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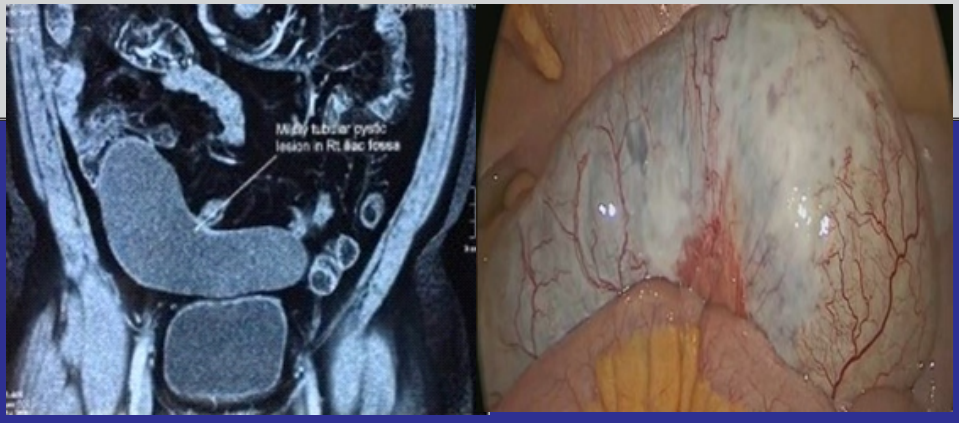

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Contents

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Contents

SCIENTIFIC ARTICLE

Awareness on consent and counselling among patients attending tertiary care hospitals : a cross-sectional study

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Keywords: Consent; risk; counselling; complication; questionnaire

Abstract

Introduction

Surgical consent and counselling are an integral part of medical practice and medical education. This study was done to assess how many of the surgical residents provide complete and accurate information to the patient during their training period.

Methods

Sixty residents from various surgical departments and 40 patients who were awaiting surgery were selected. The data was collected through interviews using two different questionnaires. The resident's questionnaire provided the information they provide to patients. The patient's questionnaire provided information on the level of their understanding from the interaction. Data were analysed using coGuide.

Results

Out of 60 residents, 56(92 %) reported that the side effects and consequences were explained fully. 25% of residents mentioned the name of the surgery and nearly 100% did not mention the operating surgeon's or unit in charge name. About 79% of residents felt that the patient was convinced with their way of communication, nearly 93 % of patients were convinced their disease process was explained well and 50% felt that the doctor informed the consequences of surgery well. 75% responded that doctor did not inform about the side-effects 98% were not aware of the alternative forms of treatment and, 87% of patients were not informed about the chances of recurrence of disease where ever applicable.

Conclusion

The majority of residents were convinced that their conveying skills are adequate for surgical counselling but they felt the need to improve. The majority of patients denied discussing complications when occurred.

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Introduction

Decision-making regarding patient care was predominantly vested with health care providers until recently. The primary supposition behind this was that the health care provider is superior and better-informed than the patient in directing patient's care [1]. A book on ethics written by Thomas Percival in 1803 states that all patients have a right to truth but when the physician can provide better treatment by lying or withholding information, he is advised to do as he thought best [2]. In 1905, the first litigation on informed consent in the supreme court of Minnesota raised questions about this approach. The case was of a patient who had given consent to operate on the right ear and the surgeon operated on the left ear after discovering a worse condition of the left ear. As the patient was not informed about this, the surgeon was held liable for his decision [3]. Hence a legal judgement was made, where all adults with a sound mind have the right in determining, the procedures to be undertaken on their body [4]. In the majority of countries, the problem regarding children's ability in making decisions related to their medical treatment remains unresolved. Gillick competence or the Fraser guidelines were used in Britain, in assessing children's competence. Using these guidelines, children>16 years, who can demonstrate sufficient maturity and intelligence to understand and appraise the nature and implications of the proposed treatment, including the risks and alternative courses of action are identified as having the legal capacity to consent for medical examination and treatment [5].

By definition, consent is to agree to do something or to allow someone to do something [5]. In medical terms, consent for surgery has wider meaning with its preconditions and implications. Initially, a simple consent varied from formal (signing on a form) to verbal (saying yes) and implied (nodding head) depending on the situation and seriousness. Over time, the emphasis shifted from simple consent to informed consent. Informed consent process requires voluntary authorization of patient or research subject, with full comprehension of the risk involved, for the diagnostic, investigative, or therapeutic procedure [6]. It is a process that involves complete and honest disclosure of the disease

condition or procedure to the patient to facilitate subsequent decision-making. It is legal documentation and whereas documentation is important in satisfying the legal aspect of the consent process, initial proper counselling constitutes the most important ethical requirement [7]. In all, the patient's right to autonomy must be respected even if it leads to harm or death. Failure to obtain consent renders a physician liable for negligence and battery [8].

A typical consent form used for the surgical procedure must contain the basic information of condition and natural progression of the disease, options/alternatives, name of the procedure, side effects/ complications, extra procedures/ stomas/ staged surgeries, name of the operating surgeon/in charge of the unit, trial/training/ first time surgery and second opinion/referral [9].

Counselling is a conversation between the patient and the doctor/clinician/care provider aimed at enabling the patient to make personal decisions related to their illness, cope with the disease, or social and emotional stress [10]. It involves the application of good communication skills modified by experience, providing clear, unambiguous, and honest information about the patient's illness. The concept of informed consent was introduced when the rights of the patient to his/her care were recognized. It became apparent that proper patients counselling based on knowledge of the disease, condition/procedure; consequences, risks, and availability of alternatives should precede consent. Thus, adequate counselling is a prerequisite to properly obtaining informed consent, it is even more important than the mere physical signing of the consent document.

In a medical college/hospital, it is the role of the junior residents to counsel and take informed consent from the patients during the initial days. The ideal time to learn is while his mentor is counselling some of his patients. This way they observe and absorb the key points in taking consent and also learn to balance between providing complete information and cautioning the patient about the risks, consequences at the same time. As they reach end of their training, they can individually practice counselling.

Hence, this study aimed to evaluate the efficiency of the junior residents in surgical counselling and providing complete and accurate information to the patient during his/her training period. This is a one-of-a-kind study, which has not been done in India to date.

Methods

This was a Cross-sectional study conducted for 3 months from January 2020 to March 2020 among surgical residents and patients at a tertiary care teaching hospital. The study consisted of two groups: one group of 60 residents from general surgery, orthopaedics, gynecology and ENT, the other group of 40 patients who underwent various surgical procedures. Both groups shared the same study setting in the same study period. We have prepared a structured questionnaire to assess whether all the key elements of the informed consent for the surgical procedure were covered in the counselling.

The questionnaire contained inquiries about the disease process, the name of the operating surgeon, the name of the operative procedure, alternative forms of treatments, risks or consequences of surgery, and complications. Some of the items were also included based on the review of existing literature [9]. The tool was validated for face validity and consensus validity by three senior-level surgeons and a public health expert.

Perceptions of the resident doctors on to what extent they have addressed these key components. The responses from the patients were also obtained on the same lines to identify the key gaps in the perception and actual implementation of the key components of informed consent. Patients were asked if residents informed them about their disease process, prognosis, treatment options, risks, chances of recurrence, complication rates, options of taking a second opinion, and referral of going to a higher centre. They were also provided with an assistant to help them mark the correct answer.

Ethical approval was obtained from the Institutional Human ethical committee of Maharajah's institute of medical science. All the study participants provided written informed consent. Confidentiality was maintained throughout the analysis and reporting of the study results. The residents were provided with structured training based on the key gaps identified in their skills following the study.

Statistical methods:

Descriptive data were presented as frequency and proportion for all categorical variables. All statistical data were analysed using SPSS version 22 [12].

Results

All 60 residents and 40 patients were considered for final analysis. Among the key elements to be covered in informed consent, risk and consequences of surgery were explained by 55 (91.66%) resident doctors. Natural history , disease process and prognosis were covered by 22 (36.66%), alternative treatments, name of the surgery were mentioned by 20 (33.33%) and 17 (28.33%) resident doctors respectively. The name of the operating surgeon was mentioned only by one resident. No resident informed the patient if the surgery was done for training purposes or for the

first time or for research purposes, whichever was applicable.

Among the surgeons 23 (38.33%) felt as they explained fully to patients, 19 (31.66%) Patients understood the disease process well and 47 (78.33%) patients were convinced.

Table 1. Summary of basic details given to patients from surgeon side (N=60)

Basic details to patients from the surgeon side	Given	Not given
Name of the surgery	17 (28.33%)	43 (71.67%)
Natural history, Disease process, prognosis	22 (36.66%)	38 (63.33%)
Risks, consequences	55 (91.66%)	5 (8.33%)
Name of operating surgeon	1 (1.66%)	59 (98.33%)
Training purpose	0 (0%)	60 (100%)
Alternative treatments	20 (33.33%)	40 (66.66%)

In the majority of cases, 44(73.33 %) patient themselves give consent,16 (26.66%) were given consent by a spouse. As methods of obtaining consent for minor procedures/ local anaesthesia, 41 surgeons (68.33%) chose verbal consent and 19 (31.66%) chose written consent.

As per consent for short GA procedures, 44(73.33%) opted for verbal consent whereas 16(26.66) opted for formal consent forms.

Among the patients, 37 (92.5%) reported that they know the disease process. Inpatient population, 21 (52.5%) reported that their doctor informed them about the surgery & its complications and 10 (25%) reported that their doctor informed them about scar and open/laparoscopic options. Inpatient population 45% reported that they know the names of the surgeons. only 1 (2.5%) patients reported that they know alternative treatments. 26 (65%) said they would like to go to higher centres, 35 (87.5%) were not knowing recurrence rate.

Table 3. Patient knowledge level summary (N=40)

Patient knowledge	Yes	No
Do you understand the disease process	37 (92.5%)	3 (7.5%)
Has the doctor been informed about the surgery and its complications	21 (52.5%)	19 (47.5%)
Has the doctor informed about the scar, open or laparoscopic options	10 (25%)	30 (75%)
Have you taken anyone help before signing	28 (70%)	12 (30%)
Do you know alternative treatments	1 (2.5%)	39 (97.5%)
Do you know who is operating on you	18 (45%)	22 (55%)
Would you like to go to higher centers	14 (35%)	26 (65%)
Do you know about recurrences	5 (12.5%)	35 (87.5%)

Table 2. Summary of questioner responses from surgeon side (N=60)

Surgeon responses	Yes	No
Do you think you have explained fully	23(38.33%)	37 (61.67%)
Patient understood disease process well	19 (31.66%)	41 (68.34%)
Is the patient convinced	47 (78.33%)	13 (21.67%)
Who usually gives consent		
Patient	44 (73.33%)	NA
Spouse	16 (26.66%)	NA
Does the patient acknowledge complications when they occurred	15 (25%)	45 (75%)
Does the patient know if you are operating for the first time	0 (0%)	60 (100%)
Does the patient know who is operating	5 (8.33%)	55 (91.66%)
Is the information given enough	13 (21.67%)	47 (78.33%)
A common way of obtaining consent for minor procedures/ local anesthesia		
Verbal consent	41 (68.33%)	NA
Written consent	19 (31.66%)	NA
A common way of obtaining consent for short GA procedures		
Verbal consent	44 (73.33%)	NA
Formal consent form	16 (26.66%)	NA

Discussion

Optimal outcomes in non-surgical or surgical procedures are achieved by appropriate patient counselling. Complete knowledge and course of any disease is a must before counselling a patient. The art of counselling aids in setting reasonable expectations, reviewing anticipated risks, optimizing post-operative compliance to reduce complications, and providing ongoing support for the patient's condition. Counselling is also a key factor in the process of mutual decision-making.

Consent is an essential part of counselling. The elements of valid informed consent can be summarized as follows:

Explanation and purpose of each standard procedure and those procedures that are experimental should be identified as such.

- Describing any attendant discomfort and risk that can be expected.
- Describing benefits that can reasonably be expected.
- Informing about any appropriate alternative procedures that can be advantageous to the patient.
- There should be a provision regarding his/her consent withdrawal or to discontinue treatment or participation in the project or activity at any time without prejudice to the subject.

Of all the components in IC form, explaining the course of the disease is very delicate and complex because the medical professional would like to treat a disease before it is complicated and becomes untreatable and identifying exactly who develops a particular complication and requires urgent treatment is unpredictable. Hence while explaining the course of disease doctors can advise about a particularly serious or lethal consequence of disease and suggest a form of treatment to prevent or avoid it. It takes a lot of imagination for the patient to get to the point.

Residents in medical hospitals/colleges are overburdened with their work such as case presentations, dissertations, etc. and patients are more anxious about their disease, billing, arranging donors, several referrals to other departments which they feel are of high priority, because of which both residents, as well as patients, do not consider or give time to consent and counselling.

All the doctors 60 (100%) working in the surgical units completed and returned the questionnaires in the present study. Ibingira CB OJ et al found a 52% response which was less than the current study [12]. Henley L et al found a response rate of 63% what similar to the present study [13]. With this, it can be highlighted that junior residents at a university teaching hospital in India are compliant in responding to surveys.

Having complete knowledge of the disease and anticipation of operative surprises are the hallmarks of an experienced surgeon, who can also know what points to highlight during counselling hours. It is a good practice to accompany and observe during those sessions. This knowledge comes after following many patients over several years and by continuous updating of current changes in treatment protocols.

In this study, 38.33% of the junior residents were convinced that they had explained everything to the patient and 68.83% of the residents felt that the patients understood the explanation. This shows that there is a lack of confidence in the resident juniors in the art of counselling. Previous studies found that patients' satisfaction can be improved by making them recognise and understand their ailment and the available treatment options which can help to increase their compliance [14] [15]. This will improve the patient's psychology, mental health, tolerance power, and quality of life [16].

This study noticed that 1(2.5%) of patients said that the resident gave them the option of alternate treatments This shows that the resident doctors need to observe their seniors while conversing with patients, before taking the task themselves and 30(75%) of patients denied that residents mentioned about a particular complication. Explaining too much information within a short period as well as informing about the post-operative complications is another tough task, which the surgeon does not expect and relatives are unprepared for, unless this future problem is discussed with them before proceeding with surgery. In the emergency setting the complications can be expected due to the situation but in elective and day-care procedures it requires a lot of stability and seriousness in choosing the words for sending the information across. Any issue that is not explained before is taken as a fault of the doctor, leading to many legal and ethical controversies.

Recently the medical system has witnessed increased incidences of conflicts between doctors and patients or their attendants. The number of lawsuits against doctors and mass level agitations by doctors has increased drastically and the major reason is poor communication between doctors and patients [17]. Such incidences can be decreased if doctors endure in listening to the patients or their families and also by providing a detailed explanation about the procedure to patients [18].

In this study, we found that 16(26.66%) of the surrogate decision-makers (spouse or family members) signed the informed consent. These surrogate decision-makers

sometimes might get confused by their decision as lawyers do when faced with external pressures [19]. Surrogate decision-makers need to be reminded about the hierarchy from which the decisions should be made [19]. Patients' specific preferences from previous conversations should be reported ideally by the surrogate before making a decision rather than considering their own [19]. If a patient's preferences are unknown, the surrogates should be encouraged to make the decision, imagining themselves as patients. If nothing works the surrogate should make a decision based on medical treatment with the help of a medical team. According to individual patients' needs, some degree of variation is necessary. Through consent, the patient is guided in the right direction by dispelling any unrealistic expectations concerning the procedure. The surgeon' should forge a relationship with the patient by providing good patient education during the informed consent process [21].

Culture should be considered in protecting the autonomy of human subjects, which might influence the IC process. Culture is multidimensional and includes values, beliefs, and practices of national, ethnic, religious, regional, and generational aspects that influence the complexity of IC. [22] Cultural competence needs to be developed by doctors or researchers in increasing their interpersonal skills and in their understanding and appreciation of cultural differences, which would foster in establishing and implementing informed consent procedures with cultural values. [23]

A deeper understanding of the gap between effective doctor and patient communication has come up as a major issue through this study which will help in providing vital content in training junior doctors [20]. Patients expect respect and empathy from doctors. Doctors should always be well dressed with good etiquette and be aware of their own emotions as well as the patient's emotions. Further research in this area is recommended to support the findings of the present study.

Conclusion

Patient satisfaction and overall outcomes can be improved by incorporating patient counselling and intensified patient selection. Teaching hospitals in India are still lacking the process of mandatory written informed consent and patient documentation during surgeries. Health care professionals should keep themselves updated with different aspects of informed consent, and its importance and they should also be educated on techniques of patient counselling.

To ease the informed consent process, an informed consent template with appropriate information and room for modification needs to be developed.

Limitations and recommendations:

This study has nominal data of one centre only. It has observation bias and Selection bias.

Even if it was done blindly and unaware of the study being conducted the results will have poor external validity. The results of the study are locally applicable and can be recommended as a Quality Improvement measure in hospitals. Due to the ongoing pandemic situation, authors were not able to cover multiple centres and hence recommend further multi-centric studies with larger sample size and including different patient categories - children, adults, educated, uneducated, emergency patients, dying, elective surgery, readily willing and self-ordained for surgery vis-a-vis reluctant and fearful to surgery.

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.

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SCIENTIFIC ARTICLE

Blood use in elective surgical procedures in a "type A" base hospital

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Keywords: MSBOS; blood orders; crossmatch to transfusion ratio; blood use; surgical patients

Abstract

Introduction

Blood orders for surgical patients make up a considerable portion of total blood requests but the majority doesn't lead to a transfusion. Routine crossmatching and reserving blood for all surgeries can be reduced by establishing a *Maximum Surgical Blood Ordering Schedul*e [MSBOS]. We have analyzed blood utilization in Base Hospital Puttalam and formulated an MSBOS with this study.

Material and methods

A total of 2145 surgeries from surgical and gynaecology & obstetric units during the period January to December 2019 were analysed. Patients who underwent massive transfusions and patients having a pre-operative haemoglobin concentration less than 8.3g/dl or obtained a pre-operative transfusion were excluded considering transfusions to correct preoperative anaemia. The crossmatch to transfusion ratio [C: T], transfusion probability [T%] and transfusion index [TI] was calculated for each surgical procedure. The procedures having a C: T of >3:1 was recommended for group and screen [G&S].

Results

Of a total of 2145 patients, 90% were females. A total of 1565 units were requested and 1521 units were crossmatched for 2034 patients while only 193 were transfused. Overall indices for the study population are CT ratio of 7.8:1, %T of 10.4% and TI of 0.15. Indices for surgical unit patients are CT ratio of 5:1, %T of 15.2% and TI of 0.29. By using the MSBOS total of 1403 cross matches could have been avoided.

Conclusions

By implementing the MSBOS 92% of cross matches for elective surgeries could have been avoided. The results are on par with the previous studies done at tertiary health care centres.

Introduction

Requesting blood for elective surgeries anticipating an event of unexpected haemorrhage is a common practice. Although newer advances in surgical hemostasis have reduced intraoperative bleeding and thus reduced the need for perioperative blood transfusions, over reservation of blood and blood products for surgical patients is observed in many institutes and most often readily justified as for a safety margin [1]. Over requesting with minimal utilization results in waste of reagents, human resource and increase the time blood packs spend in reserved status thus potentially increasing discard rates [2].

Blood requests for a surgical procedure result in checking the blood group of the patients then performing a routine crossmatch to find out whether the blood pack is compatible for transfusion. This takes up to 2 hours to perform which increases the time blood units spend outside stored temperature. Once the blood product is crossmatched the pack is reserved for that patient for 72 hours thus making it unavailable for other patients [3].

Maximum surgical blood ordering schedule [MSBOS] is a guideline initiated by Friedman in 1973 which increases the efficiency of blood usage [4]. It is prepared by analyzing the blood usage in respect of each surgical procedure. Using the MSBOS a prediction could be made if a transfusion is needed for a specific surgery. It provides recommendations on whether a routine crossmatch is necessary or whether blood grouping and antibody screening are sufficient for each procedure.

Currently, all the blood requests are crossmatched at Base Hospital Puttalam and preliminary observation suggests over-ordering of blood products. Previous studies done in National Hospital Colombo Sri Lanka, Lady Ridgeway Hospital for Children, Sri Jayawardanapura General Hospital and De Soysa Hospital for Women all suggest similar findings [5] [6] [7] [8]. There are no published studies done in base hospitals in Sri Lanka to the authors' knowledge. This study aims to analyze blood usage to prepare an MSBOS to be implemented through Hospital Transfusion Committee.

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Material and methods

A list of all elective surgeries done at Base Hospital Puttalam during the period January to December 2019 were formulated through theatre registers in retrospect. A total of 2145 surgical patients from surgical and gyn & obs units were included in the study. The blood requests received for these patients were traced from the blood bank and bed head tickets were traced from the medical records unit. Patients who underwent preoperative blood transfusion or had pre-op haemoglobin concentrations of <8.3g/dl and patients who underwent massive transfusion were excluded [3] [9]. Massive transfusion is defined as the replacement of one or more blood volumes within 24 hours [>10 units of red cell units for an adult] [10]. Data on patient demography, type of surgery, number of red cell units requested, crossmatched and transfused were noted on the data extraction form.

The following standard indices were calculated and tabulated in respect to surgical procedure studied.

$$\text{Crossmatch to transfusion ratio (CT ratio)} = \frac{\text{number of units cross matched}}{\text{number of units transfused}}$$

$$\text{Transfusion probability (\%T)} = \frac{\text{number of patients transfused}}{\text{number of patients crossmatched}} \times 100$$

$$\text{Transfusion Index (TI)} = \frac{\text{number of units transfused}}{\text{number of patients cross matched}}$$

Results

From a total of 2145 patients with their age ranging from 2-88 years, 90% were females. Patients having a pre-op blood transfusion, haemoglobin concentration of <8.3g/dl or patients who had massive transfusion were excluded [n=111]. All the requests for blood resulted in a routine crossmatch. A total of 1565 units were requested and 1521 units were crossmatched for 2034 patients [1567 patients from gyn & obs unit and 467 patients from the surgical unit] while only 193 were transfused.

This study reveals the CT ratio of 8.7:1, %T of 9.7% and TI of 0.13 for elective gyn & obs and CT ratio of 5:1, %T of 15.2% and TI of 0.29 for surgical patients. Overall indices for the study population are CT ratio of 7.8:1, %T of 10.4% and TI of 0.15

Table 1 (supplementary) summarizes the MSBOS formulated with calculated standard indices

Discussion

Access to safe, affordable surgery depends on a sufficient and safe blood supply. Blood is a scarce product vulnerable to limited shelf life. Through over reservation of blood, efficient use of already collected blood is hampered. In this setting, it is prudent to implement evidence-based guidelines tailored for local settings through multisectoral collaboration. Thereby reducing the wastage of precious resources which could be otherwise spent on a patient with a real need.

Previous studies suggest MSBOS designed specifically for an institute reduces unnecessary crossmatching which is time-consuming and expensive [11]. In creating an MSBOS the standard indices of crossmatch to transfusion ratio [C/T ratio], transfusion probability [%T] and transfusion index [TI] is calculated by analyzing transfusion data with respect for each surgery. If the surgical procedure has a C/T ratio ≥3 and TI ≤ 0.5 and T% of ≤ 30 group and screen method is recommended instead of crossmatching due to less probability a subsequent blood transfusion [3] [12].

The standard indices in both gynaecological and obstetrics patients and surgical patients who underwent elective surgeries both fall way outside of justifiable values for routine crossmatching.

Furthermore, data suggest gynaecological procedures like laparoscopic dye test, cervical biopsy, cervical polypectomy and medical management of miscarriage did not lead to a transfusion at all. Procedures like elective cesarean section, total abdominal hysterectomy, vaginal hysterectomy, myomectomy and repair of cystocele can be managed with blood grouping, screening for antibodies and saving serum for a future transfusion. Dilatation and curettage, evacuation of retained products of conception warrants group and screen and crossmatch of a unit of blood.

Considering surgical procedures like thyroidectomy, axillary fat pad excision, laparoscopic cholecystectomy, fistulectomy, lateral internal sphincterotomy, colostomy, jejunostomy, circumcision, hydrocelectomy, orchidectomy, orchidopexy and pyelolithotomy did not necessitate a transfusion. Procedures including inguinal hernial repair, appendicectomy, mastectomy, wide local excision of breast lump, saphenofemoral ligation and nephrectomy can be managed with group and screen. Procedures including esophagectomy, below and above-knee amputation, abdominoperineal resection, hemorrhoidectomy and laparotomy warrant crossmatching of the recommended amount of blood.

This study concludes with designing an institute specific MSBOS with 2019 data to be implemented through the hospital transfusion committee. The schedule requires regular evaluation and updates. With the implementation of MSBOS around 92% [n=1403] of cross matches done for routine surgeries can be reduced and thereby save time, costly reagents and potentially improve the shelf life of bloodstock.

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.

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SCIENTIFIC ARTICLE

Trap gun : an unusual firearm injury pattern and injury severity score

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Keywords: Trap gun injury; injury severity score; firearm injury; trap gun; injury pattern

Abstract

Trap gun injury causes a substantial socio-economic and health burden to Sri Lanka. The key objectives of the study are to identify the Trap gun injury pattern, injury severity score, common geographical locations, and to identify the health burden.

This is a retrospective descriptive cross-sectional study conducted at surgical units of Teaching Hospital Anuradhapura [THA]. Patients presented with trap gun injury as surgical casualty admissions were selected for the study.

Injury severity score [ISS] is used as an indicator for anatomical injury severity. A total of 53 persons who suffered from trap gun injury in the north-central province of Sri Lanka in the year 2020 were studied. Our analysis shows that more than 64.1% of those have serious or severe injuries [ISS > 3], while injury to the lower limb accounts for 88.7%.

Triangular distribution of geographical area within the north-central province of Sri Lanka is identified as the most vulnerable region. The cost of care of these patients results in a significant health burden to the free health system.

Introduction

A trap gun is an illegally manufactured unusual firearm that causes significant insecurity among the resident of rural areas in Sri Lanka. It has a long-barreled, smoothbore muzzle [figure 1] which fires low-velocity projectiles [1]. It has a basic trip system as a trigger mechanism and is triggered by the movement of an animal or human, which fires the gun [2].

Though it's uncommon in many parts of Sri Lanka, we are observing an unusual number of victims admitted to Surgical units of THA from the North Central province, particularly from rural areas.

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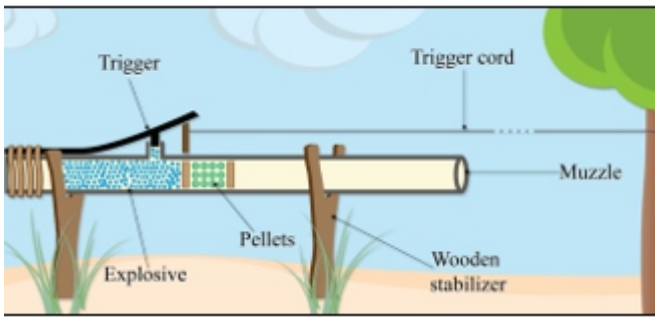

Figure 1. Illustration of a trap gun

The first case of trap gun injury in the medical literature of Sri Lanka dates back to 1888 [3]. There are instances, where approximately 200 admissions were reported annually to Teaching Hospital, Anuradhapura following trap gun injuries [4].

The purpose of this study is to identify the injury pattern, injury severity score, common geographical locations, and correlate its health burden.

Methodology

This is a retrospective descriptive cross-sectional study conducted in surgical units of THA. Patients presented with trap gun injury as surgical casualty admissions were selected for the study.

Our study population consisted of 53 patients. Bed Head Tickets [BHT's] of the patients from 2020 January to 2020 December were traced. The data were collected from the relevant BHT's by medical officers using a pre-tested checklist.

Patient demographics, time of occurrence and admission, body region involved, type of anatomical structure involved, injury description, number of surgeries done, days of hospital stay, amounts of blood, and blood component transfusions were included as study variables.

We used the Injury severity score as a simplified indicator for anatomical injury severity. We defined injury severity score as minor injuries [ISS-1], moderate injuries [ISS-2], serious injuries [ISS-3], severe injuries [ISS-4], and unsurvivable injuries [ISS-5] [Table 1].

Table 1. Injury Severity Score

Injury Severity Score [ISS] – Anatomical injury severity in trap gun injuries	
Minor injuries	ISS-1
Moderate injuries	ISS-2
Serious injuries	ISS-3
Severe injuries	ISS-4
Unsurvivable injuries	ISS-5

All the BHT's were traced from the medical record department. The data analysis was done using SPSS v.23.

Results

Figure 3. Age distribution of study populationThe ages of the victims ranged from 20 to 70 years. The mean age is 41.2. The majority of the victims are between the ages of 41 to 50 years [26.4%] [Figure 3]. 51 [96.2%] were males [Figure 2]. Firings had occurred round the clock, but a peak during dusk [6 pm to 6 pm] is observed [54.7%].

In this study, we used the Injury Severity Score as the indicator for anatomical injury severity. According to the injury severity score, 22 [41.5%] of the victims suffered a score of 3, which is severe injury. 12 [22.6%] of the victims suffered very severe injuries [ISS-4]. 17 [32.1%] had suffered moderate injuries [ISS-2] and only a small percentage [3.8%] had suffered minor injuries [ISS-1] [Table 1]. The most common body region affected is lower limbs in 47 [88.7%]. Among those cases, 39 [73.6%] were injuries below the knees.

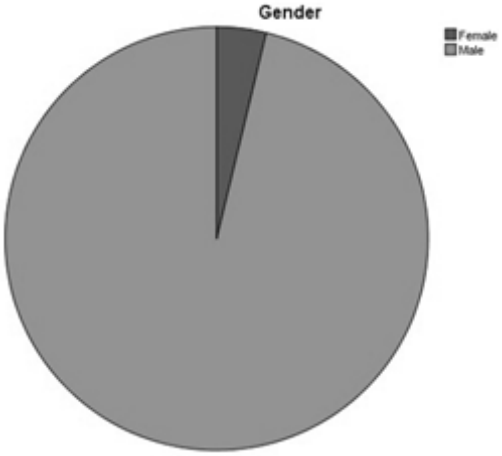

Figure 2. Gender distribution of study population

Other anatomical regions that were involved were the upper limb [5.7%] and the abdomen [3.8%], however, in most of those cases [60%] the lower limbs were also involved simultaneously. Twelve [22.7%] of the victims had suffered vascular injuries. 3 [5.7%] of them suffered from nerve injuries and [62.3%] from open fractures. Fortunately, no

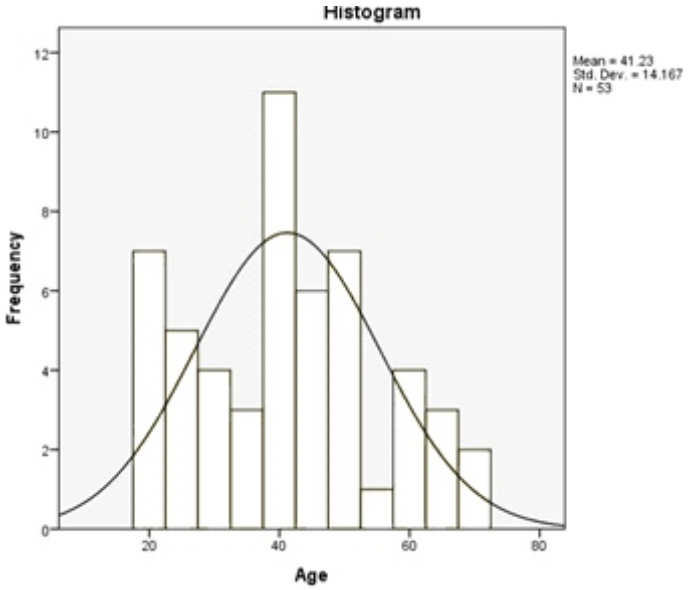

Figure 3. Age distribution of study population

Table 1. Injury severity score

Injury Severity Score				
	Frequency	Percent	Valid Percent	Cumulative Percent
minor	2	3.8	3.8	3.8
moderate	17	32.1	32.1	35.8
severe [not life-threatening]	22	41.5	41.5	77.4
severe [life-threatening, survival probable]	12	22.6	22.6	100.0
Total	53	100.0	100.0	

death or amputations were reported within the particular year.

The number of surgeries done in each of the cases varies from 1 to 10 in our study. 42 [43.1%] of them had undergone only 1 surgery, commonly under spinal anaesthesia. The median number of surgeries is 2. Out of the cases, 4 [7.9%] of them had undergone more than 5 surgeries. Seventeen [32.1%] of the victims had undergone resuscitation with blood products. Days of hospital stays range from 1 to 97. Mean hospital stay 7 days.

Forty six [86.8%] of the victims were admitted to peripheral hospitals initially. Most numbers of victims were transferred from DH Huruluwewa and BH Medawachchiy. A triangular geographical area of distribution is noted in the analysis [Figure 2].

Discussion

The reduction in the incidence of trap gun injuries might reflect the prevailing COVID-19. Where in this particular year people mobilization was restricted with several months of lockdown by law enforcement.

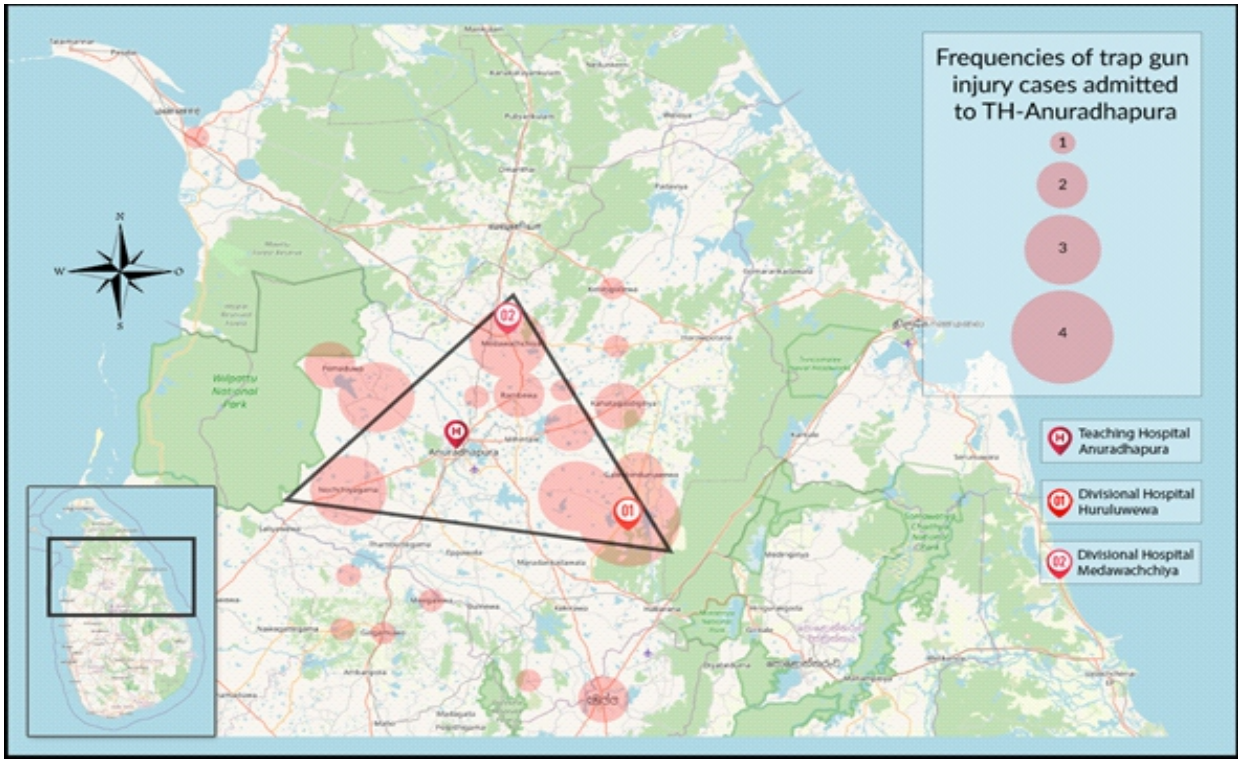

Figure 4. A triangular geographical area of distribution of trap gun injuries noted in North-Central Province, Sri Lanka.

Young males who are capable of active occupation are mostly [96.2%] at risk. Similar data has been reported in other local studies [5]. Thus, the trap gun injuries are likely to have a major economic impact on their families.

Most of the patients suffered moderate to severe injuries. Such injuries are likely to result in permanent disability. Therefore result in an enormous health burden, which includes costs involved in-hospital stay, operative treatment, drugs, and rehabilitation. This creates a huge socio-economic burden on the universal healthcare policy of Sri Lanka.

Though exact injury geographical location is not available in the BHT's, we considered the local hospitals from which they were transferred, as the vulnerable geographical area. We've noticed a triangular geographical area of distribution as the most vulnerable region. [Figure 4] It is a loosely defined region in the North Central Province, giving its vertices as Medawachchiya, Huruluwewa, and Nochchiyagama.

Preventive measures such as educating the local population, especially farmers on avoiding these hotspots need emphasis.

The possession and usage of firearms are illegal according to the Firearm Ordinance of Sri Lanka [6]. Therefore, the victims are also addressed by law enforcement on legal aspects. Trap gun is one of the worst survival threats faced by the rural agricultural community of Sri Lanka. Not only in the north-central province, but it exists in several other regions in the country[7].

It is vital to put a collaborative effort on this health hazard to safeguard wildlife as well as human beings who live in the vicinity of forests.

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.

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SCIENTIFIC ARTICLE

Knowledge, attitudes and practices regarding patient safety among surgical trainees in Sri Lanka

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Keywords: Patient safety; surgical trainees; knowledge; attitudes; practices; Sri Lanka

Abstract

Introduction

Surgical trainees play an integral role in the perioperative workup and safety of patients undergoing surgery. This study was aimed to assess surgical trainees' knowledge, attitudes and practices on perioperative surgical patient safety.

Methods

A descriptive cross-sectional study among 105 surgical trainees (males 96%, mean age 33 years, range 30-40 years) was performed using self-administered validated questionnaires on knowledge, attitudes (Safety Attitude Questionnaire-SAQ) and practices (Questionnaire on evidence-based safety practices and reporting of medical errors). Responses were marked on a 5-point Likert scale and were analysed.

Results

Approximately two thirds (n=72, 69%) were junior registrars and the rest (n=33, 31%) were senior registrars. The median knowledge score was 60 (range 10-90). The Median SAQ score was 74 (151/205, range 57-95). Approximately 65% (n=68) claimed they were aware of the protocols of marking the surgical site. Nearly three quarters (n=78, 74%) have read the WHO safe surgery guidelines. Eighty-seven participants (84%) had not attended a formal risk management course/ teaching activity. Only 53% (n=56) believed that medical errors were handled appropriately and less than a third (31%, n=33) believed that the work environment was favourable to discuss errors. Only 54% (n=57) had received appropriate feedback about their performances.

Conclusion

Overall, the patient safety culture among surgical trainees was found to be suboptimal. Formal teaching sessions, workshops and local guidelines may help improve knowledge and attitudes on patient safety among surgical trainees. Furthermore, working conditions need to be improved to encourage discussion of medical errors and allow frequent feedback.

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Introduction

Patient safety is a well-established essential concept in modern medicine and is defined as the prevention or reduction of adverse outcomes due to health care [1]. It plays an integral role in maintaining the quality of patient care and helps minimize unfavourable outcomes affecting both patient and healthcare personnel [1]. Patients may face unpleasant experiences such as pain, disability, psychological trauma, and even death due to failures in patient safety which are mostly preventable [1]. Repeated hospital admissions and deaths were among the common consequences of errors reported in many countries which also contributes to increased healthcare costs [2]. Adverse events have been reported in approximately 10% of in-ward patients and nearly two-thirds of such events were related to the actions of a surgical care provider [3]. Furthermore, around 50% of such adverse events in the surgical practice are largely preventable [4]. The morbidity due to unsafe patient care is a major contributor to healthcare expenditure which has an even greater impact on resources limited in developing countries [5]. To mitigate this, the World Health Organization (WHO) implemented the "Safe Surgery Saves Lives campaign" intending to implement best practices and safe surgery principles to enhance patient safety by minimizing preventable adverse events both inward and in operating theatre [6].

Sri Lanka is a lower-middle-income South Asian country with limited facilities, resources and technology. Compared to the West, the concepts of patient safety and reporting of medical errors have been less established in Sri Lanka [7]. Knowledge and attitudes towards patient safety among future surgeons are key aspects in improving patient safety practices in the surgical field in Sri Lanka. Furthermore, it is recommended that the exposure to patient safety should be from the beginning of surgical training and be continued throughout which would ensure the continuation of these practices beyond the period of training [8]. Assessing knowledge, attitudes and practices on patient safety among postgraduate surgical trainees is, therefore, an important area that also

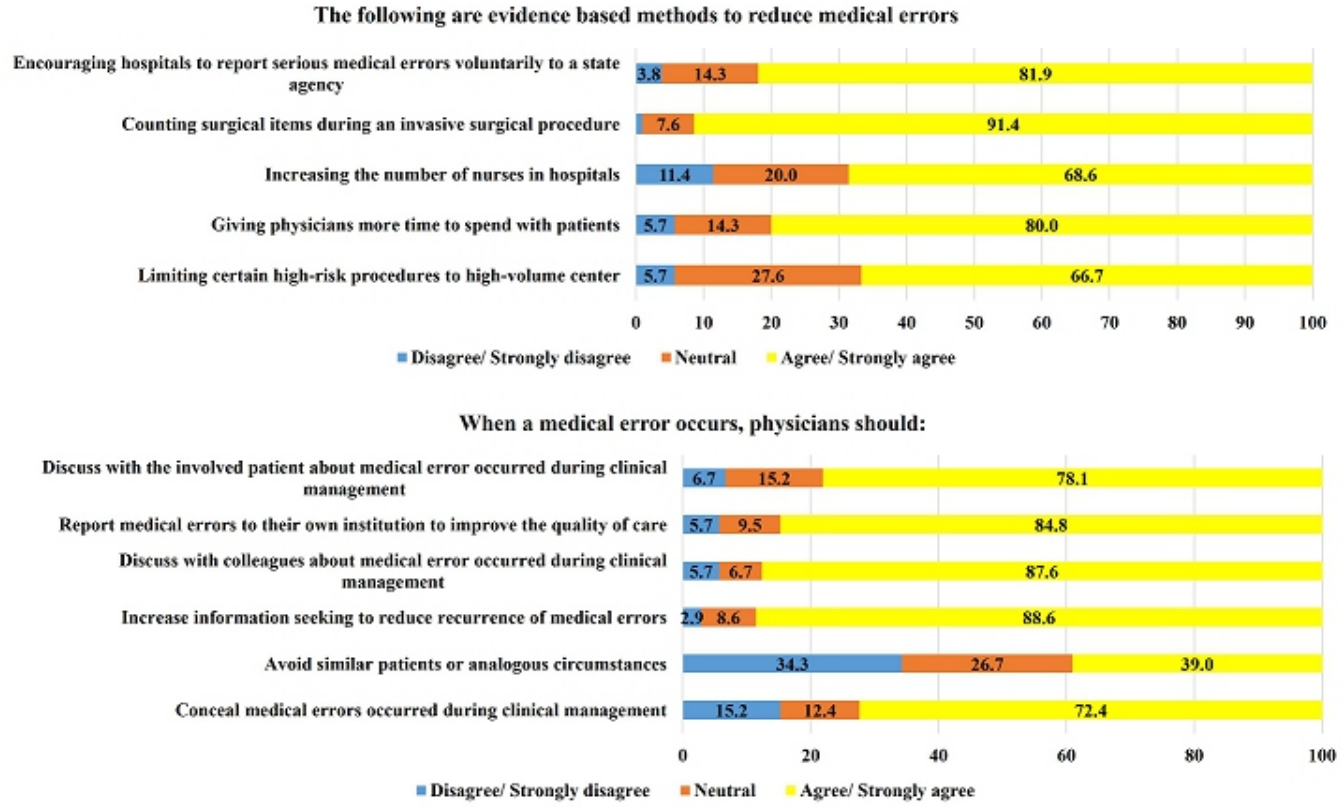

Figure 1. The perception of surgical trainees regarding evidence-based methods for reducing medical errors and the actions that should be taken following the recognition of a medical error.

would help recognize areas where further improvements are needed. This study was conducted to assess knowledge, attitudes and practices towards patient safety among postgraduate surgical trainees in Sri Lanka.

Methods

A descriptive cross-sectional study was carried out among active surgical postgraduate trainees in Sri Lanka including all registrars (residents) and senior registrars (senior residents) in all surgical specialities who have completed a minimum of 6 months of surgical training (include the period). Trainees who have completed their training period, or are currently employed overseas were excluded from the study. Ethical clearance for the study was obtained from the Ethical Review Committee of the National Hospital of Sri Lanka.

A self-administered online questionnaire in English was emailed to the trainees. The questionnaire consisted of demographic characteristics and details related to the training and clinical exposure. The knowledge was assessed using questions based on the WHO patient safety manual [9]. Validated tools including the Time Out Survey questionnaire [10] and Operating Room Version of Safety Attitude Questionnaire (SAQ) [11] were used to collect data on attitudes and practices. The Time Out Survey questionnaire consists of 14 items regarding the perceptions of practices on patient safety measures in the operating theatre. A 4-point Likert scale was used which consisted of subjective responses including rarely, occasionally, often and very often. The team's experience related to mistakes or near misses were assessed together with the usual strategies which included correct verification and safety measures. Safety Attitudes Questionnaire (SAQ) is a validated tool used to investigate the attitudes of patient safety about six dimensions such as Working Condition (WC), Job Satisfaction (JS), Safety Climate (SC), Teamwork Climate (TC), Stress Recognition (SR) and Perception of Management (PM) with acceptable validity and reliability [11]. The results were expressed as frequencies and percentages.

Results

Out of approximately 250 eligible surgical trainees, a total of 105 who responded to the questionnaire were included in the study. The vast majority were males (96%, n=101). The mean age was 33 years (range: 30-40). Approximately two thirds (n=72, 69%) were registrars (residents) and the rest (n=33, 31%) were senior registrars (senior residents). The majority (67%, n=70) of the trainees were training in general surgery followed by 16% (n=17) in orthopaedic surgery. Only 15% (n=16) have attended some form of patient risk management course.

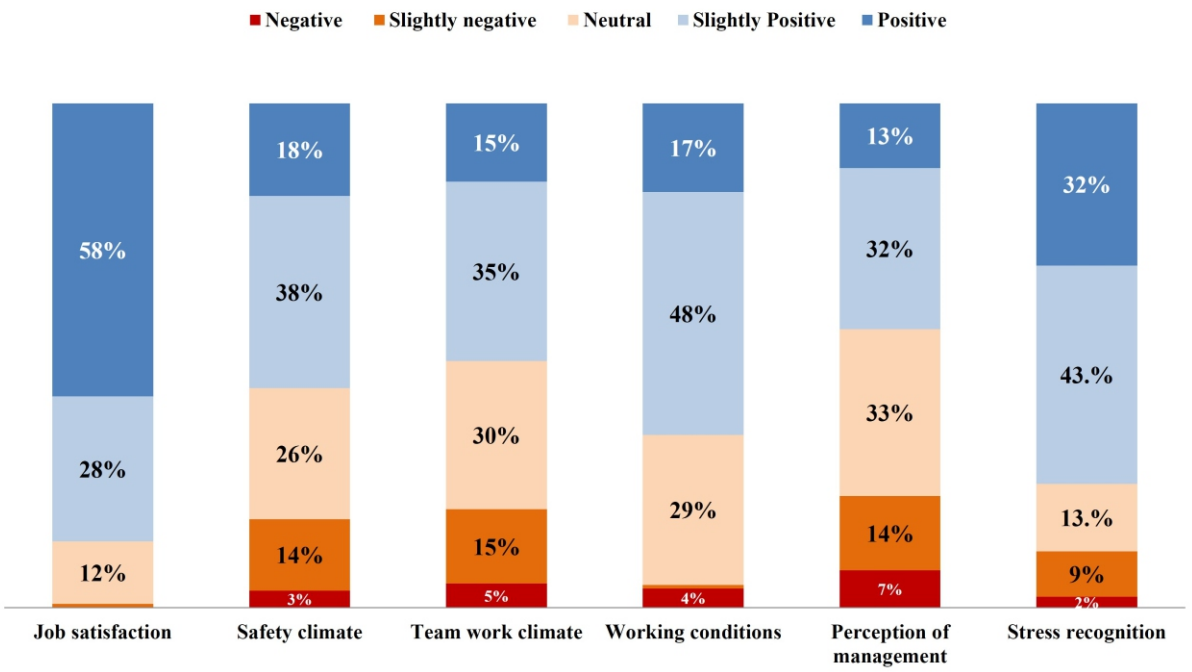

Figure 2. Trainees' response regarding the safety attitude questionnaire (SAQ)

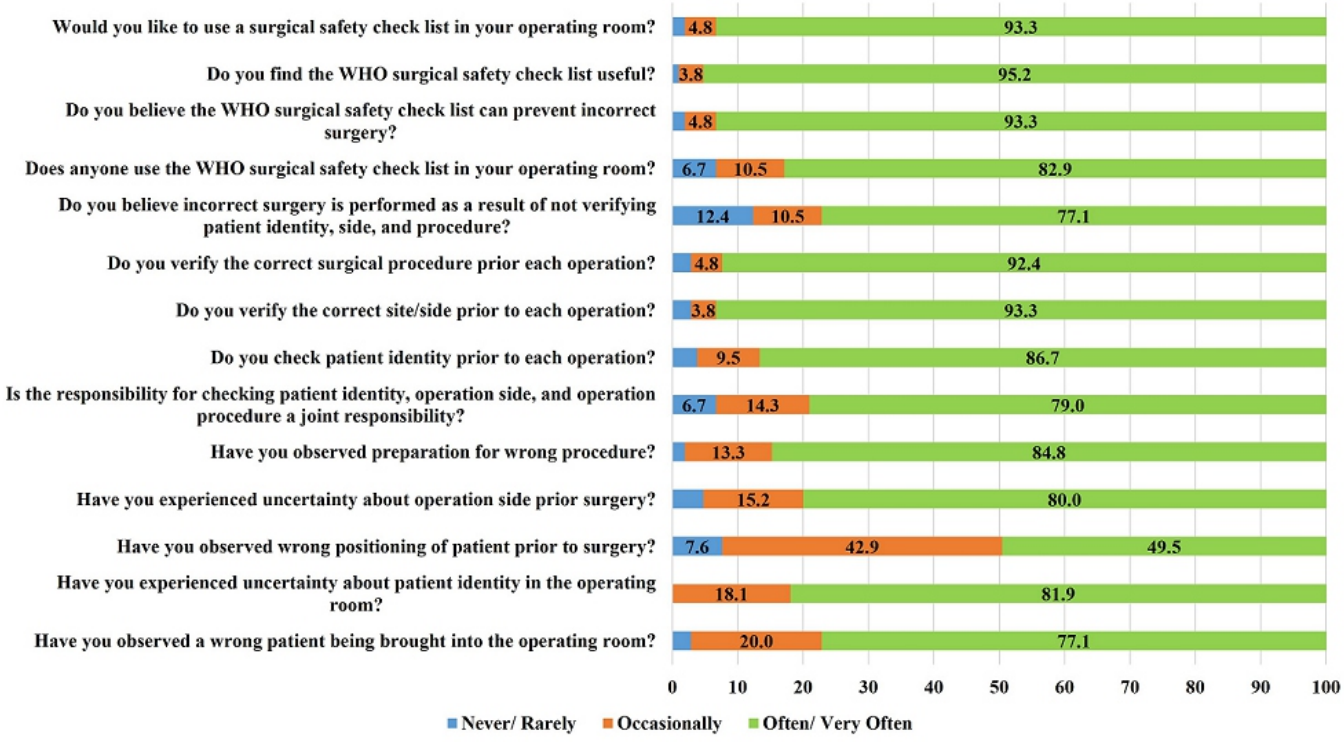

Figure 3. The summary of the responses received in the Time Out Survey questionnaire

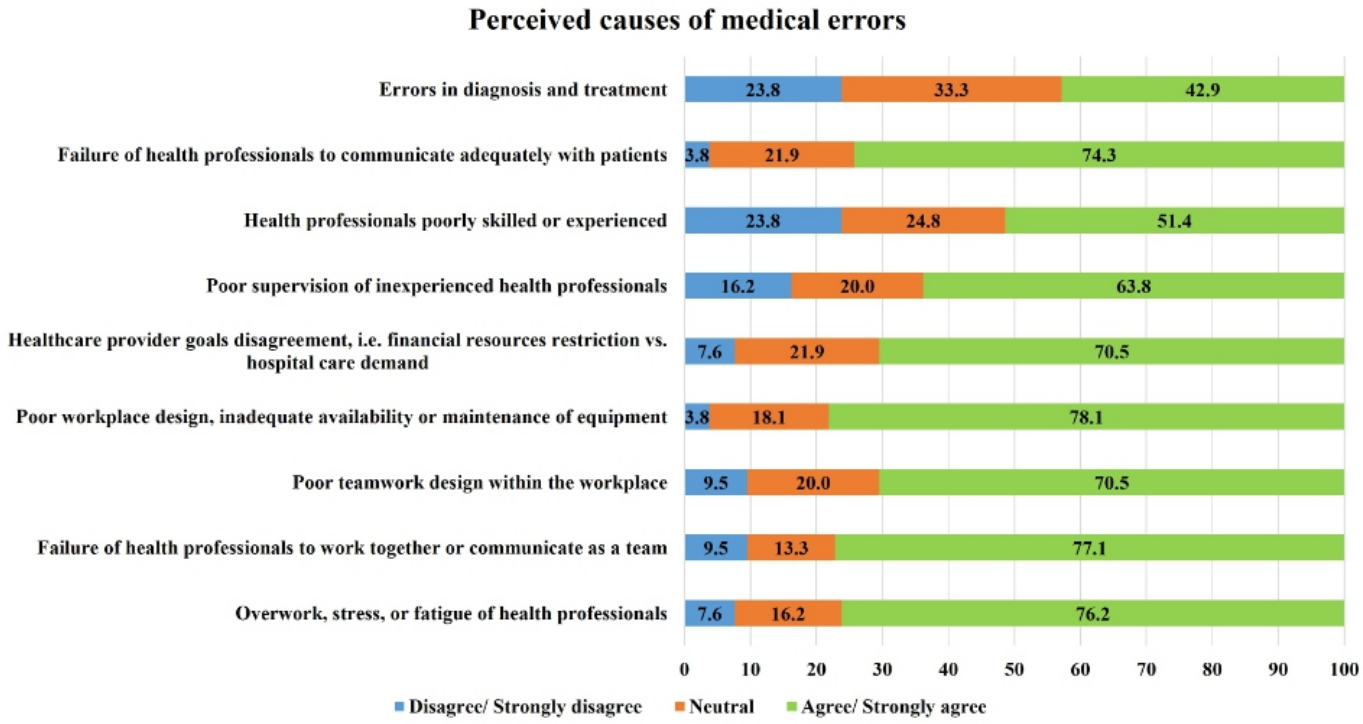

Figure 4. Perceived causes of medical errors

The median knowledge score was 60% (range: 10-90). Although 96% (n=101) claimed to have heard about WHO safe surgery guidelines, only 72% (n=78) have read it and only 50% (n=52) were aware of the 10 essential objectives in the WHOs safe surgery guidelines. Approximately two thirds (65%, n=68) claimed to know the protocols of marking the surgical site and 44% (n=46) about the timing of administering prophylactics antibiotics. Approximately 40% (n=43) knew about the ASEPSIS score in surgical site infection while 59% (n=62) were aware of the methodical wound exploration in preventing count discrepancies. Approximately 61% (n=64) claimed to know about the protocols for minimizing adverse drug reactions. Figure 1 summarises the perception of trainees regarding evidence-based methods for reducing medical errors and the actions that should be taken following the recognition of a medical error.

Median SAQ score was 74% (151/205) (range 57%-95%). Only 53% (n=56) believed that medical errors were handled appropriately in their clinical area and less than a third (31%, n=33) believed that the work environment was favourable to discuss these errors. Only 54% (n=57) had received appropriate feedback about their performances. Most of the participants responded favourably to job satisfaction (87%) and stress recognition (77%) components of SAQ. However, the favourable responses on safety climate (46%), teamwork climate (50%) and perception of management (45%) were suboptimal (Figure 2).

The summary of the responses received in the Time Out Survey questionnaire is shown in Figure 3. The response received regarding the use of the WHO checklist was generally favourable. However, only 52% stated that the WHO checklist was performed very often during their training. Furthermore, preparation for the wrong procedure, the experience of uncertainty about the operating site before surgery and wrong positioning before surgery were observed very often among 47%, 27% and 5% respectively. Around 30% claimed that they observed a wrong patient being brought into the theatre very often. Regarding perceived causes of medical errors, most of the participants believed that poor workplace design/ maintenance (78%), poor communication among professionals/ lack of teamwork (77%), overwork, stress and fatigue (76%), poor communication with patients (74%) were the major contributors (Figure 4).

Discussion

This study has shown considerable lapses in knowledge and practices on patient safety among the current Sri Lankan surgical trainees. Although the attitudes regarding the usefulness of the WHO safety checklist were favourable, the implementation of the checklist was suboptimal. The perceptions of safety practices among the surgical trainees were also suboptimal. The large volume of clinical contacts and procedures performed throughout the surgical training period allows ample opportunities to enhance patient safety. Failing to address these issues related to patient safety in the

early parts of surgical training is a missed opportunity.

Several studies from many countries have analysed perceptions and practices on patient safety among surgical trainees. An analysis of 612 surgical trainees in the United Kingdom revealed that around 36% had witnessed or were involved in an adverse patient safety event. Furthermore, around 83% had seen a 'near-miss' incident. However, only around 13% had reported an adverse patient safety incidence at some point during their training [12]. This shows that adverse patient events are still very common even in developed countries despite all efforts and policies implemented to safeguard and prioritize patient safety [9, 12]. These adverse incidents include 'near misses' and 'never events, which have been observed to be more common among interventional specialities such as surgery, radiology and cardiology. The increase in such incidents may indicate an improvement in reporting rather than a true increase. A cross-sectional study from Norway including surgeons, nurses and anaesthetists evaluated the patient safety culture in the theatre setting [10]. Before a surgical procedure, the uncertainty of patient identity and the surgical site was experienced by 38% and 81% of participants respectively. Further, around 60% had prepared for the wrong surgery. Around 90% supported a time out protocol before the operation. As these studies have indicated, gaps in patient safety procedures are a universal issue that requires recognition and interventions to minimize adverse patient outcomes.

The data on patient safety issues in Sri Lanka is very limited. A descriptive study from Sri Lanka has reported on the attitudes and utility of the WHO surgical safety checklist among a group of doctors and nurses who worked in surgical theatres (Ref). Only 79% of doctors were aware of the checklist and the utility was found to be suboptimal. Approximately 50% believed that maintaining a checklist was cumbersome during the busy surgical practice. Only 9% were trained in using the checklist [7]. This study has shown major lapses in the patient safety-related culture in the Sri Lankan setting.

In our study, only 53% believed that medical errors were handled appropriately in their clinical area and only 31% believed that the work environment was favourable to discuss medical errors. Furthermore, only 54% felt that they received appropriate feedback about their performances. This suggests that the practice related to the identification and reporting of medical errors needs improvement. The work environment should be modified to welcome discussions and feedback regarding medical errors and issues related to patient safety. Furthermore, only a minority of the participants had favourable views regarding the safety climate (46%) and teamwork climate (50%). Poor workplace design/ maintenance, poor communication among professionals, overwork, stress and fatigue and poor communication with patients were identified as major contributors to medical errors.

In Sri Lanka, there is no formal education or workshop regarding patient safety practices, especially targeting the surgical trainees. We propose to introduce the patient safety concept to the surgical postgraduate curriculum preferably before the commencement of training. Formal teaching and training programs should also be implemented for all doctors, nurses and orderlies working in the surgical care setting. Furthermore, conducting similar studies among other specialities, especially the interventional specialities may help gain a better insight into patient safety practices. Regular audits and reporting of adherence to patient safety practices and adverse patient safety incidents should also be implemented at a national level with regular monitoring of the progress.

This was a cross-sectional study among a small convenience sample of surgical trainees from Sri Lanka. Therefore, the study may not be generalizable to all Sri Lankan surgical trainees or surgical practice in general. Furthermore, the majority of the responses received were subjective thus, involves bias. As there is no consensus on acceptable standards or cut-off points on patient safety scores, it is not possible to compare the Sri Lankan scores against a reference point. However, the present standards as shown in this study can be deemed suboptimal as there is considerable room for improvement. This is the first analysis that has been performed among surgical trainees and despite the above limitations, considerable concerns related to patient safety have been identified.

Conclusion

Overall, the patient safety culture among surgical trainees was found to be suboptimal. Formal teaching sessions, workshops and local guidelines may help improve knowledge and attitudes on patient safety among surgical trainees. Furthermore, working conditions need to be improved to encourage discussion of medical errors and allow frequent feedback. Regular audits and reporting of adherence to patient safety practices and adverse patient safety incidents should be implemented at a national level with regular monitoring of the progress. Similar studies among the other interventional specialities are also recognized as a necessity.

Additional Information and Disclosures

Ethics approval and consent to participate: Ethical clearance for the study was obtained from the Ethical Review Committee of the National Hospital of Sri Lanka. Informed written consent was obtained from the participants before recruiting to the study.

Availability of data and material: Not applicable

Competing interests: The authors declare that they have no competing interests.

Funding: None declared

Acknowledgements: None

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.

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SCIENTIFIC ARTICLE

Postpartum urinary incontinence among women attending four postnatal clinics

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Keywords: Urinary incontinence; postpartum; nocturia; urinary frequency; stress incontinence; urge incontinence

Abstract

Introduction

Urinary incontinence is a distressing problem after childbirth, but its incidence and risk factors among Sri Lankan women has not been reported.

Materials and Methods

A descriptive cross-sectional study was carried out among 234 women attending postpartum clinics at two tertiary care units and two Medical Officer of Health (MOH) areas in the Colombo district using a validated interviewer administered ICIQ-FLUTS long format questionnaire. Data was analysed using SPSS software package version 26.0. Significance was taken as $p<0.05$.

Results

The prevalence of postpartum urinary incontinence (PPUI) was 5.6% (13 / 234). Nine of them (69.2%) had mixed incontinence while urge incontinence was seen in three (23.1%) and stress incontinence in one (7.7 %). Patients with chronic respiratory symptoms showed a higher prevalence PPUI ($p=0.028$). However, birth weight of the baby, mode of delivery, episiotomy, maternal age, parity, and obesity did not show an association with higher prevalence of PPUI ($p>0.05$).

Conclusion

The prevalence of PPUI was 5.6%. (95% CI 3.0% - 9.3%). It was more common in mothers who had chronic respiratory diseases. The mode of delivery had no influence on PPUI in our study.

Introduction

Urinary incontinence (UI) is defined as involuntary loss of urine that is a social or hygienic problem and is objectively demonstrable [1]. UI has been found to be twice as prevalent in women [2]. Continence is maintained by proper functioning of the urinary sphincter which has external and internal components, the former being made up of pelvic floor muscles innervated by the pudendal nerve.

Postpartum urinary incontinence (PPUI) has a multifactorial aetiology [3]. Pregnancy associated causes include - maternal age >35 years, UI occurring during pregnancy, multiparity and gestation over 37 weeks. The second group of causes is associated with childbirth. Vaginal deliveries may contribute by damaging the pudendal nerve and pelvic floor muscles [4]. Biomechanical changes occurring during labour can breach fascia and muscles of the pelvic floor [5]. Shifting of bladder and urethra during pregnancy, episiotomy, large babies, difficult deliveries, lengthy pushing phases and instrumentation during delivery have been associated with PPUI [3-6]. Even high body mass index (BMI), chronic respiratory symptoms and constipation are incriminated as associated factors of PPUI [7]. Thus, pregnancy and labour are major causes of urinary incontinence in women [8]. According to published international data prevalence of PPUI at three months after delivery is 33% (95% CI 32–36%) [9].

PPUI may not resolve spontaneously. MacArthur et al. has showed that 76.4% of the women who had PPUI 3 months postpartum remained incontinent 12 years later [10]. Continuing UI results in decreased quality of life during puerperium and later life [6]. However according to a Cochrane review, the impact of PPUI can be reduced by pelvic floor exercises before, during and after pregnancy [11].

Sri Lanka is a South Asian country having good maternal and child health as demonstrated by better than average maternal and infant mortality rates for the region. As there are no prior publications on PPUI in Sri Lanka, the objective of this study was to determine the prevalence and possible associated factors of PPUI at 3 months, among women attending postnatal clinics in primary care and hospital settings.

Methods

A descriptive cross-sectional study was carried out over a period of 3 months at postnatal clinics at two Medical Officer of Health (MOH) areas (at Boralesgamuwa and Maharagama), and two tertiary care units (at Colombo South Teaching Hospital and Sri Jayewardenepura General

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Hospital). The study population comprised of women attending postnatal clinics for follow up and for vaccination of their infants. All were between 8-12 weeks after delivery.

Women less than 18 years of age, with a history of urinary incontinence when nulliparous, who had pelvic surgery in the past, or on medication which would alter urinary continence were excluded from the study. At 95% significance level, assuming 16.6% of prevalence of urinary incontinence and assuming a 10% non-response rate, the final sample size was 234 [12].

UI occurring with manoeuvres causing increased intra-abdominal pressure was considered as stress urinary incontinence. Inability to control the desire to pass urine was considered urge UI and those with symptoms suggestive of both were considered as having mixed UI [13]. UI with an onset within 3 months after delivery was considered PPUI.

Systematic random sampling was used to select participants and an interviewer- administered questionnaire was used for data collection. The questionnaire was based on the validated International Consultation on Incontinence Questionnaire Female Lower Urinary Tract Symptoms Modules ICIQ-FLUTS long format questionnaire [14]. In addition to the questions given in ICIQ-FLUTS long format, we asked questions to detect the presence of known risk factors for PPUI. Data were analysed using SPSS software version 26.0. Chi square test and Fishers exact test were used for data analysis. Significance was taken as $p<0.05$.

Results

The total study sample was 234 postpartum women and the mean age was 29.16 years ± 5.5 SD (range:18 – 46 years). Only five were over 40 years old. The Mean BMI was 27.3 (SD = 5). Majority (67%, N=156) were overweight or obese according to the WHO recommended cut off point of 23 kg/m2 [15]. Approximately 46.6% (109/234) were primiparous, 33.3% (78/234) had 2 pregnancies and 20.1% (47/234) had 3 or more pregnancies.

In our study sample of 234 postpartum women, 18 reported that they had transient UI during pregnancy which resolved spontaneously before delivery (7.7%). A minority (N=20, 8.6%) reported that they had UI after the current delivery. Of these, 12 stated that UI developed after delivery while one had UI which began during the current pregnancy and worsened after delivery. The remaining 7 had UI during or before the current pregnancy which persisted but did not worsen after delivery. Therefore, 5.6% (13/234) of the population reported either de novo or worsening UI after delivery of the 13 women who developed PPUI the majority of 9 (69.2%) had mixed UI. Three (23.1%) had urge UI and one (7.7%) had stress UI (Table 1).

Table 1. Frequency of different types of incontinence in our study population

Type of incontinence	Frequency (%)
Mixed urinary incontinence	9 (69.2)
Urge urinary incontinence	3 (23.1)
Stress urinary incontinence	1 (7.7)
Total	13 (100)

Table 2. Mean inconvenience rating (on a scale of 1 - 10) of women with different types of PPUI

Type of UI	Mean Inconvenience rating	Range
Stress UI	8	
Urge UI	5	0 - 9 (SD 4.58)
Mixed UI	4.7	3 - 7.5 (SD 2.13)

Table 3. Frequency of known risk factors for urinary incontinence in out study population

Risk factor	Frequency	Significance
Presence of chronic respiratory diseases	13	P=0.02 (Fischer's exact test)
Age >35 years	34	P=0.698
BMI > 25 (overweight or higher)	156	P=0.315
Multiparity	125	P= 1.000
LSCS	76	P=0.232
Episiotomy done	154	P= 0.228
Birth weight > 3kg	105	P=1.000
Duration of breast feeding >10 weeks	83	P=0.775
Antepartum urinary incontinence	38	P=0.698
Diabetes	25	P=0.371

Table 4. Comparison of prevalence of stress, urge and mixed urinary incontinence in our study compared with similar studies Dolan et al (2004) 16 and Glazener et al. (2006) [3]

Study	Type of UI	Prevalence
Dolan et al.[16]	Mixed	55.3%
	Stress UI	36.8%
	Urge UI	7.9%
Glazener et al.[3]	Mixed	30%
	Stress	48%
	Urge UI	23%
Our Study	Mixed UI	69.2%
	Urge UI	23.1%
	Stress UI	7.7%

The prevalence of different types of PPUI was as follows: Stress UI – 0.4% (95% CI 0.01% - 2.4%?), Urge UI 1.3% (95% CI 0.3% – 3.7%), Mixed UI – 3.8% (95% CI 1.8%-7.2%).

The ICIQ–FLUTS (long form) questionnaire quantifies the impact of PPUI on quality of life experienced by persons experiencing UI, on a scale of 1 to 10 (10 indicating most

severe impact). Of the 13 women who developed PPUI, those who had mixed UI, reported an average inconvenience score of 4.7 (SD 2.13), ranging from 3-7.5. The 3 women who had urge incontinence reported an average inconvenience score of 5, (SD 4.58) ranging from 0 to 9. The person who had stress incontinence reported a score of 8. (Table 2)

The known risk factors present in this study sample were age >35 years, BMI > 23, multiparity, current delivery by LSCS, episiotomy, birth weight of baby > 3kg, duration of breast feeding >10 weeks, antepartum urinary incontinence, and diabetes. Of these, only the presence of chronic respiratory symptoms showed an association with higher prevalence of PPUI (p=0.028) (Table 3).

Discussion

The overall prevalence of PPUI in our study was 13/234 (5.6%) (95% CI 3.0% - 9.3%). While the prevalence of PPUI has not been reported previously in Sri Lanka, studies have been done in Western countries with the percentage of PPUI varying widely. A systematic review of several such studies showed that pooled estimates for the prevalence of UI in the 3 month postpartum period ranged from 10.3 % to 37.5 % and had an average of 26.2 % (95% CI 25.3 - 27.8%) [9]. Since this mean includes studies with significant variation, an analysis of a homogeneous subset of the studies was also carried out. In this subset, the mean was higher (33.3%) (95% CI 31.5 - 36.3) [9]. Both means are higher than the percentage of women reporting UI in the postpartum period in our study (5.6%).

While data on PPUI in Sri Lankan women is not available, prevalence of UI in the general population of women has been reported in several studies. According to Pathiraja et al, the prevalence of UI in Sri Lankan women aged 18-90 years was 55.5% [16]. In our study of postpartum women, only 5.6% (13/234) (95% CI 3.0% - 9.3%) had new or worsening UI (PPUI) after delivery. This may be attributable to differences in study population as prevalence of UI increases with age [12]. In young people pelvic floor muscle and sphincter weakness may get compensated and urinary incontinence may not be evident. As the woman gets older, pelvic floor muscles and sphincter becomes weak as part of the ageing process and the incontinence may become apparent.

In another study by Hemachandra et al among 1718 women aged 15-49 the prevalence of stress UI was 9.8% with only 0.3% urge UI [12]. In our study, the percentage for stress UI was 7.7% which is comparable. However, our percentage of urge UI was much higher (23.1%) suggesting that delivery may have had a significant effect on urge UI. Although traditional teaching implies pregnancy and vaginal delivery leads to stress UI, the reported prevalence of stress UI at 3 months postpartum varies widely, ranging from 3.9 to 31.3% [9]. Prevalence of urge UI reported in the same systematic review was lower but ranges from 0.8 to 14.8%. While many studies do not identify "mixed UI" as a separate category the studies which did so, reported that the prevalence of mixed UI in the postpartum period was between 30% and 55.3% [3,17]. The distribution of different types of UI as reported in these studies is given in Table 4.

Our study revealed a significant association between the occurrence of PPUI and presence of respiratory diseases causing a chronic cough (a cough lasting longer than 8 weeks) such as asthma, allergic rhinitis, or postnasal drip (p=0.028) [18]. Association between UI and chronic respiratory symptoms has been made among women in Sri Lanka and in a Turkish study among pregnant women [19,20]. However, neither of these studies involved women in the postpartum period. Our study failed to show a significant association between vaginal delivery and PPUI. Therefore, caesarean section may not have an added advantage over vaginal delivery in preventing PPUI. However, this should be interpreted with caution as our study sample was small, had a low overall prevalence of urinary incontinence and follow up was short.

In conclusion, the prevalence of PPUI in our cohort of Sri Lankan women was 5.6%. Mixed UI was the commonest type of incontinence. Presence of chronic respiratory diseases was the only associated factor for increased occurrence of PPUI. Other known risk factors including vaginal delivery did not appear to be associated with PPUI when assessed within three months of delivery of the baby.

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.

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REVIEW ARTICLE

Thromboembolic events from the intraoperative use of topical gelatin and albumin-glutaraldehyde haemostatic agents

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Keywords: Gelatin based haemostat; albumin glutaraldehyde haemostat; topical; tromboembolism; education

Abstract

Introduction

An under-recognised complication of gelatin-based [GBA] and albumin-glutaraldehyde-based haemostat agents [AGA] is their potential to embolise. This review aims to collate and analyse cases reported in the literature of perioperative thromboembolic phenomena secondary to locally applied GBA and AGA agents.

Methods

An electronic search was performed on databases Embase, Ovid Medline, Proquest, Scopus and Pubmed. 8875 articles were reviewed from title and abstract. After exclusion criteria and duplicates were removed, 13 articles with 18 cases were included for analysis. Data extracted from each of the articles included patient demographics, surgery type, the haemostatic agent used, clinical features, radiology and pathological findings, and associated morbidity and mortality.

Results

Thromboembolic events reported included fourteen secondaries to GBA and four from AGA. Cases included twelve pulmonary emboli, three peripheral emboli, two cerebral emboli and one coronary embolus. Embolic phenomena were most common following spinal orthopaedic surgery in GBA patients [43%], and Type A Aortic dissection repair in AGA patients [100%]. The application of 10ml or more of GBA was frequently reported in cases [64%]. Six cases were fatal. The time course of each event ranged from occurring intraoperatively to 45 days post-operation.

Conclusion

GBA and AGA agents are associated with venous and arterial embolisation and high overall mortality. GBA application over an unclear bleeding site poses a risk of arterial embolisation. Surgical fields should be dried before the application of AGA. Quantities of GBA > 10mL were frequently reported. GBA and AGA embolisation can occur anywhere from immediate to 45 days postoperatively.

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Introduction

Topical haemostatic agents are routinely used as an adjunct to promote haemostasis in a variety of surgical settings, and are considered a relatively safe class of agents [1, 2]. These agents are fundamental in reducing perioperative blood loss, which translates to reductions in blood transfusions, hypothermia, acidosis, length of hospital stay and mortality [3]. In our recent review, we highlighted the importance of recognising Gelatin based agents [GBA] in their potential to precipitate anaphylactic reactions [4]. Thromboembolic events across the spectrum of peripheral venous thrombosis, to venous and arterial embolism at various vascular beds are rare complications reported with mechanical and flowable gelatin based agents [GBA], as well as albumin-glutaraldehyde adhesives [AGA]. Literature regarding this complication is largely based on case reports across a variety of operations, but all similarly reporting a high mortality. We present a comprehensive review synthesising the literature relating to GBA and AGA agents. It will highlight the importance and awareness of considering this differential when these agents intraoperatively are used intraoperatively, provide pathophysiological mechanisms for agent propagation, and provide insight and elaborate on the perioperative diagnosis and management of this condition.

Materials and Methods

Search strategy

Databases searched included Embase, Ovid Medline, Proquest, Scopus and CINAHL. The final search was completed on the 20 June 2021. A research librarian within the authors institution assisted with conduction the search, using the prescribed search terms in Appendix 1.

After removal of duplicates 8875 articles were screened against title and abstract [Figure. 1]. Highly specific inclusion and exclusion criteria were set as to answer the specific subject of thromboembolic phenomena secondary to topical haemostatic agents. Most articles were excluded as they

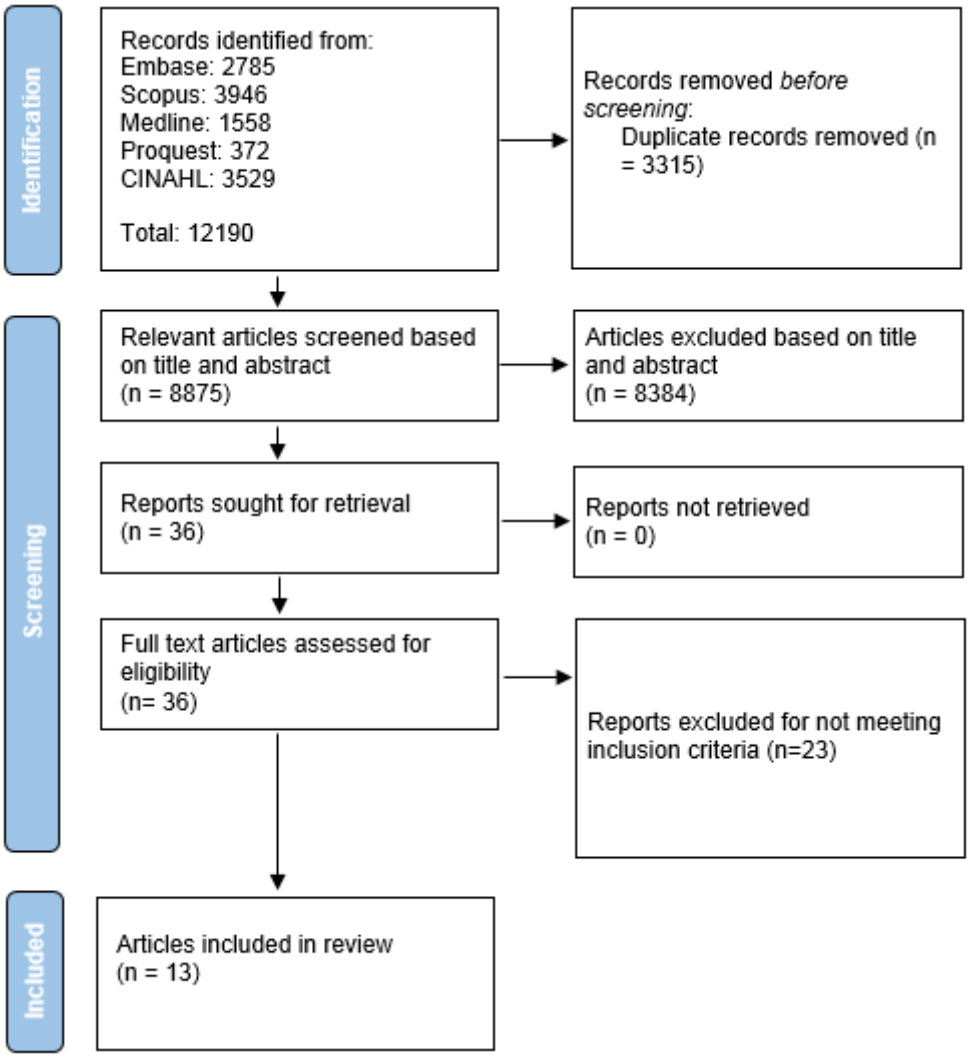

Figure 1. PRISMA diagram of selected articles

related to in-vitro or animal studies, or did not assess the outcome of interest of thromboembolic phenomena.

Study selection

We included case series and case reports describing intraoperative or postoperative thromboembolic phenomena deemed secondary to GBA or AGA agents. The bibliographies of included articles were analysed to increase the effectiveness of the literature search. Two authors independently reviewed the titles and abstracts. Studies or reports were included if they contained one of the outcome variables of interest: arterial or venous embolism secondary to GBA or AGA in any vascular bed including; extremity, gut, pulmonary, cardiac and cerebral. Articles must have described either the incidence, clinical manifestation, pathophysiology, diagnosis or management to be eligible. Studies or reports involving agents other than GBA and AGA, and those describing air, gas or fat embolism were excluded. Articles published in the non-English literature, letters, editorials, in-vitro or animal studies were excluded.

Data extraction

Patient demographics, surgery type, incidence rates, haemostatic agent used, clinical manifestations, location of thromboembolic event, differential diagnosis considered, pathology and imaging findings, case management and complications were drawn out.

Results

A total of 13 articles, including ten articles related to GBA and three related to AGA were retrieved [Table. 1].

Gelatin based haemostatic agents

Ten articles, comprised of eight case reports [5, 6, 7, 8, 9, 10, 11, 12] and two case series [13, 14] reported a total of 14 events attributable to the GBA used. Within case reports and case series, thromboembolic events reported included 12 pulmonary emboli and two cerebral events [13]. Patient ages ranged between 11 and 78 years. Five [35%] cases were fatal [8, 10, 11, 13]. Five cases were confirmed to be secondary to embolisation of the haemostatic agent through pathological

Table 1. Summary of literature for perioperative embolic phenomena secondary to Gelatin and Albumin-glutaraldehyde based agents.

Author	Methodology	Age	Surgery	Haemostat Used + volume	Intraoperative vs post-operative day	Signs/Symptoms	Radiology/Pathology	Embolic location	Complications	Mortality (Y/N)	Management
Ferschl et al. (2009)	Case report	18	Thirteen level spinal fusion	Surgifoam	Intraoperative	Hypotension and hypocapnea.	TOE: Increased right ventricular volume, reduced systolic function + leftward septal bowing + small left ventricle + numerous mobile masses migrating from right atrium to right ventricle	Right atrium + Right ventricle + segmental/subsegmental pulmonary arteries	Right heart failure + Cardiac arrest	N	CPR. Followed by low dose heparin infusion 3 months of therapeutic anticoagulation.
Wei et al. (2015)	Case report	68	L4-5 transforaminal lumbar interbody fusion	Surgifoam and recombinant thrombin + thrombin-soaked absorbable gelatin sponges	Post-operative day 3	Dyspnea and hypoxia	CTPA: Multiple bilateral segmental and subsegmental PE's	Pulmonary arteries	PE	N	Heparin infusion. Bridged to warfarin for 6 months.
Sagar et al. (2017)	Case report	38	L5/S1 discectomy	Thrombin based haemostatic matrix (not specified)	Post-operative day 5.	Left sided chest pain and dyspnoea	CTPA: heterogeneous filling defect with mixed attenuation + 'pseudoair pattern' in the left main pulmonary artery	Left main pulmonary artery	PE	N	Therapeutic heparin infusion. Switched to 6 months of Warfarin
Steinestel et al. (2012)	Case report	78	Removal L5 dorsal root ganglion schwannoma	FloSeal	8 hours post operatively	Dyspnoea and haemodynamic instability	CTPA: Numerous filling defects throughout both pulmonary arteries TTE: Transthoracic echocardiogram showed septal hypokinesia + paradoxical septal movement + marked dilatation of the right ventricle Pathology: Thin, peripheral rim containing erythrocytes and fibrin, with the rest of the thrombus consisting of acellular, eosinophilic granula with enclosed fibrin and thrombocytes. Identical to Floseal	Both main pulmonary arteries	Right Heart failure + Cardiac arrest	Y	CPR
Mura et al. (2018)	Case report	63	Laparoscopic Cholecystectomy	Floseal	Immediate post-operative	Dyspnoea, tachycardia, hypertension and hypoxia	CTPA: Multiple scattered bilateral minus images of the segmental and sub segmental branches of the pulmonary artery	Pulmonary arteries	PE	N	Conservative.
Ji et al. (2020)	Case report	11	Posterior spinal fusion	Gelatin sponges	Intraoperative	Hypotension, bradycardia, desaturation, and decreasing end-tidal carbon dioxide	TOE: hypokinetic and dilated right ventricle with severe tricuspid regurgitation and a D-shaped small left ventricle with normal function Pathology: Diffuse embolization of the pulmonary arterioles with amorphous, haemogenic, and blue foreign substances	Diffuse embolization of the pulmonary arterioles	Cardiac arrest	Y	CPR, followed by heparin bolus 0.5mg/kg
Skovrlj et al. (2014)	Case report	56	Multilevel lateral interbody fusions and thoracolumbosacral instrumented fusions with bilateral iliac fixation	Surgifoam	Intraoperative	Drop in the patient's recorded end tidal CO2 level, the reading from the arterial line became flat, and the patient lost his pulse	Pathology: angulated particles of embolic sealant with entrapped red blood cells within small-and-medium-sized vessels of the lungs and heart	Pulmonary arteries and coronary arteries	Cardiac arrest	Y	CPR
Bezanko et al. (2021)	Case report	33	Ultra-low anterior resection	Surgiflo	Intraoperative	Haemodynamic instability	CTPA – Bilateral segmental pulmonary emboli	Pulmonary arteries	PE	N	Nil
Coss et al. (2020)	Case series	1. 44 2. 63	1. Spinal fusion of C3 + peridontoid mass biopsy 2. Anterior cervical discectomy, bilateral foraminotamies + C3-6 vertebral fusion.	1. Gelfoam 2. Floseal	1. Immediate post-operative 2. Immediate post-operative	1. Right nystagmus and right arm dysmetria 2. Delayed awakening and was not breathing spontaneously	Pathology: 1. Occlusion of the right vertebral artery by red-gray material. foreign material morphologically consistent with Gelfoam. amorphous eosinophilic branching nonbirefringent foreign material 2.Thromboembolic occlusion by a red-gray material. Eosinophilic foreign material morphologically consistent with Floseal. Amorphous eosinophilic branching non-birefringent material	1. Right vertebral artery 2. Right vertebral artery + Right distal brachial artery, radial artery + ulnar artery.	1. Right lateral medullary infarct 2. Infract of pons, inferior left cerebellar hemisphere, vermis, and right frontal lob	1. Y 2. Y	1. Intra-arterial thrombolysis and thrombectomy with recanalization of the basilar and right vertebral arteries 2. Conservative

Yue et al. (2017)	Case series	1.66 2.74 3.72 4.63	1. WLE, right segmental mandibuletomy, partial maxillectomy and radial free forearm flap reconstruction 2. WLE, subsigmoid segmental mandibulectomy, partial maxillectomy, right neck dissection and anterolateral thigh free flap reconstruction 3. Left segmental mandibulectomy, subtotal glossectomy, radical excision left infratemporal fossa and fibula free flap reconstruction 4. Lateral mandibulectomy, subtotal glossectomy, neck dissection + free fibula reconstruction	Floseal	1.Day 4 post-operative 2.Day 3 post-operative 3.Day 17 post-operative 4.Day 6 post-operative	All: persistent tachycardia for more than 24 h, fever of more than 37.8C, and decreased oxygen saturation below 95%	CTPA: 1. Segmental branches in the right upper and middle lobes with a non-occlusive thrombus in the right lower lobar artery 2. Pulmonary emboli involving right upper, middle and lower lobe subsegmental arteries 3. Right middle lobe segmental pulmonary artery 4. Bilateral segmental and subsegmental pulmonary arteries	Pulmonary arteries	All: PE	All: N	Heparin infusion followed by warfarin for 6 months
Feghaly et al. (2011)	Case report	54	Bentall Procedure for type A Aortic Dissection	Bioglue	Day 45 post-operative	Cold, pain and paraesthesia in her right leg	Duplex US: Lower limb showed a complete occlusion of the right common iliac artery Pathology: Pathological analysis of those pieces revealed consolidated Bioglue.	Right common femora artery	Right leg ischemia	N	Arterial thrombectomy
Mahmood et al. (2004)	Case report	74	Type A Aortic Dissection repair	Bioglue	Day 6 post-operative	Chest pain, tachycardia, tachypnoea and hypotension	Pathology: Bioglue within left circumflex artery + right coronary + diagonal branch of LAD	Left circumflex artery, right coronary artery and the diagonal branch of the left anterior descending artery	Myocardial Infarction + Cardiac arrest	Y	CPR
Bernabeau et al. (2005)	Case report	1.30 2.76	1. Type A aortic dissection repair 2. Type A Aortic dissection repair	1. Bioglue 2. Bioglue	1. Day 14 post-operative 2. Intraoperative	1. Sudden short distance left limb claudication, with absence of left popliteal and posterior tibial and pedal pulses 2. Absence of previously patent radial pulse.	Pathology: 1. Bioglue on analysis. 2. Histopathologic examination of the embolic material confirmed it to be Bioglue	1. Popliteal artery 2. Humeral artery	1. Left lower limb ischemia 2. Upper limb ischemia (unclear which side)	Both: N	1. Embolectomy using Fogarty catheter. 2. Thromboembolectomy with Fogarty catheter.

PE= Pulmonary embolism, WLE= Wide local excision, CTPA= Computed-tomography pulmonary angiogram, TTE= Transthoracic echocardiography, TOE= Transoesophageal echocardiography, US= ultrasound, CPR= Cardiopulmonary resuscitation.

analysis [8, 10, 11, 13]. The remaining cases were diagnosed on echocardiogram [5] or Computed Tomography Pulmonary Angiogram [CTPA] [6, 7, 14, 12]. Nine cases from case reports or case series reported using either >10ml of agent or 'a large number' gelatin sponges [5, 6, 10, 11, 8, 14]. One case reported using 5ml of Surgiflo[[12]. The remaining cases did not report the volume used. Intraoperative, or immediate post-operative events included six PE's [5, 8, 9, 10, 11, 12] and two cerebral events [13]. Of those PE's, 67% of patients rapidly deteriorated into cardiac arrest, with the remaining two patients developing haemodynamic instability. Products administered included; Gelfoam[[Pfizer, US] [13], Floseal[[Baxter, US] [8, 9, 13, 14], Surgifoam[[Ethicon, US] [5, 6, 11], Surgiflo[[Johnson & Johnson Wound Management, Somerville, NJ] [12], Thrombin-soaked absorbable gelatin sponges [Ethicon, US] [6], Gelatin sponges [Fukangsen, Guilin, China] [10].

Albumin-glutaraldehyde based haemostatic agents

Three articles reported a total four cases attributable to AGA use [15, 16, 17]. Thromboembolic events included three peripheral emboli and one cardiac embolus [15, 16, 17]. Ages ranged between 30-76. One case was fatal due to coronary embolism [16]. The sole agent used was Bioglue[[Cryolife Inc, Kennesaw, Ga] and the sole surgery was repair of type A aortic dissection. One case reported using 35ml [15], with the remaining cases not reporting volume used. All cases were definitively diagnosed on pathological analysis. One case of peripheral embolism was identified intraoperatively [17], the remaining were diagnosed post-operatively up to 45 days [15, 16].

Discussion

Herein we have summarised 18 published cases of embolism secondary to GBA and AGA agents. Strikingly there was an overall mortality of 33%, with immediate intraoperative hemodynamic compromise and cerebral embolisation a harbinger of mortality, with 67% and 100% of cases fatal, respectively. It is not clear if this reflects under recognition of GBA and AGA embolisation, lack of clear guidelines and/or no definitive treatment. Intraoperative haemodynamic compromise has numerous potential precipitants. This review and our previous work highlight two causes; pulmonary embolism and anaphylaxis as a cause after use of topical haemostatic agents [White et al. 2021]. The ability for a haemostat to embolise is not arbitrary and reflects its nature and intended use. GBA agents are composed of a granulated gelatin based matrix that may or may not be mixed with thrombin prior to administration [18]. Bioglue[is composed of purified bovine serum albumin [45%] and glutaraldehyde [10%]. These agents act at varying points in the formation of a clot, with the gelatin and AGA component swelling on application to provide a mechanical seal and the GBA thrombin component subsequently activating secondary haemostasis through the coagulation cascade [19]. We have categorised the discussion of embolisation in this review into arterial and venous. Note, albeit pulmonary emboli anatomically involve the pulmonary arteries, they are part of the venous thromboembolism spectrum and thus we are characterising these as venous emboli.

Arterial Embolisation

Overall, there were six cases of arterial embolisation with a mortality of 50% [17; 15, 13, 16]. In the absence of a patent foramen ovale, it is likely arterial embolisation originated from direct GBA application over an arterial vascular bed. Four patients suffered Bioglue[embolisation secondary to its usage in type A aortic dissection repair [15, 16, 17]. Bioglue[is a relatively watery and transparent adhesive, and its role in repair of type A dissection is a well-known quandary in cardiothoracic surgery [20]. It has been previously reported that the three likely mechanisms of Bioglue[embolisation include unintended spillage into true lumen, entry into the true lumen via escape through distal re-entry sites and leaking through anastomotic needle sites [21]. Furthermore, as blood perturbs the haemostatic mechanism and bonding of Bioglue[to aortic tissue, the lumen should be appropriately dried before its application otherwise this may pose a risk of embolisation [22]. One of the four cases was associated with mortality, with the single case having unique embolisation into the coronary vasculature [16]. It is suggested to prevent Bioglue[embolisation into the coronary ostia, a moist sponge can be placed in the true lumen during application of Bioglue[[22]

Two cases of cervical neck surgery led to vertebral artery occlusion and subsequent cerebral infarction. In this case authors identify brisk and heavy bleeding of unclear origin which they applied Gelfoam[and Floseal[to with subsequent haemostasis. It was not identified if the bleeding was arterial or venous. In cervical neck surgery the limited space combined with complex anatomy and magnification can result in an obscured field of view, which can be compounded with bleeding. Surgeons can lose sight, with some suggesting they blindly apply GBA [23]. This can lead to application and entrainment of GBA into an arterial bleed if the site is not identified. These cases highlight the critical importance of maintaining a dry surgical field during its use and ensuring direct vision when applying the agent. If there is concern for embolism, the wound can be flooded with saline to entrain this rather than apply further GBA.

Venous Embolisation

The second group of emboli were those that migrated through the venous system, most often centrally to the pulmonary vasculature. Six cases involved spinal surgery [5, 6, 7, 8, 10,

11] four head and neck reconstructions [14]. one cholecystectomy [9], and one ultra-low anterior resection [12]

Embolisation to the pulmonary vasculature from the spinal venous network is complex and dependent on location of surgery and application of GBA. The vertebral venous plexus is comprised of the internal plexus, external plexus and the horizontal basivertebral veins which drain into extraspinal veins centrally to the right atrium. The lumbar and thoracic vertebral plexus drains into the azygous venous system, and the cervical regions empties into the vertebral and jugular veins. However, the surgeon need be aware that the venous spinal system is valveless and interconnected, lending itself dependent on gravity, thoracic and abdominal pressures, and patient positioning. It is well known in spinal surgery that patient positioning is implicated in thromboembolism, with reported incidence as high as 12% [24], and likely reflects the valveless nature of this system. The positioning of a patient is surgeons' preference, however positioning of the patient will affect venous pressures and risk of bleeding vs. embolism. Risk of embolism or GBA entrainment is higher if there are low venous pressures [surgical site elevated above the heart], whereas risk of bleeding is higher with higher venous pressures [surgical site below the heart] [25]. We suggest if there is suspicion of GBA embolism, the tilt of the operating table can be adjusted to reduce the negative pressure gradient between the site of operation and the right atrium.

Head and neck surgery may be associated with propagation to the pulmonary vasculature due to exposure of the pterygoid plexus, a venous network with a large endolumen, which may allow the propagation of foreign material through its channels via the retromandibular and external jugular veins to the pulmonary arteries. Of note, the pulmonary emboli which occurred secondary to GBA application to the pterygoid plexus occurred between 3 – 30 days post operatively, which may reflect the lateral pterygoids association to the pterygoid plexus. The lateral pterygoid exerts an effect on the pterygoid plexus during its contraction, creating a pump like effect which propagates blood back to the heart, however this may facilitate and dislodge GBA [26].

Whilst site of application is evidently important, volume used appeared to be a risk factor for subsequent embolisation. The finding that most cases GBA emboli were following application of > 10mL is consistent with previous work [5, 6, 8, 10, 11, 14]. Two retrospective cohort studies [27, 28] identified use of > 10ml as a risk factor for developing subsequent embolism – either DVT or PE, which is supported by the observation that both Floseal[and Surgiflo[may pass through 40um filters, far smaller than vessel lumens [29]. A multivariate analysis of embolic events in patients post meningioma surgery demonstrated 11 of the 12 patients who experienced embolic phenomena were administered at least 10ml of Floseal[[27]. Of note, prophylactic enoxaparin did not reduce the risk of thromboembolic events, supporting the case that these emboli were secondary to GBA material. These findings were replicated in Gazzeri et al's [2018] review of patients undergoing intracranial tumour surgery, with injection of 10ml or more GBA agent significantly increasing the risk of PE from 5.6% to 6.8% [p=0.02]. Whilst volume of these agents administered cannot always be helped, it is important to recognise this volume as a risk factor and monitor the patient closely for embolic phenomena post-operatively.

The overall incidence of these events is not determined, and likely under-reported. However, observational studies in patients undergoing meningioma and brain tumour resection found the embolic incidence to be 2.6% and 5.6%, respectively [27, 28]. Although there are relatively low case numbers, the presentation of intraoperative or immediate post-operative pulmonary embolism frequently cardiac arrest [67%], carrying a relatively high mortality of [75%]. This stands out from the reported mortality of up to 30% in 'massive' PE's from activation of the coagulation cascade [30]. The exact reason for this increased mortality is unclear, although, may be posited to there being no physiological lytic counter to GBA agents, as there is for a regular biological clot. Further, there have been several reports of GBA agents causing intractable bleeding through the development of bovine-associated antibodies cross reacting and depleting coagulation factors [31]. No study in this review reported measuring such antibodies, but speculatively the depletion of coagulation factors and subsequent bleeding could result in a depletion of any anti-thrombotic enzymes that would reduce the peri-GBA material clot burden.

The high percentage of patients who presented as rapidly deteriorating from a haemodynamic perspective underscores the importance of anaesthetic and surgical staff considering embolisation of GBA material. Although critical to consider and recognise intraoperatively, consideration must be given to GBA embolisation weeks following the agent administration. GBA and AGA agents can take between 4-6 weeks to fully reabsorb, and can present anywhere along this timeframe, as demonstrated by the numerous cases days or even weeks' post application [6, 14, 15, 16, 17, 27, 28].

Radiological Features

Echocardiography was utilised in 80% of intraoperative PE's, each demonstrating evidence of either thrombus migration or right heart strain [5, 8, 10, 12]. Postoperatively, CT was

successfully utilised to identify GBA emboli. Wei et al. [2015] described hypodensities [HU -100] in the pulmonary artery or venous sinus that, on first inspection, were consistent with intravascular air. Hypodensities on postoperative CT at sites of GBA use for liver resection [32], cervical surgery [13] and discectomy [7] have similarly been reported in the literature. This phenomenon, known as the 'pseudo-air sign' was first described by Learned et al. [2014] in patients following intracranial neurosurgical procedures. The mechanism of this finding can be understood through recognising GBA agents often incorporate a significant amount of air when deployed. On imaging this manifests as a low density in Hounsfield units, and is distinguishable from acute clot which tends to be hyperdense. No imaging characteristics were described for Bioglue[.

Histological Features

Macroscopically at autopsy, Gelfoam[and Floseal[embolism appeared as red-gray material [13] whereas Gelatin sponges appeared as amorphous, hemogenic, and blue foreign substances [10]. Histology of Gelfoam[and Floseal[demonstrated amorphous, eosinophilic, branching non-birefringent foreign material [13]. Steinstel et al. [2013] identified Floseal[as an embolus with a thin peripheral rim containing erythrocytes and fibrin, with the rest of the thrombus consisting of acellular, eosinophilic granula with enclosed fibrin and thrombocytes. Skorvlj et al [2014] described Surgifoam[as angulated particles of embolic sealant with entrapped red blood cells. These histopathological findings can be understood through the 'foreign body reaction', which involves the immune system acting to 'wall off' non-degradable foreign bodies, with eosinophilic infiltrates representing the tendency for GBA agents to produce IgE mediated immune reactions [34].

Management

In cases with haemodynamic compromise, haemodynamic and life supporting measures should be instituted with no specific adjustment to the Advanced Life Support algorithm identified in any of the cases. In cases without haemodynamic compromise, GBA agents can take between 4-6 weeks to fully reabsorb, and monitoring for this complication should occur in the immediate post-operative period and follow-up reviews. A successful anticoagulation regime identified involved the commencement of a heparin infusion [5, 6, 14], until bridging to therapeutic Warfarin for a 3-6-month course [5, 6, 14], however this is low quality evidence. No case assessed the use of direct oral anticoagulants in the treatment of this condition.

Regarding interventional approaches, one case of vertebral artery embolism attempted intra-arterial thrombolysis and thrombectomy with recanalization which resulted in acute infarcts of the pons, inferior left cerebellar hemisphere, vermis, and right frontal lobe [13]. Although interventional thrombectomy was unsuccessful for GBA cerebral embolism, endovascular thrombectomy or embolectomy was effective in the treatment of all AGA peripheral emboli [15, 17]. This identifies a gap in the literature regarding the management of haemostat embolisation, and the measures utilised to manage it will require further assessment.

Implications and Take Home Messages

This review supplements the surgical literature on haemostatic agents, demonstrating their risk of embolism. Surgical site and volume of agent appear to be the predominant risk factors in the subsequent development of arterial and venous emboli. Intraoperative cardiovascular collapse after administration of AGA or GBA should alert the surgeon and anaesthetist to provide life supporting measures and reduce the negative gradient between the surgical site and right atrium. Communication at the time of GBA or AGA application, similar to the practice seen on injection of patent blue or bone cement, would assist in prompting anaesthetic staff to monitor for any haemodynamic compromise. Echocardiography is a useful tool in detecting GBA PE's intraoperatively, and intravascular hypodense material on computed tomography may assist the clinician with diagnosis of GBA post-operative setting. It is important to obtain a clear, dry field when using Bioglue[for Aortic surgery, and ensure all haemostatic agents are injected under vision.

1. Intraoperative haemodynamic compromise secondary to GBA embolism is associated with high mortality.
2. Haemostat application over an unclear source of bleeding, or into an oozy field site poses a risk of arterial embolisation.
3. Quantities of GBA > 10mL are significantly associated with thromboembolism.
4. GBA haemostat emboli may appear hypodense on CT imaging, and is reported to be due to the concomitant entrainment of air leading to a “pseudoair” sign.
5. GBA and AAG embolisation can occur anywhere from immediate to 45 days post operatively.

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APPENDIX 1: SEARCH TERMS

[surgiflo OR gelfoam OR floseal OR surgifoam OR haemostat* OR hemostat* OR gelatin OR 'gelatin sponge' OR "albumin with glutaraldehyde" OR "albumin-glutaraldehyde" OR "albumin glutaraldehyde" OR BioGlu*] AND [embol* OR thrombo* OR thromboemboli* OR infarc* OR "pulmonary embol*" OR "pulmonary infarc*" OR "cerebral embol*" OR "peripheral embol*" OR "cardiac embol*"] AND [topical OR local]

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REVIEW ARTICLE

Impact of microscopic intermediate sub inguinal varicocelectomy on varicocele and infertility

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Keywords: Varicocele; subinguinal; microscopic varicocelectomy; MISV; infertility; microscopic intermediate subinguinal varicocelectomy

Abstract

Varicocele is primarily tortuous dilation of the internal spermatic veins [ISV] and pampiniform plexus in the scrotum. It is the most common correctable cause of infertility. It has a higher prevalence in primary and secondary infertile in men. In this article, we reviewed the advantages and disadvantages of microscopic intermediate sub inguinal [MISV] varicocelectomies over conventional surgical methods. Although various mechanisms are postulated for pathogenesis, increased venous reflux is accepted as the predominant cause. Varicocelectomy is done to ligate the veins and reduce venous reflux without affecting the arteries, vas deferens and lymphatics. Open, laparoscopic and microscopic varicocelectomies are the different surgical approaches of varicocele. Embolization is another treatment option. MISV is a relatively novel technique and considered superior to the conventional treatment approaches because of increased spontaneous pregnancy rates, reduced recurrence, increased seminal parameters and fewer postoperative complications, as evidenced by many studies. Microscopic visualization and usage of micro-doppler in surgery improves safety. Absolute indications for varicocelectomy are documented infertility, clinically palpable varicocele abnormal seminal parameters and potentially treatable female infertility or normal fertility. Persistent pain, discrepancies in the testicular volume of more than 20% and hypogonadism are considered as relative indications for varicocelectomies. MISV should be regarded as the gold standard treatment method for varicocele.

Introduction

Varicocele is abnormal tortuous dilation of pampiniform plexus and internal spermatic veins [ISV] of the scrotum [1–3] and is closely related to abnormal seminal parameters and infertility evidenced by previous studies. [1,2,4,5] Prevalence of varicocele in the normal healthy male population is 10-15% [6] Increased prevalence of varicocele [40-70%] is noted in men with primary and secondary infertility [7–9]. Though the varicocele was observed in patients with infertility, most people with varicocele [75%] have normal fertility rates [1,2,10]. Despite many research articles claiming the cause and effect relationship between infertility and varicocele, it remains controversial to establish varicocele as a definite cause.

Varicocelectomy is the surgery to ligate the internal spermatic veins as much as possible without affecting the testicular arteries and testis [5]. Favourable outcomes of a varicocelectomy are spontaneous postoperative pregnancies, success in artificial conception methods, improvement in seminal parameters and reduction in postsurgical pain [8]. Varicocele recurrence, hydrocele, accidental testicular arterial damage, causing testicular hypotrophy, and persistent pain are unfavourable outcomes [11].

Etiopathogenesis

There are few mechanisms postulated for infertility in varicocele. Increased hydrostatic pressure in ISV due to venous reflux, scrotal hyperthermia, generation of reactive oxygen species [ROS] leading to increased DNA damage and reduced antioxidant capacity of testicles are those mechanisms [6]. These explained mechanisms can lead to harmful consequences. Those are increased damage to the germinal epithelium by toxic metabolites, reduced sperm quality, reduced testosterone production and loss of germinal cells, and testicular hypertrophy [12–14]. Venous reflux into the ISV is considered a significant cause among postulated pathophysiological mechanisms for the detrimental consequences of varicocele.

Further various anatomical and physiological factors contribute to increased venous reflux in ISV. Those are long course and the perpendicular confluence of the left testicular vein and renal vein, reflux into significant collateral veins [cremasteric, external pudendal and gubernacular] due to incompetent valves in the internal spermatic vein and metabolites from renal and suprarenal glands [15, 16]. So, the goal of varicocelectomy is to reduce the venous stasis in the

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collaterals caused by venous reflux. This is achieved by ligation of ISV with collateral veins [16,17]. The most negative influence of varicocele is the progressive reduction of testicular function [17–21]. Intervening at the right time may be imperative and challenging in practice.

Symptomatology and indications

Most of the patients are asymptomatic, and they are found to have varicocele when they seek medical advice for infertility after multiple failed attempts of conception [6,9,15,16]. A minority of patients have dull aching pain [10%] in the scrotum or testis or lump or swelling in the scrotum. Absolute indications for all types of surgical methods for varicocele are as follows: clinically palpable varicocele in the presence of infertility, one or two abnormal seminal parameters with a treatable cause of infertility or normal fertility in a female partner [17]. Relative indications are longstanding pain, non-obstructive azoospermia, severe oligoazthenospermia, testicular volume discrepancy of more than 20% and hypogonadism [18].

MISV over conventional methods and its influence on the outcome

Though the reasons for infertility remain unresolved, surgical correction positively impacts outcomes [2]. Thus, various surgical techniques are used in the treatment of varicocele. Those are the open approach, laparoscopic method, macroscopic and microscopic intermediate sub inguinal varicocelectomy [MISV]. Embolization is another method to correct varicocele. MISV recently gained popularity because of three factors; increased successful spontaneous pregnancies, fewer complications and low recurrence rates compared to conventional methods [6,16,19]. Evidence suggests MISV is preferred over traditional methods because of various advantages. Microscopic visualization discriminates small spermatic arteries and veins and avoids aggressive handling of arteries with a precise operative approach on testis [3,6,16,20,21]. Further introduction of intraoperative Doppler with papaverine helps identify arteries from veins. Evidence suggested that postoperative hydrocele and varicocele recurrence are significantly less than conventional methods.

Technical aspects of surgery

A transverse skin incision of 3 cm will be made immediately below the external ring, over the pubic ramus. The incision is further deepened and extended into scarpa fascia. Atraumatic babcock clamp will be used to mobilize the spermatic cord and vascular bundle carefully. Thereafter, these structures will be elevated into the surgical wound. Surrounding tissues of the spermatic cord and vessels are freely dissected and mobilized through the surgical wound. The spermatic cord will be kept carefully at this juncture by the retractor. Then, the microscope is brought inside the operative field to enhance visualization and magnification up to 8-15 times. External spermatic fascia is divided and examined with the help of a microscope. Vas deferens and surrounding vascular bundle, including lymphatic vessels, are identified and preserved.

At this point, a microvascular Doppler is used to examine vessels several times for the precise differentiation of arteries and veins by hearing the arterial pulsation. 20 MHz microvascular Doppler is commonly used. Further, it is used to preserve the testicular artery and careful dissection of dilated veins. Once the ligation of veins within the spermatic cord is done, the spermatic cord is reduced into vas deferens. Vascular bundle and vas again placed back in to place. The surgical wound will be closed with sutures.

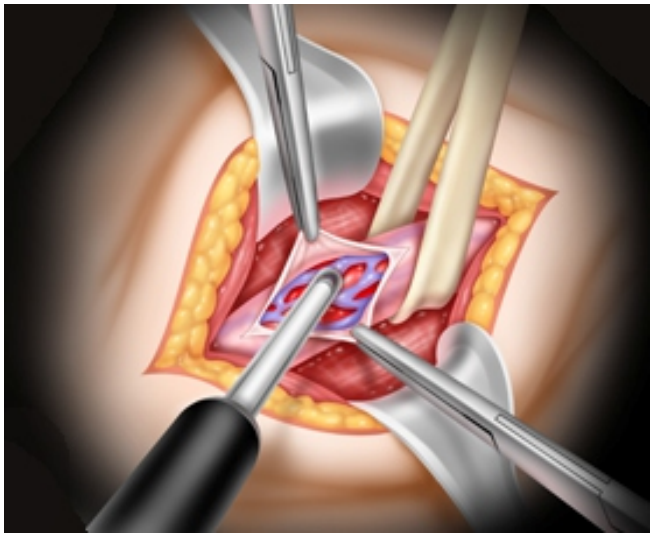

Figure 1 A. Microvascular doppler in subinguinal approach

Figure 1 B. Use of microdoppler during the procedure

Methods of analysis

All articles were searched electronically using Cochrane, EMBASE, PubMed, LILACS, SCOPUS and Google scholar databases. Keywords related to microscopic intermediate subinguinal varicocelectomy were searched in the title and abstract fields. Two investigators performed initial screening and eligibility based on titles, abstracts and keywords of citations from the electronic database. Of the articles that met the inclusion criteria, two investigators reviewed critical articles from systemic reviews, meta-analysis, prospective and retrospective cohorts by assessing full texts. All data pertaining to the advantages and disadvantages of MISV on infertility over conventional methods were extracted and categorized by the other two investigators. Finally, a narrative synthesis was performed by all four investigators. A systemic review was not performed due to the heterogeneity of the studies.

Studies regarding MISV

There are many studies stating the advantage of MISV over conventional methods. Maguid et al conducted a study on MISV for men with infertility on 162 patients [22]. Improved motility of sperm, increased sperm count and increased pregnancy rates with reduced complications were noted in their study. Phan et al conducted a study on the same topic in 86 patients [23]. They also found similar findings as to the previous study. In another study on MISV outcomes in 100 patients, Kumar et al [24] concluded that MISV is a safe surgical option for varicocele related infertility with improved pregnancy rates and seminal parameters. Jungwirth et al [n=272 CI-95%] conducted a study on clinical outcomes of MISV in infertile men [25]. Increased pregnancy rates and improved parameters of sperm were noted in their patients.

In a study by Kandari et al [26]on MISV in 100 patients, increased pregnancy rate and reduced hydrocele formation were noted in patients who had undergone MISV in their study. A meta-analysis was performed by Majzoub et al impact of MISV on male infertility in 452 oligospermic patients [27]. Increased sperm counts and motility with increased pregnancy rates were found following MISV in their study. Guptha et al carried out a study on outcomes following MISV in patients with oligospermia in 56 patients [28]. Improved pregnancy rates were observed in patients with severe oligoasthenospermia. A retrospective study was performed by Kadigolu et al on the impact of MISV in 92 patients with infertility [29]. Increased sperm count with improved quality of sperm was noted in their study.

Table 1. Summary of studies on microscopic intermediate subinguinal varicocelectomy

Author and Study type	Outcomes
Jungwirth et al [25] [1990-1998] Retrospective study [n=272]	Increased quality of sperm and pregnancy rates with low post-operative complications after MISV.
Maguid et al [2010] [22] Prospective study [n=162]	Increased motility of sperm and pregnancy rates with reduced post-operative hydrocele and recurrence following MISV over conventional surgical methods for varicocele.
Phan et al [23] [2021] Prospective study [n=86]	Increased pregnancy rates and reduced post-operative complications following MISV.
Kumar R et al [24] [2003] Prospective study [n=100]	Increased sperm count and quality with increased pregnancy rates. MISV is a safe surgery for varicocele.
Kandari et al [26] [2010-2015] Prospective study [n=100]	Reduced recurrence of varicocele and hydrocele and increased pregnancy rate following MISV.
Majzoub et al [27] [2021] Meta-analysis [n=452]	Increased sperm count, motility of sperm and pregnancy rate after MISV.
Gupta et al [28] [2018] Retrospective study [n=56]	Increased pregnancy outcomes in patients with severe oligospermia following MISV
Kadioglu et al [29] [2014] Retrospective study [n=92]	Increased sperm count with improved quality following MISV in patients with varicocele.
Guo et al [30] [2015] Prospective study [n=87]	Improved parameters of sperm with increased conception rate following MISV
Jun Wang et al [31] [1996-2013] Meta-analysis [n=2042]	Increased pregnancy rates with reduced complications following MISV
Chia-FengLee [32] [2010] Prospective study [n=224]	Incread quality of sperm and reduced scrotal discomfort following MISV and Its safe and minimally invasive surgery for varicocele.

Confidence interval 95 %; MISV- microscopic intermediate subinguinal varicocelectomy

Guo et al conducted a randomized controlled trial on outcomes of MISV with the use of a doppler scan in 86 patients [30]. Increased conception rates with increased sperm counts were noted in their study. There was a meta-analysis by Jun wang et al on outcomes of subinguinal varicocelectomy in 2042 patients [31]. Increased pregnancy rates with improved seminal parameters and reduced post-operative complications were noted in the study. Another prospective study was carried out by Chia-Feng lee et al on MISV outcomes in 224 patients [32]. Increased quality of sperm with reduced scrotal discomfort following MISV was noted in their study.

Conclusion

Varicocele remains one of the correctable causes of male infertility. Varicocelectomy is indicated in an infertile male with a clinically palpable varicocelewith two abnormal seminal parameters and when the female partner has normal fertility or a treatable cause of infertility. Physical examination and vascular doppler help in the diagnosis [10]. MISV increases spontaneous postoperative pregnancy rates and the success of artificial conception methods and improves seminal parameters [3,33–35]. It has reduced the percentage of recurrence, hydrocele formation and postoperative pain compared to other conventional surgical procedures [36–38]. MISV has to be considered as the gold standard for varicocele repair over conventional surgical methods, as evidenced by many studies

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.

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TECHNICAL NOTE

A novel technique to widen the 1st web space by using 'spare parts' of thumb polydactyly

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Keywords: 1st web space contracture; local tissue flaps; first web release

Abstract

First web space contracture causes significant morbidity and hence their release is important to make use of normal hand functions. First web space helps in improving the grasp. There are several methods of normalizing the 1st webspace. In this article we are describing a local flap that uses the spare tissue of the thumb polydactyly for recovering the defect created from the release of the first web contracture, thereby providing coverage with a tissue that has good vascularity and also giving sensation to the resurfaced part.

Introduction

Contractures of the first web space can cause distorted hand functions. They cause alteration in the normal anatomy of the thumb causing decreased thumb movements. There are various causes of 1st web space contracture which commonly include trauma, burns, etc.

The first web space is typically found in form of a tetrahedron, the distal skin forms a curve that extends from the index MCP joint to an area just distal to the thumb MCP joint [1]. Muscles such as adductor pollicis, first dorsal interosseous, and also flexor pollicis brevis lies within this webspace. These muscles help in augmenting the various thumb movements. The first web space measures around 100 degrees [2].

In the following study, the spare skin in accessory thumb has been used for coverage of thumb and thumb skin was used for the creation of 1st webspace. This novel technique is been reported for the first time.

Case presentation

4 years old female child presented with syndactyly of right 3rd webspace and left-hand radial polydactyly (Wassel type 5) along with 1st web space contracture. Preoperative evaluation and investigations were done. Written informed consent was taken from parents, preoperative photographs were taken (Figure 1) and the patient was taken for operation under general anaesthesia.

Tourniquet was applied on the left upper limb. Stay sutures were taken. The incision was marked as shown in the figure. Flap consisting of the skin and dorsal tissue was raised. The bones of the radial accessory digit were excised. The collateral ligaments of the radial side were repaired. Incision release of the 1st web space contracture was done.

A flap consisting of skin and tissue from the dorsum of the retained thumb was raised and transposed to resurface the

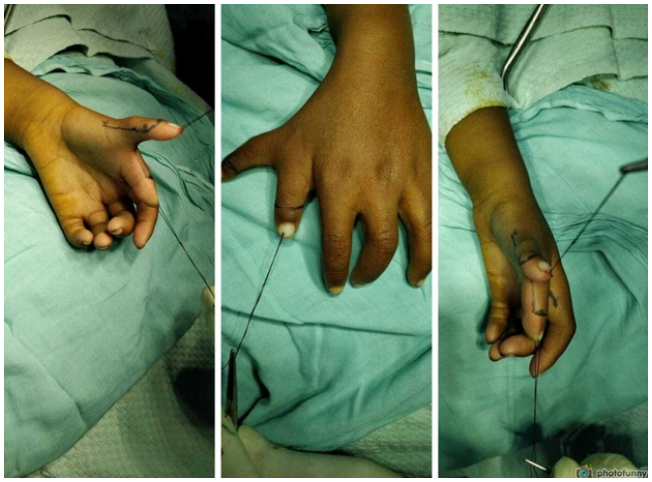

Figure 1. Preoperative images

Figure 2. Post operative images

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created 1st webspace. The previously raised flap of the accessory digit was then used to cover the raw area over the retained thumb (line diagram). Then the excess volar skin of the accessory digit was excised Figure 2).

Under tourniquet control, right 3rd webspace simple syndactyly release was done and the raw area was covered with full-thickness skin grafting. Full-thickness grafts were harvested from this excised skin and used to cover raw area created after syndactyly release of right 3rd webspace.

Tourniquet was released. Hemostasis was achieved. Cleaning and Dressing were done. Splintage was applied. The dressing was opened on day 2. The patient was discharged on 3rd day. The patient was on regular follow up and has regained normal thumb functions and there has been no redevelopment of 1st web space contracture even after 1 year of follow up. Parents were satisfied with the outcome.

Discussion

First web space contractures unfavourably affect normal hand functions. They restrict the normal thumb opposition and abduction, thereby impairing all the pinches and grips [3]. The thumb accounts for about 40% to 50% of the hand's normal function, thus contractures of the first web space cause significant disabilities which have to be addressed at the earliest.

Webspace contractures are associated with thumb duplication, commonly with type 4 and 5 and less commonly with type 3 and 4. Traditionally, in thumb duplication with 1st web space contracture, z plasty or a four flap z-plasty is usually performed. In some cases, a dorsal rotation flap or FTSG harvested from excised thumb is used [4]. The use of volar neurovascular island flap tunnel to webspace has also been described as a spare part technique [5]. However, the use of dorsal skin to augment 1st webspace has not been reported in the literature.

As the procedure is described, there is no incision over the volar side of the thumb, thus no functional or aesthetic deformity is present. Also, the incision lines camouflage with the dark Indian skin over the dorsal aspect of the thumb, thus improving aesthetics. Also, there is no need for tunnel-ling, thus improving flap viability.

Postoperative care is important to maintain the first web space after its release. After a healing period of 14 days, the splint was removed and the patient was started on physiotherapy. The patient could do near-normal thumb opposition and abduction. Local tissue transfer in such cases has been seen to be a good option for webspace deepening. It is important to choose the optimal configuration of the flap to reach dependable endpoints.

Conclusion

We have described here a unique flap technique that uses the spare tissue of thumb polydactyly for resurfacing the released first web contracture, thereby providing coverage with a tissue that has good vascularity and also giving sensation to the resurfaced part.

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.

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Learning Points:

- A careful preoperative assessment of the anatomy of the biliary tree as well as the gallbladder in patients going through pancreaticoduodenectomy.
- Adequate sampling of the gallbladder might be significant in recognizing early lesions in patients with extrahepatic cholangiocarcinomas; We might recommend that all gallbladders be resected along with the bile ducts for cholangiocarcinoma should be carefully inspected intraoperatively, and all suspicious lesions should undergo frozen section examination.

CASE SERIES

Peritoneal sandwich technique: A novel technique in the treatment of large ventral hernias

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Keywords: Large ventral hernia; peritoneal sandwich technique

Introduction

Ventral hernias are one of the common problems encountered during surgical clinic visits. They are a nuisance to the patients and a nightmare to the surgeon. Large hernia (incisional) is defined as those with a size defect of 10cm or more [1].

Large ventral hernia repair is more challenging to surgeons when the primary fascial closure cannot be achieved [2]. The peritoneal sandwich technique is an excellent and versatile technique to overcome this problem.

Case series

Here the author describes the surgical technique and the outcome of the peritoneal sandwich technique among six patients who underwent surgery for large ventral herniae over one year. Amongst those six patients, 4 were incisional hernias and 2 were large para-umbilical herniae.

Patients were subjected to a nutritional assessment and weight reduction regime in the preceding 3 months of the surgery. All patients were operated on under general anaesthesia with prophylactic antibiotic cover. The skin incisions were made over the previous scars for the incisional hernial repairs (except for one patient where a transverse incision was made for a previous vertical laparotomy scar). Vertical midline incisions were made for the para-umbilical hernial repairs.

The hernial sacs were dissected carefully and were opened vertically to create right and left peritoneal sac flaps. After careful dissection and reduction of the hernial contents the anterior layer of the right or left rectus sheath was divided close to the margin of the hernial defect along with its corresponding hernial sac. This was used to reconstruct the posterior layer of the rectus sheath. A polypropylene mesh was positioned behind the rectus muscles and placed over the reconstructed posterior rectus sheath. This is a modification of the sub lay technique. To cover the mesh, the anterior layer of the rectus sheath was reconstructed by using the contralateral hernial sac after the division of its corresponding posterior rectus sheath close to the margin of the hernial defect [Figure: 1]. This will lead to a partial bridging situation, where a part of the defect is closed only with the mesh and two layers of peritoneal covers derived from the original sac ("peritoneal sandwich technique"). Once meticulous haemostasis was achieved, two suction drain tubes were inserted into the mesh plane and subcutaneous tissue plane. The skin was closed with clips.

Postoperatively the patients were kept in the ward for 48 hours for observations and intravenous antibiotics. The average days to discharge was 3 and the average days to drain removal was 5. Out of the 6 patients, 3 developed superficial surgical site infections and 1 developed skin necrosis. All of these complications were treated conservatively with antibiotics and wound debridement, without necessitating any major surgical procedures or mesh removal.

Discussion

According to the European Hernia Society, large hernia (incisional) is defined as those with a hernial defect sized 10cm or more [1]. Repair of large ventral hernias is a challenging surgery for the surgeon when primary fascial closure cannot be achieved [2] and for the patient when it is closed under tension it leads to serious complications such as abdominal compartment syndrome, burst abdomen and later recurrence. The peritoneal sandwich technique addresses these problems by bridging the fascial gap, using part of the hernial sac and isolating the mesh from both the intra-peritoneal contents and the subcutaneous tissue. This technique applies to both midline and transverse hernias [2]. The main disadvantage of this technique is a high rate of postoperative wound-related complications of up to 68%, which is mainly due to the formation of large skin and subcutaneous tissue flaps [1]. However, these complications can be treated conservatively, without the need for any major surgical procedures or removal of mesh [1]. The recurrence rate of the peritoneal sandwich technique is almost zero per cent [1].

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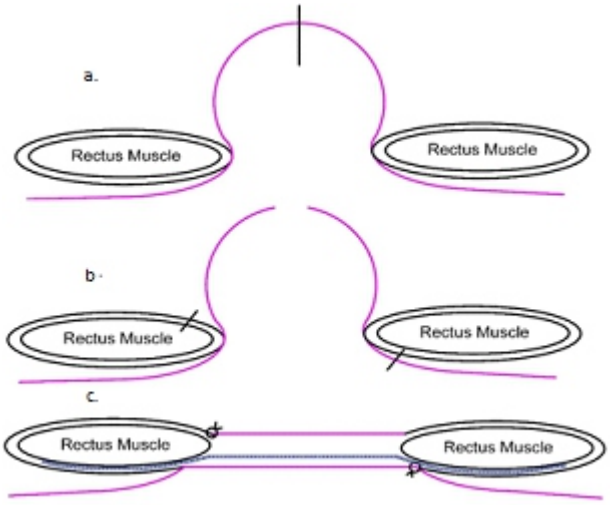

Figure 1. Illustrate the peritoneal sandwich technique. (a) Hernial sac is divided vertically, (b) anterior and posterior rectus sheath is divided close to the margin of the defect, (c) left part of the sac is used to reconstruct the posterior rectus sheath. Sublay poly propylene mesh is placed under the rectus muscles and right part of the sac is used to reconstruct the anterior rectus sheath.

In this case series, four out of six patients (approximately 67%) developed wound-related complications and all were treated conservatively without any major surgical procedures and removal of the mesh. All the wounds healed completely without any complications. During the short period of this study, there was no recurrence noted. Although a larger number of cases and long term observation is essential in future to prove the statistical significance.

Conclusion

The peritoneal sandwich technique is an excellent and versatile novel technique to treat large ventral hernias with very low rates of recurrence. Although this technique has a high rate of wound-related complications, most of them can be managed conservatively without the need for any major surgical interventions or the removal of the mesh.

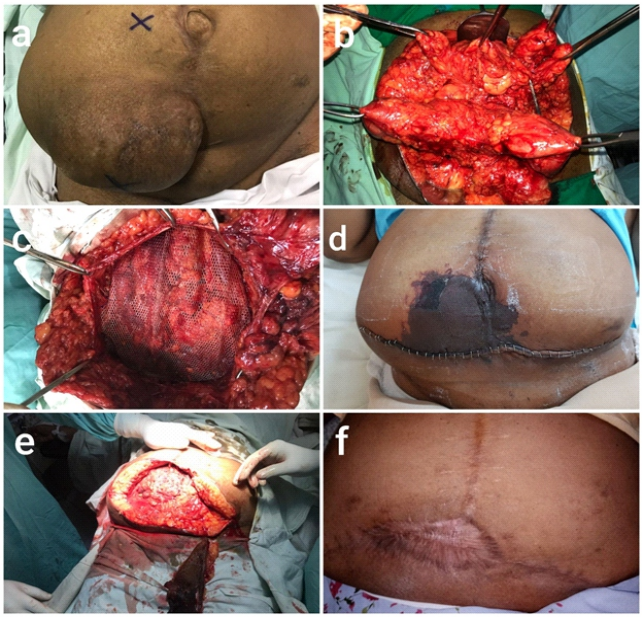

Figure 2. Images of one of the patients in this case series. (a) Large incisional hernia, (b) with multiple hernia sacs, (c) underwent peritoneal sandwich technique with prolene mesh, (d) developed post-operative skin flap necrosis, (f) thorough wound debridement followed by VAC wound dressing applied without the removal of mesh, and (f) complete wound healing was achieved after 6 weeks duration.

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.

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Learning Points:

- Large hernia (incisional) is defined as those with a size of defect of 10cm or more.
- The peritoneal sandwich technique is an excellent and versatile technique to repair the large ventral herniae.
- The peritoneal sandwich technique has a low rate of recurrence.
- Even though the peritoneal sandwich technique has relatively a high rate of wound related complications, it can be managed conservatively without necessitating any major surgical procedures or mesh removal.

CASE REPORT AND REVIEW OF LITERATURE

Epigastric hernia complicated with bowel ischaemia

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Keywords: Epigastric hernia; bowel ischaemia; small bowel; bowel resection; gangrene

Abstract

Epigastric hernia, a form of abdominal ventral hernia, accounts for 0.5 – 10.0% of all abdominal wall hernias. These may be congenital due to incomplete midline fusion of developing lateral abdominal wall domains or acquired. It usually occurs in individuals in the age groups of 20 to 50 years and infants. It is rarely large enough to admit more than a small amount of extra-peritoneal fat. We discuss an epigastric hernia known only for a little more than 4-hours, presented strangulated, leading to ischaemia of small bowel requiring resection and review literature on epigastric hernias and their complications.

Introduction

Bowel Ischemia is a rare complication of an epigastric hernia. At present, surgery is the treatment of choice for bowel ischemia irrespective of the cause. This paper discusses the diagnosis and management of a patient with complicated epigastric hernia and reviews literature while elaborating the current treatment and direction of the futuristic approach.

Case presentation

A 60-year-old, female presented with acute continuous epigastric pain and nausea for 4 hours. This was her first presentation and denied noticing any epigastric abnormality before. She had no comorbidities or allergies.

The patient had a tender, irreducible epigastric swelling. Abdominal X-ray revealed distended bowel loops while Ultrasonography [USS] confirmed a lack of peristalsis. However abdominal USS was imprecise to identify bowel ischemia. Radiological findings favoured a bowel obstruction.

Her haematological and biochemical investigations including serum lactate levels remained normal. Conservative methods were attempted with intravenous fluid resuscitation, pain relief, muscle relaxants, nasogastric tube drainage and the local application of ice packs. However, conservative attempts failed to reduce the epigastric hernia and worsening of symptoms prompted surgery. At surgery, an epigastric hernia had a thick peritoneal sac and a narrow neck leading to ischemia of a herniated small bowel loop.

Figure 1. Small bowel ischemia

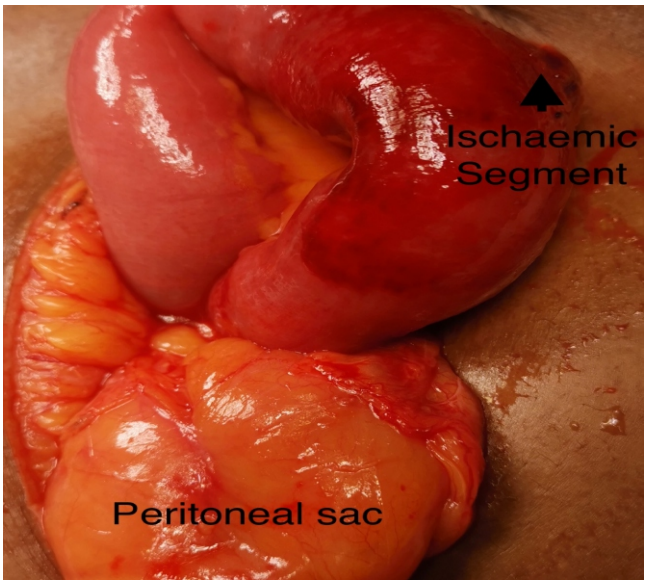

Figure 2. Peritoneal sac [true epigastric hernia]

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The strangulated ischemic small bowel was resected and continuity was restored during surgery. Ischemia was histologically confirmed. Surgery was completed with an anatomical hernia repair. The patient had an uneventful recovery.

Literature review

Epigastric hernia

An epigastric hernia occurs due to a small fascial defect along with the linea alba abdominals, between 3cm below the xiphoid process and 3cm above the umbilicus in the midline [1]. These may be congenital due to incomplete midline fusion of developing lateral abdominal wall domains or acquired by heavy manual work, extreme weight gain or persistent coughing. With a prevalence of 0.5 -10%, common among the 20-to-50-year age group and in infants. It rarely occurs between the 1–18-year age group [2]. Though older studies show male predominance [3], recent studies show equal gender distribution due to women being involved in heavy physical activities [4,5].

Microscopic studies have indicated that reduced Type I collagen and higher elastin composition in abdominal wall architectur predispose to epigastric hernia [6,7]. An extra-peritoneal weak space is formed between the transversalis fascia and parietal peritoneum by perforating small blood vessels causing herniation at these weakened areas due to ongoing chronic or intermittent intra-abdominal pressures [8,9]. Any condition that increases the intra-abdominal pressure can cause the protrusion of intra-peritoneal fat and other visceral parts through the areas of ruptured or weakened linea alba resulting in epigastric hernia formation [10].

Most epigastric hernias are asymptomatic, while minority symptomatic patients usually complain of epigastric mass or swelling and epigastric pain aggravated by cough or physical training [11]. Pain is localized, varying from constant pain to acute colicky pain and can be radiated in any direction. Lying down could relieve the pain but may get aggravated by gravitational traction on irreducible content [12]. The common accompanying symptoms are nausea, vomiting, constipation, and dyspepsia [13].

Differential diagnoses of epigastric hernia are peptic ulcer disease, gallstone disease, proximal small bowel obstruction and hiatus hernia [14]. Diagnosis is mainly by physical examination, irreducible tender mass with midline defect on palpation between xiphoid and umbilicus are diagnostic clinical features of epigastric hernia, while decreased bowel sounds are a feature of strangulation or obstruction [15,16]. The masses are frequently observed in small dimensions, occasionally voluminous epigastric hernias up to 5-10 cm had been reported. There is a 20% chance of these being multiple due to more than one defect on the linea alba [17].

Epigastric hernias are categorized as false epigastric hernias, occurring commonly, contain extraperitoneal fat without a peritoneal sac protruding at defects of the linea alba. True epigastric hernias are rare and contain extraperitoneal fat lined protruding peritoneal sac, with or without abdominal viscera of intestines or omentum [7] like in our patient with ischaemic intestines which is even rare a presentation. If the defect is large, the peritoneal pouch may contain omentum, or other intra-abdominal viscera other than the peritoneal fat [18,19].

Incarceration of an epigastric hernia if occurs, very rarely could lead to strangulation at the neck of the peritoneal pouch, due to a narrow, tight neck at the linea alba. It is important to rule out bowel ischemia due to a closed-loop within the hernia sac when the afferent and efferent bowel loops are obstructed compromising blood supply to the bowel [18,20].

Commonly available USS is very effective in the diagnosis of epigastric hernia while X-ray may detect signs of mechanical ileus. Computed tomography [CT] is useful in identifying bowel complications due to incarceration, strangulation and ischaemia [4].

Surgical intervention

Epigastric hernias do not spontaneously disappear, and complications will eventually require surgery [29]. Surgery is the only recommended treatment to repair an epigastric hernia, due to the risk of the hernia enlarging and causing additional complications such as pain and tenderness, bowel obstruction, loss of domain; in which the hernia becomes so large that's nearly impossible to repair even with a mesh [30]. A complicated hernia is challenging as they have increased morbidity and mortality compared to uncomplicated hernias [31].

Epigastric hernia with bowel obstruction causing intestinal ischemia can progress to non-traumatic perforation or ischemic necrosis [32]. Repairing the hernia needs reduction of the obstruction, adhesiolysis or resection of the bowel segment. The surgery can be performed laparoscopically or as an open procedure [33]. Surgical repair of the strangulated epigastric hernia depends on the skill and choice of the operating surgeon, available resources, and the patient's general condition too. Literature has demonstrated success with laparoscopic or robotic techniques to evaluate strangulated bowel with direct visualization or more objectively with Intravenous Indo Cyanin Green [ICG] and infrared visualisation cameras to assess circulation [34,35].

Discussion and conclusion

Epigastric hernia can become a diagnostic dilemma at times. Having an open mind in assessing any clinical presentation becomes important in arriving at a working diagnosis. Clinical suspicion of a strangulated epigastric hernia, which is a rare condition led us to intervene on time. This patient being a heavy manual worker, epigastric herniation was considered in the differential diagnosis of abdominal pain owing to its location.

This patient's serum lactate levels may have remained within normal parameters due to relatively short duration of symptoms, a small segment of ischemia with full-thickness involvement or may be due to complete cessation of circulation preventing venous blood flow.

We do not have documented incidence of epigastric hernia in the Sri Lankan population, while our experience in dealing with them is limited compared to common abdominal wall hernias. Anecdotally the incidence may be less than 10% reported maximally in literature but needs to assess and report properly in the future. In addition to the rarity of the presentation of this complicated epigastric hernia without prior knowledge of its existence, low incidence of true epigastric hernias [7] and strangulation of an epigastric hernia leading to bowel ischaemia [36] led us to write this review to help surgeons not to miss this diagnosis. Clinical diagnosis and prompt intervention at the earliest following resuscitation can make a huge difference in the outcome for such a patient.

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.

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CASE REPORT

Caecal epiploic appendagitis: a rare diagnosis in a young patient with red herring right iliac fossa pain

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Keywords: Epiploic appendangitis; red herring sign; appendisectomy

Introduction

Epiploic appendagitis is an inflammation of the appendices epiploicae which are fat-filled pouches of peritoneum protruding from the colonic serosa. Appendices epiploicae are found ubiquitously in the caecum and colon except for the rectum. They were first described by Vesalius in 1543 [1], but only gained popularity in 1853 when Virchow proposed their detachment as a source of intraperitoneal loose bodies [2]. They typically emerge along the taenia (taenia Libera and omentalis), in two rows in the caecum, ascending colon, descending colon and the sigmoid colon. But, in the transverse colon, they align in a single row as the taenia omentalis provides an attachment for the greater omentum. Due to their distribution over the entire colon, inflammation of the appendages may mimic various acute abdominal conditions [3]. Here we describe the first reported case of epiploic appendagitis mimicking as acute appendicitis in Sri Lanka.

Case presentation

A 25-year-old obese young male presented to the surgical casualty with acute onset non-migrating right-sided lower abdominal pain of two days duration. He had one episode of vomiting. The painful episode was not associated with fever and his bowel opening and urine output were normal. Clinical examination revealed tenderness of the right iliac fossa (RIF) with rebound tenderness. Laboratory investigations revealed mild neutrophil leukocytosis (White cell count 11,000/uL) in the absence of an elevated C-reactive protein. Urine analysis was normal. An ultrasound scan of the abdomen revealed inflammatory changes in the RIF region and the presence of a non-compressible structure. Considering the clinical background and the ultrasound scan finding, a working diagnosis of acute appendicitis was made, and the patient underwent open surgical exploration via Gridiron incision. Intraoperatively, however, a gangrenous pedunculated epiploic appendage of 3.0x1.5x1.0cm size was noted arising from the caecum with evidence of torsion of the stalk. The appendix was normal and was seen in the vicinity of the gangrenous appendage (Figure 1). Appendicectomy and excision of the appendage were performed. Both specimens were sent for histological evaluation.

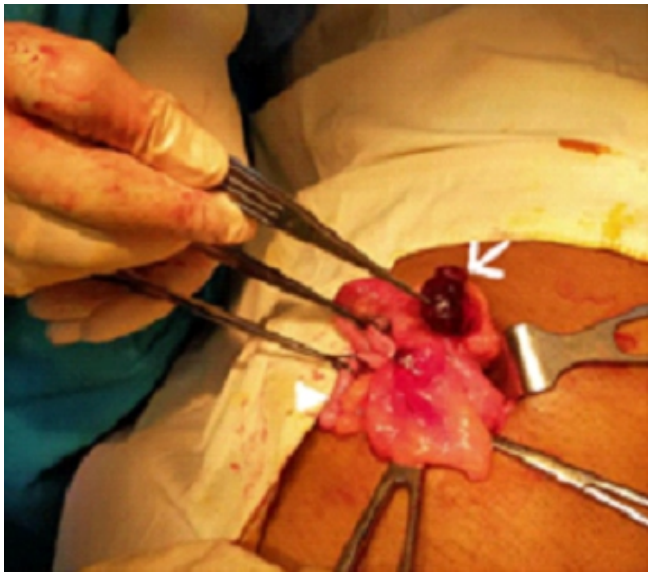

Figure 1. Caecal epiploic appendagitis secondary to torsion (Arrow) with normal looking appendix(Arrow head)

The patient had an unremarkable recovery and was discharged the following day with oral analgesics. The patient did not have any wound-related complications in the early postoperative period. The histopathology report revealed mesenteric fatty tissue infiltrated with sheets of neutrophils along with fat necrosis, haemorrhage and infarction consistent with acute epiploic appendagitis and the appendix was not inflamed.

Discussion

Epiploic appendagitis is a rare inflammatory condition of the appendices epiploicae. They are either primary or secondary. Primary epiploic appendagitis results due to ischaemic insult to the appendage following torsion compromising its arterial supply or after venous thrombosis [3,4]. Meanwhile, secondary epiploic appendagitis occurs as a result of inflammation in the vicinity.

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Incidence of primary epiploic appendagitis accounts for 8.8 cases/ 106 population per year [2]. This is a disease of the middle-aged population with the peak in the 4th and 5th decades [2,4]. However, there are isolated reports involving paediatric, young and elderly patients. There is a slight male gender predilection [3].

Appendices epiploicae which develop in the fetal life are believed to provide some degree of mechanical protection during peristalsis, to involve in the host immunity and to store fat [2]. As a result, they enlarge in size in the adults and they are larger in the obese population. These larger pedunculated masses can easily undergo torsion with subsequent appendagitis. Thus, obesity is a well-known risk factor for epiploic appendagitis. Other risk factors include intensive strenuous exercises and the presence of a hernia [3].

Epiploic appendagitis is notorious for its nonspecific sharp abdominal pain which is usually non-migrating and localized [3]. There may be features of peritonism. It can mimic an acute abdomen of various origins. A common site of appendagitis is the sigmoid colon which may mimic acute diverticulitis. Epiploic appendagitis of the caecum may mimic acute appendicitis as in our patient. Other differential diagnosis includes acute cholecystitis, ovarian torsion, salpingooophoritis, regional enteritis etc [2].

Patients may remain normothermic or may run a mild fever. Usually, they are otherwise clinically well. Inflammatory markers including white cell count and C-reactive protein may be normal or slightly high [2]. This provides the treating surgeon with a diagnostic dilemma and is often misdiagnosed.

Until the last two decades when cross-sectional imaging was not readily available, epiploic appendagitis was an intraoperative diagnosis warranting exploration with all the surgical and anaesthetic morbidities and often resulted in administration of intravenous antibiotics resulting in a prolonged hospital stay. Recent advances and increased availability of imaging like contrast-enhanced computed tomography of the abdomen resulted in the timely diagnosis of this self-limiting condition [5].

Ultrasonographic features of epiploic appendagitis include a hyperechoic non-compressible mass with a hypoechoic rim, in the absence of central vascularity as noted in the doppler study. Contrast-enhanced computed tomography which is the gold standard imaging modality identifies this as an ovoid (0.5-5cm sized) fat density lesion with surrounding inflammation and thickened parietal peritoneum. A thrombus in the epiploic vein may represent the characteristic "central dot". Magnetic resonance imaging may identify it as an oval lesion with fat tissue intensity in T1, T2 weighted images and there might be a ring enhancement with Gadolinium [4,5].

Once the diagnosis is established the patient can be safely managed with analgesics and anti-inflammatory agents like NSAIDs considering the self-limiting course of the disease [2,5]. Usually, complete resolution occurs in 7-14days [1]. However, the resolution of imaging findings takes a longer duration. Failure of resolution of symptoms or recurrent symptoms may be dealt with laparoscopic resection of the non-infected inflamed appendage, thus reducing the surgical morbidity [2].

Occasionally, epiploic appendagitis may be complicated with detachment resulting in intraperitoneal loose bodies or "peritoneal mice" formation, calcification, adhesions, abscess formation, peritonitis and intestinal obstruction [2]. Unfortunately, due to the unavailability of cross-sectional imaging, functioning laparoscopic equipment and the rarity of the condition, our patient underwent an open surgical exploration and resection of the necrotic appendage. However, the patient had an unremarkable recovery and was discharged.

Conclusion

Non-specific, non-migrating, sharp, localized abdominal pain with near-normal inflammatory markers in an otherwise stable patient should be promptly evaluated with a cross-sectional imaging to exclude rare conditions like epiploic appendagitis. Epiploic appendagitis is better managed conservatively if diagnosed preoperatively.

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.

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Learning Points:

- Epiploic appendagitis is a rare cause of acute abdomen, notoriously capable of mimicking many abdominal conditions.
- Absence of typical symptoms and characteristic features in a contrast enhanced CT abdomen helps prompt diagnosis of the condition which can be safely managed conservatively.

CASE REPORT

Synchronous gallbladder carcinoma in a patient with distal bile duct cholangiocarcinoma: a histopathological surprise

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Keywords: Synchronous; gallbladder; distal cholangiocarcinoma; pancreaticoduodenectomy; anomalous pancreatic biliary duct junction

Introduction

Double malignancies of the biliary tract are rare. They could be either metachronous or synchronous, and much of the knowledge on synchronous biliary tract malignancies come from Japanese literature [1, 2].

The simultaneous presence of malignancies could be due to synchronous primary or metastasis. The majority of synchronous carcinomas identified in Japanese literature are linked to an abnormal pancreatic biliary duct junction [APBDJ]. However, this is not a requirement for the development of synchronous extrahepatic biliary tract cancers [1]. A few Indian studies have hypothesized the possible aetiopathogenesis, diagnosis and the best way to treat them [5]. Here we report a case of synchronous primary gallbladder carcinoma in a patient with distal cholangiocarcinoma.

Case presentation

A 55-year-old female presented with complaints of right-sided abdominal pain, back pain for 4 months, loss of appetite for 3 months and obstructive jaundice for two weeks. She was referred from a local hospital due to progressively elevated liver enzymes and gallbladder calculi in an ultrasound scan.

On examination she was icteric and a tender globular mass was palpable in the right hypochondrium. A clinical diagnosis of obstructive jaundice due to malignant obstruction distal to the insertion of cystic duct was made.

Ultrasound scan of the abdomen found more than 20 mobile calculi measuring 5 - 10 mm in the gallbladder without evidence of acute cholecystitis. The common hepatic duct was dilated up to 10mm without intrahepatic duct dilatation. The liver was grossly enlarged with grade 2 fatty liver.

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MRI/MRCP showed an irregular stricture with shouldering in the common bile duct [CBD] immediately above the pancreatic head with proximal CBD [diameter 14mm] and intrahepatic duct dilatation. No calculi were seen in the CBD. Dilated biliary ducts showed a beaded outline. The gallbladder was distended and contained multiple calculi. The gallbladder wall was not thickened. No definite masses were seen in the pancreatic head.

The patient was discussed at the multi-disciplinary team meeting [MDT] and was concluded to have a tumour in the distal CBD with intact common hepatic duct and the biliary confluence. Since there was no evidence of vascular invasion and distant metastasis, Pancreaticoduodenectomy [Whipple's procedure] was planned after optimization.

The patient underwent a Whipple's procedure. The specimen showed an irregular circumferential growth of the distal CBD. At surgery, the gall bladder was noted to be a mildly distended with stones in situ without significant wall thickening [Figure 1]. The post-operative period and recovery was uneventful.

Histopathological examination showed synchronous malignant tumours arising in the distal CBD and fundus of the gallbladder [Figure 2]. Microscopic sections revealed extrahepatic cholangiocarcinoma of pancreaticobiliary type involving the distal CBD with clear resection margins, regional lymph nodes and adenocarcinoma of the gallbladder involving the muscularis propria without invasion of the serosa.

Pathological staging of pT3pN1pMx [Stage III or higher] for distal CBD cholangiocarcinoma and pT2aNxMx [stage IIb] for adenocarcinoma of gallbladder were made. Post-surgery, the patient was referred to an oncologist for adjuvant chemo-radiotherapy and further radiotherapy to the gallbladder to be discussed. The repeat MRI in three months showed a normal gallbladder bed and liver.

Table 1. Biochemical profile of the patient at presentation

Investigation	Value	Unit
Hb [haemoglobin]	11.4	g/dL
AST [aspartate aminotransferase]	119	IU/L
GGT [gamma-glutamlytransferase]	901	IU/L
ALT [alanine aminotransferase]	322	IU/L
ALP [alkaline phosphatase]	813	IU/L
Protein, total	73.9	g/L
Bilirubin, total	4.66	mg/dL

Discussion

Synchronous gallbladder and bile duct malignancies are rare. Approximately 5 -7.4% of patients with bile duct carcinoma had synchronous carcinoma of the gallbladder [1]. The reported incidence of multiple tumours of the extrahepatic biliary tract and the association with unsuspected gallbladder cancers are higher[3], probably due to inadequate sampling of the gallbladder when performing the extrahepatic bile duct malignancy resection.

The simultaneous presence of two malignant tumours is frequently mistaken for metastasis from a primary tumour elsewhere in the biliary tree. To distinguish these two entities, the following characteristics are used: 1] There is no direct continuity between the two tumours. 2] The growth patterns are typical of primary tumours. 3] There is a clear histologic distinction between the two tumours. [3]. All three criteria were fulfilled in our patient; the adenocarcinoma of the gallbladder was at an early stage [pT2aNxMx- stage IIa] whereas the cholangiocarcinoma of distal CBD was more advanced [pT3pN1Mx- stage III or higher]. Both were accounted for as primary adenocarcinoma by the pathologist as they had the primary growth patterns. Anyway, these measures may not be adequate to affirm the synchronicity of extrahepatic biliary malignancies, subsequently, Kurosawa et al have indeed encouraged a mapping method to affirm the uniqueness of the two lesions[1].

The aetiopathogenesis of synchronous extrahepatic biliary cancers has not been properly understood. Anomalous pancreaticobiliary duct junction [APBDJ] is an important aetiology as it is thought to be due to the effects of pancreatic juice reflux on the mucosa of the biliary tract [4]. In our case the normal pancreatic biliary duct junction was demonstrated in MRCP imaging, supporting that synchronous extrahepatic malignancy can occur even with a normal pancreatic biliary duct system [5].

Field cancerization is explained by the biliary tree being exposed to concentrated bile, bile salts and bile acids for a long term, affecting lining epithelium and consequently on carcinogenesis. Adenocarcinoma of the gallbladder generally arises due to the metaplasia dysplasia-carcinoma sequence and chronic inflammation increase the frequency of expression of intestinal goblet cells and p53 mutation [6]. Intraepithelial spread may also contribute as an aetiology, especially in patients with papillary adenocarcinomas [7].

The presence of the gallbladder carcinoma was a histopathological surprise; as we were unable to diagnose gallbladder malignancy preoperatively. Since the post-resection status of the cholangiocarcinoma was R0 with regional lymph nodes the patient had to undergo adjuvant chemo-radiotherapy and re-imagining in three months for two years. The repeat MRI liver was normal in this case. Although the gallbladder resection margins were negative with negative lymph nodes following classic cholecy-stectomy, MDT decided to follow up with regular imaging rather than offering resection of the gallbladder fossa and regional lymphadenectomy – considering the surgical morbidity. In case of evidence of probable recurrence, radiotherapy to gallbladder fossa was contemplated.

Conclusion

The finding of extrahepatic biliary tract malignancies is becoming more common than previously believed. The preoperative diagnosis of such cases is rarely made. Therefore aggressive resection and careful histopathological examination are essential for successful management and diagnosis of these special cases.

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.

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Learning Points:

- A careful preoperative assessment of the anatomy of the biliary tree as well as the gallbladder in patients going through pancreaticoduodenectomy should be done.
- Adequate sampling of the gallbladder might be significant in recognizing early lesions in patients with extrahepatic cholangiocarcinomas; We recommend that all gallbladders resected with the bile ducts for cholangiocarcinoma be inspected intraoperatively, and any suspicious lesions undergo frozen section examination.

CASE REPORT

Precise identification of the segmental anatomy of lung improves the outcome of thoracoscopic lobectomy

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Keywords: Thoracoscopic lobectomy; congenital cystic lung lesions(CLL); congenital pulmonary airway malformation (CPAM)

Introduction

Congenital Cystic Lung Lesions(CLL) comprises a broad spectrum of bronchopulmonary malformations of the lung encompassed in the recent terminology of Congenital Thoracic Malformations(CTM).

These lesions could be detected antenatally or present with respiratory distress postnatally. However, as in our case, they can remain asymptomatic until later life. Pulmonary lobectomy is the definitive surgical intervention for these lesions, which is traditionally done through posterolateral thoracotomy. Video-Assisted Thoracoscopic Surgery(VATS) has recently emerged as a technique for lung lobectomy with equivalent complication rates.

Case presentation

A 15-year-old girl was found to have a cystic lesion in the right lower lobe of the lung while being investigated for an acute lower respiratory tract infection. In the chest x-ray and contrast-enhanced computerised tomography (CECT) of the chest, the lesion was visible with a fluid level.

Thoracoscopic right lower lobectomy was planned as the definitive treatment for the cystic lung disease once the infection was completely treated. The procedure was done under general anaesthesia with endotracheal intubation. Lung collapse was achieved with CO2 insufflation of the thoracic cavity at a pressure of 12 mmHg with a flow rate of 2l/min after the initial port placement. Progressive collapse of the right lung was achieved with CO2 pneumothorax.

The objective of the operation was to remove the right lower lobe without injury to vascular and bronchial structures to the middle and the upper lobe. Division of the inferior pulmonary ligament led to the exposure of the inferior pulmonary vein. In our patient the major fissure was complete and there were no inflammatory adhesions.

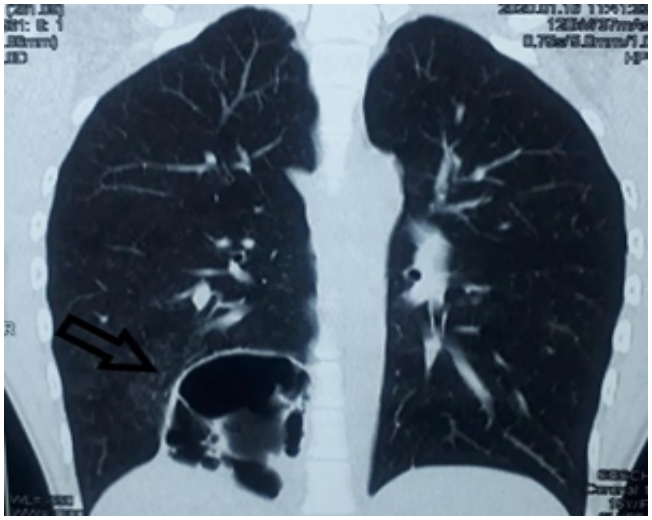

Figure 1. Contrast enhanced computerized tomography of the chest showing the right lower lobe cystic malformation. Arrow indicates the lesion.

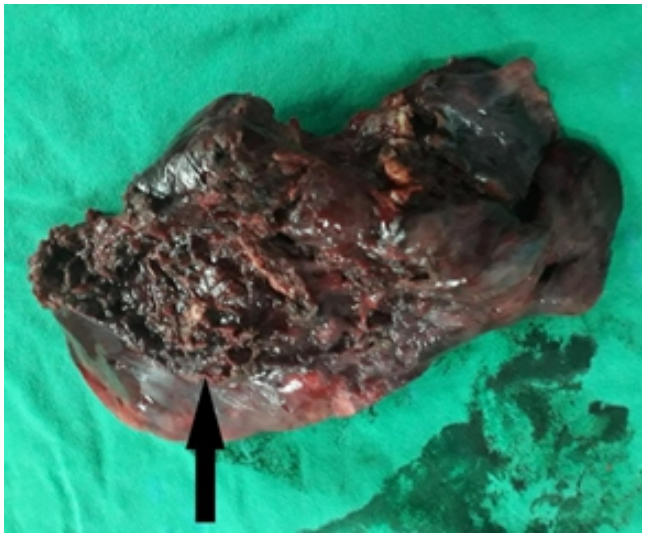

Figure 2. The resected right lower lobe of the lung. The arrow indicates the cystic lesion.

Branches of the pulmonary artery were identified superficially on the fissure which was carefully dissected and divided before accessing the pulmonary vein and bronchial branches. The branches of the pulmonary artery, bronchus,

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and vein were taken by ultrasonic dissector, endo clips and staples where necessary. After the division of the pulmonary artery branches, bronchial branches were divided. In our patient, the superior segment bronchus was occluded and divided separately, and then the trunks to the basal segments were taken separately. Branches of the inferior pulmonary vein were occluded and divided last.

She was discharged in two weeks following the surgery. Up to now, her exercise tolerance is as well maintained as before. The histology of the resected lobe revealed a congenital pulmonary airway malformation (CPAM).

Discussion

Clinical presentation of congenital cystic lung disease widely varies. It could be detected antenatally or postnatally. Of the babies who are born, approximately one-quarter will be symptomatic at birth with abnormal breathing and respiratory distress in whom surgical intervention is indicated [1].

Formal lobectomy is the recommended surgical treatment for the CLL [2,3]. Conventionally, lobectomy was performed as an open surgical procedure through posterolateral thoracotomy. However thoracoscopic lobectomy has emerged as a feasible, well accepted and standardised technique in children [4].

During thoracoscopic surgery, lung collapse is either achieved by single lung ventilation or insufflation of CO2. A large series by Rothenberg et al. revealed CO2 pneumothorax alone could achieve satisfactory lung collapse [4]. In our patient, a similar strategy was adopted to achieve lung collapse by creating pneumothorax of 10-12 mmHg.

If the major fissure is incomplete it should be completed before accessing the vascular and bronchial branches of the fissure. Pulmonary artery branches are dissected preferably at the segmental level before the division of the bronchial and pulmonary venous branches. In some patients, the posterior segmental artery to the lower lobe arises from the posterior ascending branch to the upper lobe, which could be injured if not adequately exposed in the dissection of the fissure [5] Inferior pulmonary vein is identified after the division of the inferior pulmonary ligament. Exposure of the inferior pulmonary vein is very important before attempting control of its tributaries, in case an inadvertent injury occurs to the vein. The division of bronchial branches before the division of venous branches gives excellent exposure for the dissection of veins [4]. If the lobar bronchus is too large, segmental bronchial branches should be taken separately. Anatomically bronchial branches follow the same anatomical arrangement as the pulmonary artery branches in the major fissure.

Thoracoscopic lobectomy for CLL is known to cause many intraoperative and postoperative complications, however, overall morbidity and complication rates have been relatively low compared to open approaches [6,7]. In the review by Rothenberg et al., the overall rate of complication was 3.3% with air leak reported in 3 patients (0.8%) [4].

Long-term functional outcomes following thoracoscopic lobectomy have been excellent in children.

Conclusion

Thoracoscopic lobectomy for congenital cystic lung disease in children is a feasible and safe procedure. Precise spatial identification of anatomical structures of the lung and mediastinum is of vital importance for success in minimal access thoracic surgery.

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.

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Learning Points:

- Precise identification of segmental anatomy of the lung is imperative for successful completion of thoracoscopic lung lobectomy.
- Ultrasonic dissector, clips and stapling devices are necessary for control of vascular and bronchial structures in a thoracoscopic lobectomy.
- Thoracoscopic lung lobectomy is safe and feasible in children.

CASE REPORT

Uncommon pathology in a common surgical emergency: giant appendiceal mucocele with malignancy mimicking appendicitis

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Keywords: Appendix; mucocele; hemicolectomy; mucinous cystadenoma

Introduction

Acute appendicitis with its classic symptoms of right lower abdominal pain, fever and vomiting is well-known, however, symptoms arising from the appendix can occasionally be atypical particularly when there are some rare underlying pathologies within. One such pathology is an Appendiceal Mucocele. It is usually discovered incidentally at the surgery or during radiological evaluation done for unrelated complaints. Surgical options can be a simple standard appendicectomy, partial caecectomy, ileocaecectomy or even right hemicolectomy, the ultimate goal being the attainment of clear margins. It is recommended that surgery be offered for all appendiceal mucoceles because of the risk of underlying malignancy. Here we present a case of a giant appendiceal mucocele with an underlying malignancy which was successfully treated by a laparoscopic limited right hemicolectomy.

Case presentation

A 62-year-old gentleman presented with lower abdominal pain and increased frequency of micturition for a few days. An ultrasound scan of the abdomen revealed a large cyst in the appendix with prostatomegaly. His vital signs were normal. Abdominal examination revealed a mildly tender, well-defined lump in the right iliac fossa. Contrast-enhanced computed tomography of the abdomen revealed a 15 cm x 6.2 cm x 6.3 cm tubular cystic lesion in the right iliac fossa arising from the ileocaecal junction suggestive of appendiceal mucocele (Figure 1). We, therefore, proceeded with laparoscopy. At laparoscopy, the findings were confirmed (Figure 2). Given the possibility of malignancy in such a large appendiceal mucocele, a limited right hemicolectomy was performed. His postoperative course was uneventful. Histopathological examination confirmed mucinous cystadenoma of the appendix, both proximal and distal resection margins were clear and there was no regional lymph node involvement. The patient is currently doing well and is under follow up.

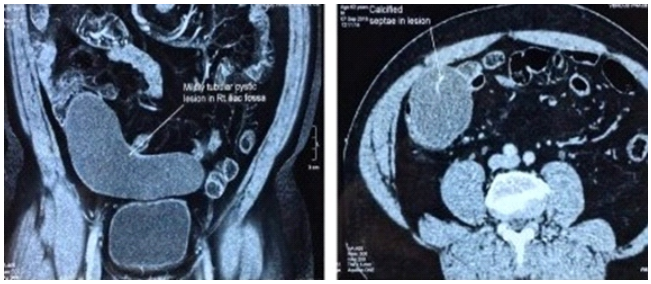

Figure 1. CECT abdomen showing a giant tubular fluid-filled mucocele of the appendix (Left – coronal view, Right – axial view)

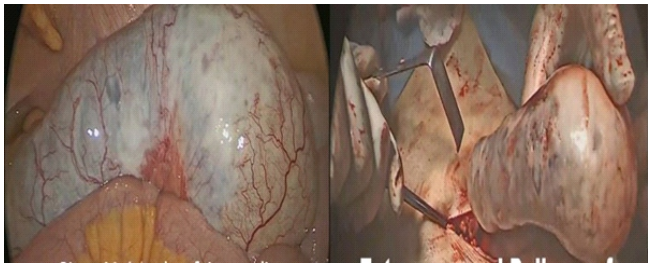

Figure 2. Large tubular structure in right iliac fossa (Left – Laparoscopic view, Right – Extracorporeal view after delivery of ileocaecal junction)

Discussion

Appendicular mucocele is a rare condition where there is a cystic tubular dilatation of the appendiceal lumen. It occurs in patients in their 5th or 6th decades and there is a slight female preponderance. They are often asymptomatic, however, they can present as acute appendicitis. Rarely they can present with bowel obstruction or gastrointestinal bleeding due to intussusception, genitourinary symptoms due to obstruction of the right ureter or bladder or generalized peritonitis from a rupture [1,4]. The relevance of appendiceal mucocele in the spectrum of appendiceal tumours was not clearly defined until recently when the Peritoneal Surface Oncology Group International (PSOGI) developed a consensus classification that has helped to resolve much of the confusion surrounding the diagnostic terminology. Accordingly, mucinous lesions of the appendix are divided into 1) Non-neoplastic appendiceal mucinous lesions (also referred to as inflammatory or obstructive mucoceles) like simple mucoceles or retention

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cysts characterized by degenerative epithelial changes secondary to obstruction due to faecolith and 2) Neoplastic appendiceal mucinous lesions which include a) Serrated polyp with or without dysplasia, b) Mucinous neoplasms – either a low-grade appendiceal mucinous neoplasm (LAMN) or as high-grade appendiceal mucinous neoplasm (HAMN) and c) Mucinous adenocarcinomas which can be well, moderately or poorly differentiated mucinous adenocarcinomas [1].

Radiological studies, in particular, Contrast-enhanced computed tomography and ultrasound abdomen can diagnose appendiceal mucoceles, however, they cannot definitively distinguish between non-neoplastic and neoplastic lesions. On most occasions, neoplastic lesions are generally larger (measuring more than 2 cms) compared to non-neoplastic lesions. The presence of soft tissue thickening, wall calcifications and wall irregularity, but not an increase in wall thickness, are suggestive of malignancy. The presence of ascites with hypodense peritoneal lesions and scalloping of the liver surface suggests the intraperitoneal spread of neoplastic cells from a ruptured mucinous neoplasm [2].

Surgical resection is recommended for all appendiceal mucinous lesions. As there are no reliable criteria to exclude benign from malignant lesions, surgery should be pursued even for a benign-appearing appendiceal mucocele on imaging studies. An earlier laparoscopic approach was not advised because of the risk of rupture but now with increasing expertise, more surgeons are favouring the laparoscopic approach. The decision on whether to perform the surgery, laparoscopic or open is largely dependent on the surgeon's expertise [3]. In either case, the principles followed have to be the same, which include resection of the appendix, wide excision of mesoappendix to facilitate retrieval of all peri-appendiceal lymph nodes and careful assessment of the base of the appendix to exclude any extension into the caecal wall. In patients with a positive margin at the appendix base or positive peri-appendiceal lymph nodes, a right hemicolectomy is warranted [3,4]. A more aggressive approach such as a radical resection, removal of all gross implantations and hyperthermic intraperitoneal chemotherapy (HIPEC) is recommended in cases of ruptured appendiceal mucinous neoplasms that have to lead to Pseudomyxoma Peritonei (PMP) [1].

The prognosis of appendiceal mucinous lesions is closely associated with the histopathology, presence and extent of peritoneal spread. Prognosis in benign lesions is excellent with a 5-year survival rate of 91% to 100% after standard appendicectomy. Neoplastic lesions, particularly high-grade appendiceal mucinous neoplasms (HAMNs) have a more guarded prognosis even after curative resection. Histopathologic features such as the presence of extra-appendiceal neoplastic epithelium, high-grade cytology, architectural complexity and invasion are important predictors of recurrence. Prognosis is worse for mucinous adenocarcinomas, particularly if the appendiceal mucocele ruptures into the peritoneal cavity. Therefore all of these patients need to be under surveillance. Tumour markers such as Carcinoembryonic antigen (CEA), Ca 19-9 and Ca 125 can be elevated in patients with advanced appendiceal mucinous lesions and the levels correlate with treatment outcomes [5]. Currently, there are no guidelines for post-treatment surveillance but it is advised according to the histology, grade and completeness of surgery[1,5].

Conclusion

Appendiceal mucoceles or appendiceal mucinous lesions can present as appendicitis. They are difficult to diagnose clinically. Computed Tomography of the abdomen is essential. Large sizes of mucoceles should raise suspicion of underlying malignancy. Appropriate and timely surgical resection with clear margins leads to excellent post-op recovery and oncological outcomes, however, these patients require close follow-up.

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.

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Learning Points:

- Appendiceal mucoceles, both benign and malignant can present as acute appendicitis
- There are no pre-op tests to convincingly differentiate benign from malignant appendiceal mucoceles
- Surgical excision with negative margins should be the treatment of choice for all appendiceal mucoceles and these patients require close postoperative follow-up.
- Laparoscopic excision can be offered in safe and experienced hands