained a thin strand of omentum. The caecum was lying intra-peritoneally and there was no sliding component to the hernia. The scrotal contents were also grossly oedematous and infected.

An appendicectomy was done. Two difficult intra-operative decisions remained. The only way to control the scrotal sepsis was to do an orchidectomy although this was the patient's only testis. Also, an endogenous tissue repair was not feasible with the dilated internal ring due to the oedematous spermatic cord and weak posterior wall. Therefore, a right orchidectomy with the division of the spermatic cord at the internal ring and a mesh repair of the hernia was done using a light polypropylene mesh. The skin was closed with 3/0 polypropylene vertical mattress sutures. A suction drain was placed in the scrotum.

The patient had an uneventful recovery. Intravenous antibiotics were continued until the patient was discharged on the 5th post-operative day. At review one week later, his surgical wound had healed completely and the sutures were removed. He was advised to report back immediately if he develops a discharge from the surgical wound. He is doing well two months after surgery. Endocrinology referral will be

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Table 1. Guide for management of Amyand's hernia as suggested by Lossanoff and Basson [5]

Type of hernia	1	2	3	4
Salient features	Normal appendix	Acute appendicitis localized in the sac	Acute appendicitis, peritonitis	Acute appendicitis, other abdominal pathology
Surgical management	Reduction or appendicectomy (depending on age), mesh hernioplasty	Appendicectomy through hernia, endogenous repair	Appendicectomy through laparotomy, endogenous repair	Appendicectomy, diagnostic workup and other procedures as appropriate

done at the next clinic visit.

Discussion

Amyand's hernia is named after the French surgeon Claudius Amyand, who performed the first recorded successful appendicectomy in 1735. The patient was an 11-year boy who had an acutely inflamed appendix within an inguinal hernia sac. There is no consensus on the optimal management approach to Amyand's hernia [3]. It was suggested by Milanchi and Allins in 2007, that a mesh repair without appendicectomy should be considered if a normal appendix is discovered upon an exploration of hernia contents. They also suggested that if the appendix was inflamed, a laparoscopic appendicectomy should be followed by open hernia repair without a prosthetic mesh [4]. But a more comprehensive guideline was provided by Lossanoff and Basson in 2008. They suggested 4 different approaches to 4 types of Amyand's hernia (Table 1).

Although the above guideline was comprehensive, our patient who had a ruptured appendix with gross scrotal sepsis and a weakened posterior wall did not strictly belong to any of these categories. An orchidectomy and mesh repair (using a light polypropylene mesh) was done weighing risks versus benefits.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

References

1. Michalinos A, Moris D, Vernadakis S. Amyand's hernia: a review. Am J Surg. 2014 Jun;207(6):989-95. https://doi.org/10.1016/j.amjsurg.2013.07.043
2. Ivanschuk G, Cesmebasi A, Sorenson EP, Blaak C, Loukas M, Tubbs SR. Amyand's hernia: a review. Med Sci Monit. 2014 Jan 28;20:140-6. https://doi.org/10.12659/MSM.889873
3. Amyand C, Of an inguinal rupture, with a pin in the appendix caeci, incrusted with stone, and some observations on wounds in the guts. Philosophical Transactions of the Royal Society of London. 39 (443): 329-336. https://doi.org/10.1098/rstl.1735.0071
4. Milanchi S, Allins AD. Amyand's hernia: history, imaging, and management. Hernia. 2008 Jun;12(3):321-2. https://doi.org/10.1007/s10029-007-0304-6
5. Losanoff JE, Basson MD. Amyand hernia: a classification to improve management. Hernia. 2008;12:325-6. https://doi.org/10.1007/s10029-008-0331-y

Learning Points:

- An acute scrotum even in an elderly male could pose life-threatening complications
- Early ultrasonography should be considered even in the elderly male presenting with an acute scrotum.