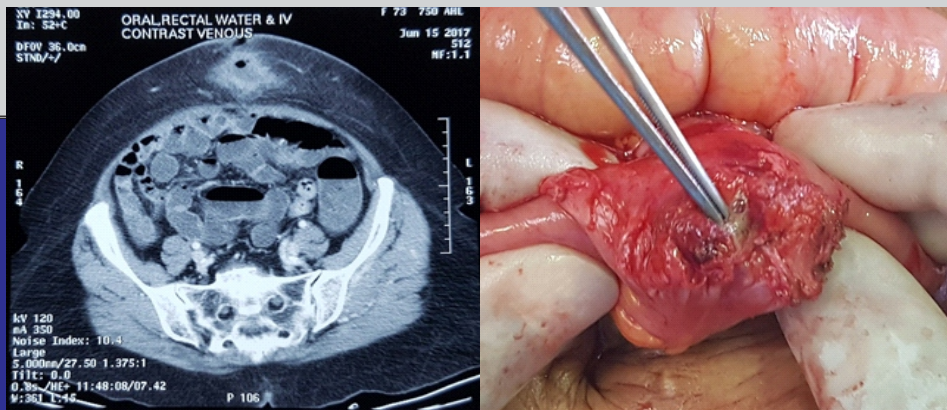




# THE SRI LANKA JOURNAL OF SURGERY

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## In this issue

- Diagnosis and management of colovesical fistulae
- A descriptive analysis of lung and pleural tumours
- Pathological analysis of mediastinal masses
- Communication failures in surgery in the Asia Pacific region
- Portal vein variations in Sri Lankan patients

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# The Sri Lanka Journal of Surgery

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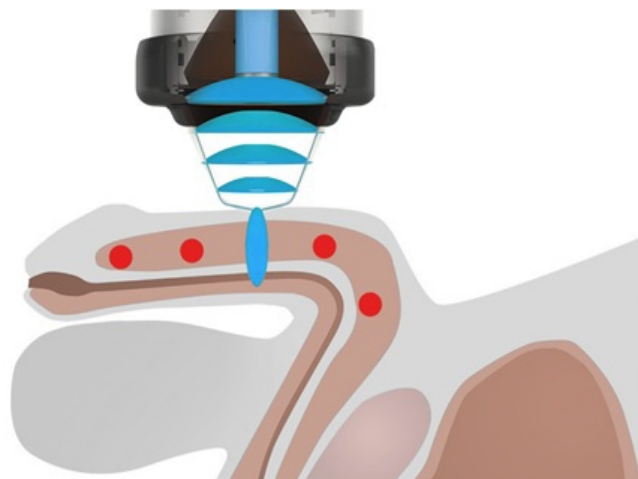
## A centre dedicated for men's health and wellbeing for the first time in Sri Lanka - End your suffering with an effective treatment for Erectile Dysfunction

Lanka Hospitals PLC, a premier health care provider in Sri Lanka, announces its latest addition to the Centres of Excellence- the Male Wellness Centre (MWC) – in a bid to offer services to improve health and wellbeing of men. It's also significant that a fully-fledged wellness centre dedicated solely for men has been established for the first time in Sri Lanka.

The MWC caters to a host of services including Personnel fitness scheduling and programming, Sport health and injury management, Dietary & Nutritional advices, Pre-marital counseling and health screening, Management of premature ejaculation, Management of Erectile dysfunction, Cosmetic surgeries (Bariatric / Ocular / Dental). In addition to the General health screening, patients can obtain screening for Liver, Kidney, Respiratory, Cardiac, Diabetic, Endocrine-Hormonal, Cancer and Sexually Transmitted Diseases in addition to Substances and Alcohol abuses. Furthermore, apart from leading physicians MWC offers the service of competent consultant specialists such as Cardiologist, Endocrinologist, Diabetologist, Venerologist, Urologist, Nephrologist, Oncologist, Surgeon, Vascular Surgeon, Psychiatrist as well as Counsellor.

Erectile Dysfunction (Impotence) is a common health issue suffered by men, defined by the difficulty in achieving and maintaining a penile erection during sexual intercourse. In the Sri Lankan context, the issue is hardly brought into light especially by those who suffer and often show reluctance to seeking proper medical attention. Often, incorrect and misleading advice not only aggravates the issue, but also lead them to face unwanted complications. A special Shock Wave Therapy unit was established within the Male Wellness Centre by the Lanka Hospitals to specifically treat impotence.

The Centre conducts in-depth studies and comprehensive medical analysis to precisely identify the causes for impotence such as Vascular, Psychogenic, Neurological, Hormonal, Structural and others. Being a newer and less invasive way to treat this common sexual challenge shock wave therapy has proven to be effective even when oral medication has failed. Also known as penile extracorporeal low-intensity shockwave therapy, this method involves the use of low intensity acoustic pulse waves that lead to release of factors which promote growth of new blood vessels in the penis. Therapy comprises of a handheld device being angled towards the shaft of the penis. One of the main advantages of this treatment method is that it has no clinically relevant side effects. Each treatment session can last approximately 20 minutes.



**Figure 1.** Shock wave therapy

Shock wave treatment is a completely painless way to treat what can be a life altering condition and a regular course of treatment usually comprises of six sessions. The frequency of these session can be tailor made as below and would be decided by the consultant:

- 1) Every day for 6 days
- 2) Every second day over an 11 day period
- 3) Twice a week for 3 weeks

The outcomes include gaining of more frequent erections, more rigid erections, ability to maintain an erection and perform entire act of sexual intercourse and freedom to reduce or omit medication. Therefore the use of a treatment which researchers claim is “really a breakthrough” could be good news for men who have erectile dysfunction.

As a hospital staying abreast with latest medical technology, Lanka Hospitals established Male Wellness Centre in a bid to provide world class health care services to Sri Lankan as well as International patients. Moreover, when catering to health issues and conditions that are highly sensitive and personal, Lanka Hospitals delivers complete confidentiality to its patients with the assistance of its specially trained staff.

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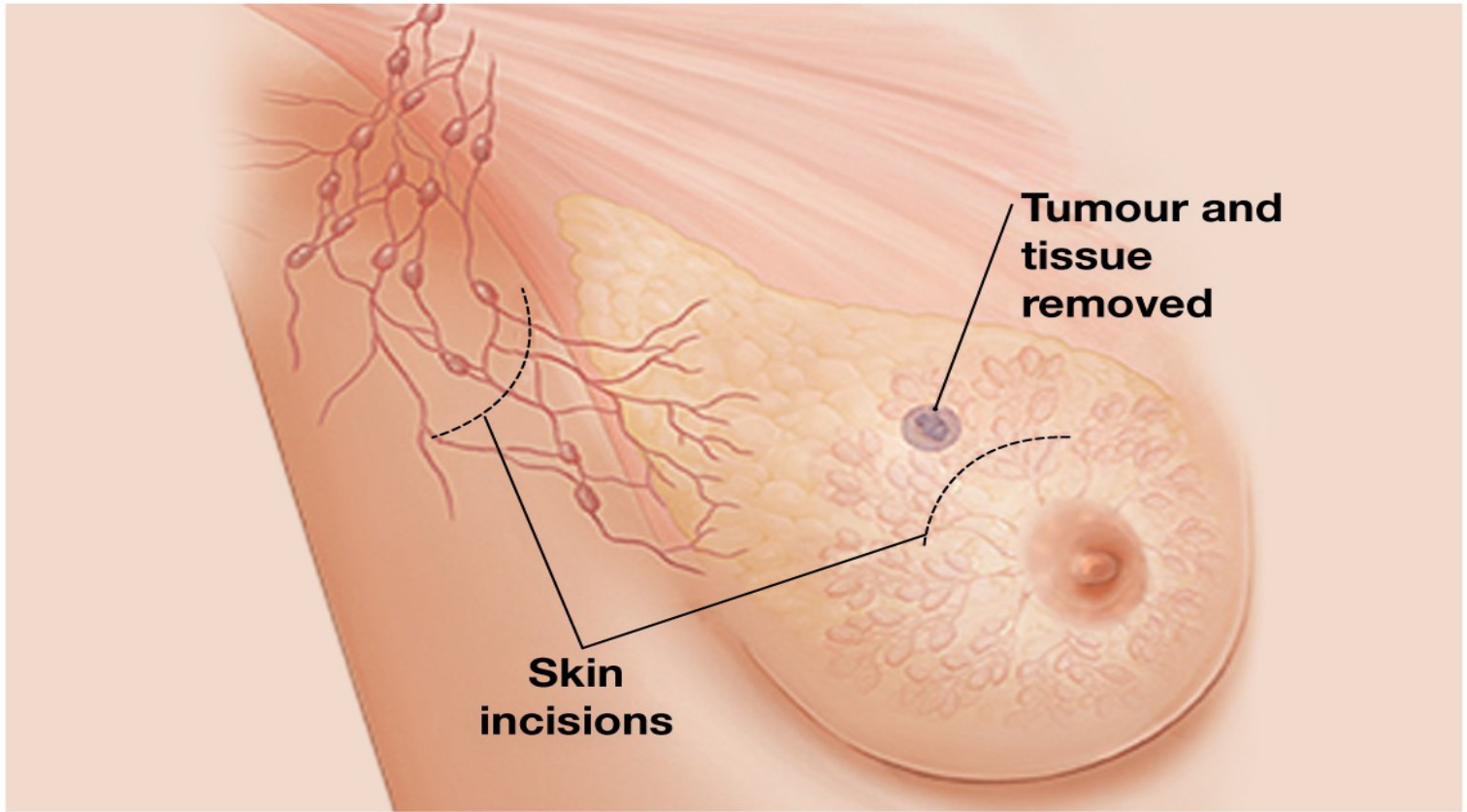
- Each session duration: 20-30mins
- Usually performed twice a week for 3 weeks
- The sessions can be tailored on patient preference after discussing with the Consultant Genito-Urinary Surgeon or Physician



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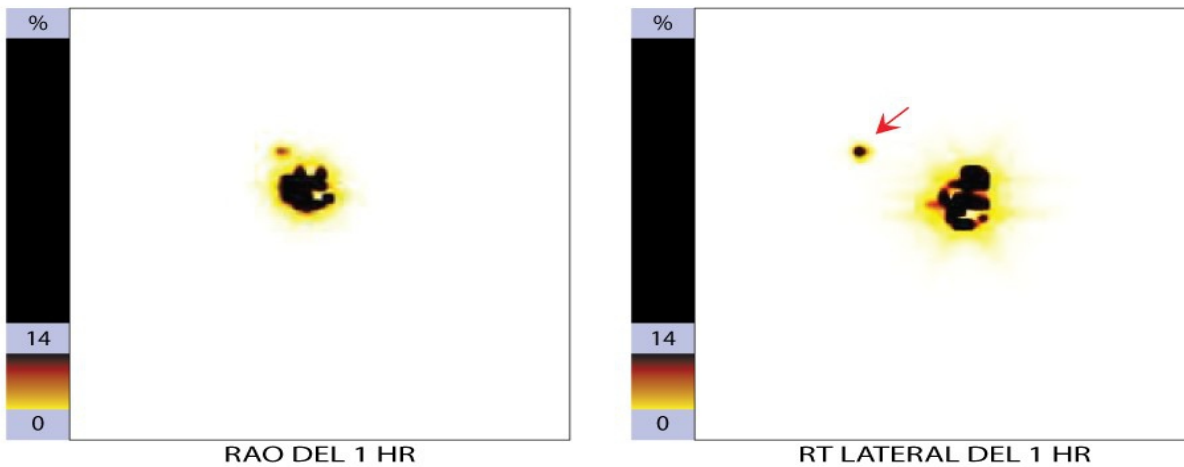


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## Diagnosis and management of colovesical fistulae

Rehan T Gamage<sup>1</sup>, M. G. S. R. Kumara<sup>2</sup>, A. L. A. M. C. Ambegoda<sup>2</sup>, Anuruddha M Abeygunasekera<sup>2</sup>, Amal Priyantha T G<sup>1</sup>, S. Thoufeek<sup>3</sup>

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**Keywords:** Colovesical fistula; diverticular disease; faecaluria; pneumaturia

### Abstract

### Introduction

Colovesical fistulae (CVF) are the relatively uncommon presentation in colorectal surgical practice. However, the rarity of the disease gives rise to problems in diagnosis and treatment as adequately powered data is lacking in published literature. Furthermore, the aetiology of CVF in Asia differs from the West which plays an important role in patient management.

### Methods

The records of all the patients with CVF managed in the Gastrointestinal and Urological surgical units of a tertiary care centre over a nine-year period were collected and analysed. Follow-up data have been collected prospectively to assess the outcome.

### Results

A total of 11 patients (M: F=9:2) with a median age of 59 years were studied. Faecaluria, pneumaturia and recurrent urinary tract infections were the commonest presenting symptoms. The diagnosis was based on clinical evaluation. Cystoscopy, colonoscopy and CECT were utilized to identify the underlying pathology, complications and for staging. Commonest benign pathology was diverticular disease (n=7), followed by tuberculosis (n=1). Adenocarcinoma of the sigmoid colon and squamous cell Carcinoma of the bladder were reported in three patients. Majority of patients (n=9) were managed successfully by open-left colonic resection with or without temporary ileostomy and bladder repair, while inoperable patients were managed with a stoma.

### Conclusion

CVF is a relatively uncommon condition in our setup and mostly related to isolated diverticular disease of the sigmoid

colon. Diagnosis of CVF can be made with accuracy by proper clinical assessment. Cystoscopy and LGIE are essential components of the diagnostic workup of a patient with suspected CVF. During surgery, segmental resection of the colon is favoured than local repair.

### Introduction

Abnormal communication between bladder and colon is a recognized disease entity in gastrointestinal and urological surgery. The sigmoid colon is more frequently involved in colovesical fistulae (CVF) than the rest of the colon. The first report of a CVF was in 1685, and it was scientifically described by Harrison Cripps in his landmark paper in 1888 (1). Diverticular disease, inflammatory bowel disease and malignancies of colon and bladder are the commonly recognized causes of CVF (2).

However, the rarity of CVF gives rise to problems in diagnosis and management as adequately powered data is lacking in published literature. Moreover, underlying aetio-pathology complicates the situation which seems to be different in Asia when compared to the Western world (3). Lack of data on CVF from Sri Lanka makes the preparation of tentative guidelines on management strategies difficult. When considering the impact of colovesical fistula on the quality of life of these patients, early diagnosis and evidence-based management are critically important. Therefore, we decided to analyse the data from a group of patients with CVF, who were managed in gastrointestinal and uro-surgical units in a tertiary care centre of Sri Lanka.

### Methods

The records of all patients who had treatment for CVF in the Gastrointestinal and Urological surgical units of Colombo South Teaching Hospital from 1.1.2010 to 31.12.2018 (9 years) was collected. Demographic data, nature of the presentation, investigations carried out and interventions performed in all patients were analysed. Follow-up data have been collected prospectively to assess the outcome. Approval for the study was obtained from the Ethics Review Committee of the Institute.


### Results

Hospital records of eleven patients with CVF were identified.

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The male to female ratio was 9:2. Age of presentation varied from 38 to 76 with a median of 59 years. Commonest method of presentation was faecaluria (n=10) followed by recurrent urinary tract infections (n=6) and pneumaturia (n=1).

Cystoscopy and lower gastrointestinal endoscopy (LGIE-flexible sigmoidoscopy or colonoscopy) were carried out in all patients. Fistula tracts were detected by cystoscopy in 7 patients. On the other hand, LGIE was not able to identify the fistula in any of the patients. Contrast enhanced CT Abdomen and pelvis (CECT) was carried out in four patients which revealed features such as hydronephrosis, thickened sigmoid colon and air in the bladder. However, fistula tracts were not identified in CECT scans. When considering the anatomy of fistulae, all patients had fistula tracts between the sigmoid colon and the posterior wall or dome of the bladder.

The most common underlying pathology was diverticular disease (n=7) of the sigmoid colon. Other causes included adenocarcinoma of the sigmoid colon (n=2) and tuberculosis (n=1). One patient came with fecaluria two weeks after transurethral resection of a bladder tumour done elsewhere. The histopathology of the bladder tumour was squamous cell carcinoma.

Open surgical procedures were carried out to treat our patients. Sigmoid colectomy with colo-colic anastomosis, repair of bladder defect in two layers and inter-positioning of the omentum was the procedure performed in patients with benign pathologies. Out of those, one patient was managed initially by local repair of the sigmoid defect instead of segmental resection due to extensive adhesions. That patient had an early recurrence and underwent colectomy later with a successful outcome. Except for the patient with undiagnosed tuberculosis, all patients who underwent laparotomy and repair of the CVF had an unremarkable recovery.

Undiagnosed tuberculosis patient had persistent fever postoperatively and further investigations revealed tuberculosis and treatment initiated. Later, histopathological assessment of the resected CVF specimen confirmed the disease. The patient who developed the CVF after TURBT was in ASA III category due to cardiac disease and diabetes mellitus. She has had surgery for ovarian carcinoma 18 years ago. As she was having severe urinary sepsis, defunctioning colostomy was done but she succumbed three days later due to cardiac failure.

When considering the patients with malignant pathologies, one patient with sigmoid colon malignancy had undergone anterior resection with defunctioning ileostomy, cystectomy and ureterosigmoidostomy and survived only for three months. Other patient presented five years after a reversal of

Hartman procedure, which was performed due to recto-sigmoid carcinoma. Defunctioning ileostomy was performed as the patient was not operable due to acute on chronic renal impairment and early mortality was reported.

## Discussion

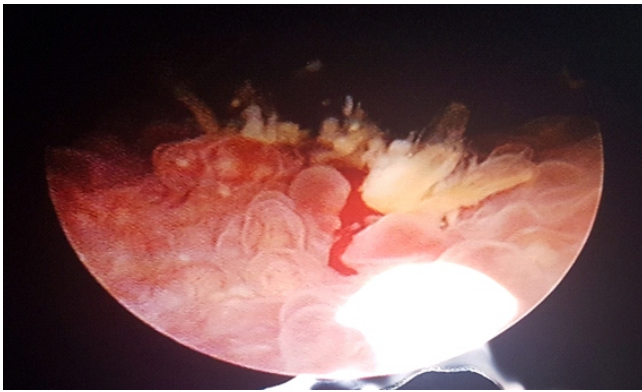
Colovesical fistulas are less common in females and it is believed that uterus acts as a barrier between colon and bladder (4). This was evident in our case series too. Diverticular disease of the sigmoid colon is the commonest reason for CVF in our patients, which is similar to western literature (1). It is responsible for CVF in two-thirds to three-fourths of cases (3, 5, 6).

Interestingly, prior to this presentation our patients with diverticuli causing CVF did not have any complications of diverticular disease. On the other hand, we did not encounter Crohn's disease induced fistulae probably due to the low prevalence of the disease in Sri Lanka (7). Bladder carcinoma leading to CVF is rare and when it happens is usually due to squamous cell carcinoma of the bladder which constitutes only about 1-3% of bladder malignancies (1, 8). This was true in our case with bladder cancer causing the CVF too.

In our case series mainstay of diagnosis was clinical, and investigations were performed to identify underlying pathologies and for staging purposes of cancer detected. Faecaluria and pneumaturia are considered as pathognomonic features of colovesical fistula, and the majority of our patients had these symptoms (2). Emphysematous cystitis is the only other cause which can cause pneumaturia and it is extremely rare (2). However, patients hardly divulge these symptoms by themselves unless questioned directly as they consider faecaluria and pneumaturia are medically insignificant and describe recurrent urinary sepsis as the main problem.

Therefore, focused history taking and clinical evaluation are invaluable for prompt diagnosis. Historically poppy seed test was a simple but very useful bedside test to diagnose a CVF (2). Orally ingested poppy seeds were collected from urine confirming the presence of a connection between the bowel and bladder. With the advent of sophisticated investigations, this has become obsolete. The Bourne test where voided urine after barium enema is spun down and imaged for contrast is also not done anymore as barium enema itself has been replaced by LGIE and CECT scanning (9).

LGIE was performed in all the patients to exclude an underlying malignancy or strictures and to detect diverticular disease rather than to identify the fistulous tract. In contrast, cystoscopic evaluation has a higher sensitivity in the identification of the fistulous opening (2, 3, 4). Fistula appears as a localized area of erythema and congestion in the early



**Figure 1.** Bullous oedema of bladder mucosa around the opening of the fistula. Faecal particles are seen in yellow colour.

stages and becomes papillomatous when it matures and very rarely seen as a clear defect in the bladder wall [Figure 1]. Therefore, careful observation of the abnormal area of the bladder for a few minutes is useful, which often reveals the inflow of faecal particles or purulent material into the bladder. If not, an inexperienced clinician may assume the findings as just a bladder tumour and will be disappointed with benign histology of the biopsy and would lead to repeated biopsies and delay in diagnosis. CECT was performed in our patients selectively, even though it is considered the most accurate diagnostic tool to assess the extraluminal pathologies which is the usual cause of the CVF. According to our experience CECT was not useful in identifying the fistulous tract in most cases. Most authors agree that radiological definition of a CVF is notoriously difficult (3). Hence, a normal CECT could not exclude the possibility of a CVF. However, some authors believe that CECT, barium studies, and cystography are superior to lower GI endoscopy & cystoscopy in CVF diagnosis (6). Staging of colonic malignancy and suspected pelvic collections were the main indication for CECT in our patients.

Segmental resection and local repair are the main modalities of reported surgical interventions in colovesical fistula (3). Resection of the involved segment of colon is vital to achieve satisfactory healing and to prevent a recurrence. According to our results too, colonic resection and anastomosis is the most appropriate strategy. Single stage repair and anastomosis is possible in most of the patients, especially when an isolated diverticulum is the cause of CVF. Defunctioning ileostomies were performed selectively in our patients, especially in patients with malignant pathologies following colo-rectal anastomosis. This strategy has enabled us to minimise the consequences of an anastomotic dehiscence while reducing stoma related complications. Recently published studies describe the efficacy of laparoscopic and robotic assisted repair of CVF (10, 11). However, these require expertise and

resources and rarity of CVF makes these less viable options for a low-middle income country like Sri Lanka.

### Conclusion

CVF is a relatively uncommon condition in our country and mostly related to isolated diverticular disease of the sigmoid colon. Diagnosis of CVF can be made with accuracy by proper clinical assessment. More specifically, male patients more than 50 years of age with a history of faecaluria, pneumaturia and severe, recurrent urinary tract infections should be suspected of having a CVF. Cystoscopy and LGIE are essential components of the diagnostic workup of a patient with suspected CVF. Vigilant cystoscopic inspection by a clinician with awareness of the expected findings improves the sensitivity of objectively diagnosing a CVF. During surgery, segmental resection of the colon is favoured than local repair.

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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## A descriptive analysis of lung and pleural tumours in a premier referral centre in Sri Lanka

Y. Mathangasinghe<sup>1</sup>, I. H. D. S. Pradeep<sup>2</sup>, S. A. U. Perera<sup>3</sup>, Ramani Punchihewa<sup>4</sup>

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**Keywords:** Lung; pleura; neoplasms; cancer; histology; pathology

### Abstract

#### Introduction

This study describes pathological findings of lung and pleural neoplasms among a cohort of Sri Lankan patients.

#### Methods

A descriptive cross-sectional study was conducted among patients with lung and pleural tumours referred to National Hospital for Respiratory Diseases in 2017. Patients who underwent biopsy under direct vision or radiological guidance were included. Contrast Enhanced Computerized Tomography (CECT) findings were correlated with the histological diagnosis.


#### Results

The population was aged 8-93 [mean (SD)=58.4(13.3)] years. Of 396 patients, 252(63.6%) were males. Majority (n=324, 81.4%) had lung tumours while 72(18.2%) had pleural tumours. Malignant neoplasms were found in 373(n=94.2). Of them, majority (n=180, 45.5%) were core biopsies, followed by lobectomies (n=77, 19.4%). Commonest benign lung tumour was hamartoma (n=13, 3.3%). Schwannoma was the commonest benign pleural tumour (n=3, 0.8%). Among the primary malignant lung tumours, adenocarcinoma was the commonest (n=124, 31.3%). Six (1.5%) primary malignant pleural neoplasms (mesotheliomas) were found. Among the metastatic deposits in the lung, the majority was colorectal adenocarcinomas (n=9, 2.3%). The sensitivity, specificity, positive and negative predictive values of CECT in discriminating malignant lung and pleural tumours were 94.6%, 90.9%, 99.3%, and 54.1% respectively. A one-way ANOVA showed significant differences in the distribution of age among different types of masses [F (5,396) =2.759, p=.018]. The age of patients with benign lung neoplasms (mean=51.3±17.4 years), was less compared to the malignant pleural tumours and primary malignant lung tumours.

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Primary malignant lung tumours predominated among males [ $\chi^2$  (5,396) =27.463, p=.000].

### Conclusions

Adenocarcinoma was the commonest primary lung tumour (Male: Female=1.6:1). There was a male predominance in primary malignant lung tumours. CECT has a poor negative predictive value in discriminating malignant neoplasms of lung and pleura.

### Introduction

The spectrum of lung and pleural neoplasms include benign and malignant tumours, while the latter can be further subcategorized into primary and secondary (metastatic) lung malignancies. The lung is considered the most common organ of the body to be involved by metastatic tumours (1). Age standardized incidence of lung cancer continues to increase by 0.1% per year in males and 0.3% per year in females (2). It is projected to be the second leading cancer in men in 2030 (3). Similarly, the incidence and mortality of lung cancer have risen exponentially in the Asian region (4). According to published data, lung cancer is responsible for the most common cancer related mortality in Sri Lanka (1.38% of total deaths) (5) and accounts for the second highest direct healthcare cost caused by smoking in the country in the year 2017 (6). Even though pleural neoplasms are relatively uncommon compared to the malignancies involving the lung, the associated high morbidity and mortality warrants timely diagnosis and proper management of these lesions (7).

Being an island, Sri Lanka has a relatively different pool of genes compared to the rest of the world. Similarly, socioeconomic and cultural differences lead to the exposure of different types of risk factors for lung and pleural neoplasms in this country. Hence, it is sensible to hypothesize that the clinicopathological and demographic characteristics of lung and pleural neoplasms may differ in Sri Lanka from the rest of the world. Nevertheless, studies on socio-demographic factors, clinicopathological findings and radiological correlations related to lung and pleural tumours are sparse in Sri Lanka. These data are imperative to devise screening strategies and to assess the diagnostic yield of each investigation modality.

National Hospital for Respiratory Diseases (NHRD), Welisara is the premier referral centre for patients with lung and pleural tumours in Sri Lanka. Hence, a nationally representative sample could be obtained from this hospital. Therefore, this study describes the socio-demographic and pathological findings of lung and pleural tumours among Sri Lankans in the year of 2017 who were referred to the NHRD. We also intended to assess the sensitivity, specificity, positive and negative predictive values of computed tomography and cytology in diagnosing lung and pleural lesions.

## Methods

This descriptive cross-sectional study was conducted at the NHRD from 1st January to 31st December 2017. The study protocol conformed to the guidelines of the Declaration of the Helsinki (8) and the approval was obtained by the participating institution.

All the patients diagnosed with lung and pleural tumours by means of histopathological analysis in the institution were included in the study. If the patients underwent serial biopsies (eg: patients who had a core biopsy and subsequently underwent lobectomy or pneumonectomy), the most recent biopsy was analysed to prevent duplication of results. There were no particular exclusion criteria. Socio-demographic details of the subjects (age, gender, nationality and comorbidities), procedural details, operative findings and pre-procedural Contrast Enhanced Computed Tomography (CECT) findings were collected. Standard histological stains and immunohistochemical stains were used and specimens were analysed by a consultant pathologist. Pre-procedural CECT films were analysed by a consultant radiologist. If there was radiological evidence or suspicion of a malignancy, the CECT was categorized as “malignant”. If none of the features was suggestive of a malignant neoplasm, the CECT was categorized as “benign”. Patients with at least a single positive biopsy result for malignant cytology or histology of the lung or pleura and radiological evidence of multiple metastasis were considered as patients with multiple metastasis. Data were analysed using Statistical Package for Social Sciences (SPSS) software, version 23. Descriptive data were presented as percentages or as mean  $\pm$  standard deviations. Significance of associations among continuous variables was tested using a one-way Analysis of Variance (ANOVA) and independent sample t-test, and categorical variables using a chi-squared test. In all analyses, a p-value  $\leq$  0.05 was considered statistically significant.

## Results

### Socio-demographic characteristics

The study sample size was 396; of those, 252 (63.6%) were males and 144 (36.4%) were females. The population was aged 8-93 [mean (SD) = 58.4 ( $\pm$ 13.3)] years. Of them, 73

were previously diagnosed with a malignancy. The sample comprised of 324 (81.4%) patients with lung tumours and 72 (18.2%) patients with pleural tumours. The majority (n=59, 14.9%) of the lung tumours originated from the left upper lobe. The majority (n=61, 15.4%) of the pleural tumours involved the right pleura. A summary of the sites of the tumours is given in Table 1. In our study 373 (n=94.2) were malignant tumours. A minority (n=23, 5.8%) was benign. Biopsies were obtained under radiologically guided or operative techniques (eg: bronchoscopy, thoracoscopy). Of the malignant tumours, majority (n=180, 45.5%) were core biopsies, followed by lobectomies (n=77, 19.4%). All the pleural biopsies (n=72, 18.2%) were obtained from Video Assisted Thoracoscopic Surgeries (VATS). A summary of the sampling methods is given in Table 2.

### Histological findings

Hamartoma was the commonest benign lung tumour (n=13, 3.3%). Schwannoma was the commonest benign pleural tumour (n=3, 0.8%). Among the primary malignant lung tumours, adenocarcinoma was the commonest (n=124,

**Table 1.** Distribution of the main primary sites of the lung and pleural tumours

| Site of the tumour     | Number (percentage) |
|------------------------|---------------------|
| Right upper lobe       | 57 (14.4%)          |
| Right middle lobe      | 21 (5.3%)           |
| Right lower lobe       | 58 (14.6%)          |
| Left upper lobe        | 59 (14.9%)          |
| Left lower lobe        | 46 (11.6%)          |
| Right main bronchus    | 3 (0.8%)            |
| Left main bronchus     | 4 (1.0%)            |
| Lower trachea          | 1 (0.3%)            |
| Right pleura           | 61 (15.4%)          |
| Left pleura            | 55 (13.9%)          |
| Multiple lobes of lung | 31 (7.8%)           |

**Table 2.** Distribution of the main primary sites of the lung and pleural tumours

| Site of the Tumour | Biopsy method   | Frequency (Percentage) |
|--------------------|-----------------|------------------------|
| Lung Tumours       | Core biopsy     | 180 (45.5%)            |
|                    | Lobectomy       | 77 (19.4%)             |
|                    | Pneumonectomy   | 10 (2.5%)              |
|                    | Segmentectomy   | 2 (0.5%)               |
|                    | Wedge resection | 21 (5.3%)              |
|                    | Excision biopsy | 34 (8.6%)              |
| Pleural Tumours    | VATS            | 72 (18.2%)             |

31.3%). Of them, 117 (29.5%) were differentiated. This was followed by 89 (22.5%) squamous cell carcinomas of the lung. The majority of them were well differentiated squamous cell carcinomas (n=64, 16.2%). Overall there were 17 patients with small cell carcinoma and 258 patients with non-small cell carcinoma. Of 396 study participants, six primary malignant pleural neoplasms (mesotheliomas) were found. Among the metastatic deposits in the lungs from extrapulmonary malignant tumours, the majority was from colorectal adenocarcinomas (n=9) followed by sarcomas (n=8). Primary lung adenocarcinoma was the commonest cause of secondary pleural deposits (n=21) from primary malignant lung tumours. Table 3 summarizes the histological categories of tumours with the age at presentation. The distribution of the lung and pleural neoplasms according to the histological findings are summarized in Table 4. Previous cytology (bronchial brush or wash, fine needle aspiration) reports were available in 51 patients. Forty-seven patients with previous cytology reports had malignant neoplasms confirmed by histological examination. Of them, four cytology reports were concluded as benign and one report was inconclusive. A summary of previous cytology and histological findings of benign and malignant neoplasms is given in Table 5. The sensitivity and specificity of cytology in detecting malignant lung and pleural tumours were 89.4% and 75.0% respectively in this study. The positive predictive value of cytology to detect malignant tumour was 97.7%, and the negative predictive value was 37.5%.

### Radiological findings

CECT was obtained prior to the surgery or endoscopy in 338 (85.4%) patients. Out of 316 patients with malignant tumours who underwent CECT, 299 (94.6%) were detected as suspicious for a malignant lesion in CECT. Of the malignant tumours, 17 (5.4%) were categorized as non-suspicious in CT. Four adenocarcinomas of the lung were interpreted as lung abscesses in the CT scans by the radiologist. A summary of the CT and histological findings of benign and malignant neoplasms are given in Table 6. Thus, the sensitivity and specificity of CECT in detecting malignant lung and pleural tumours were 94.6% and 90.9% respectively in this study. The positive predictive value of CECT to detect malignant tumour was 99.3%, and the negative predictive value was 54.1%.

### Results of the statistical analysis

A one-way Analysis of Variance (ANOVA) was used to examine whether the presenting age differs with respect to the histological type of the neoplasm. The independent variables included benign and malignant lung and pleural neoplasms. The malignant neoplasms were further categorized as primary and secondary. The dependent variable was the average age of

**Table 3.** Age at presentation in different categories of lung and pleural neoplasms. (SD=standard deviation).

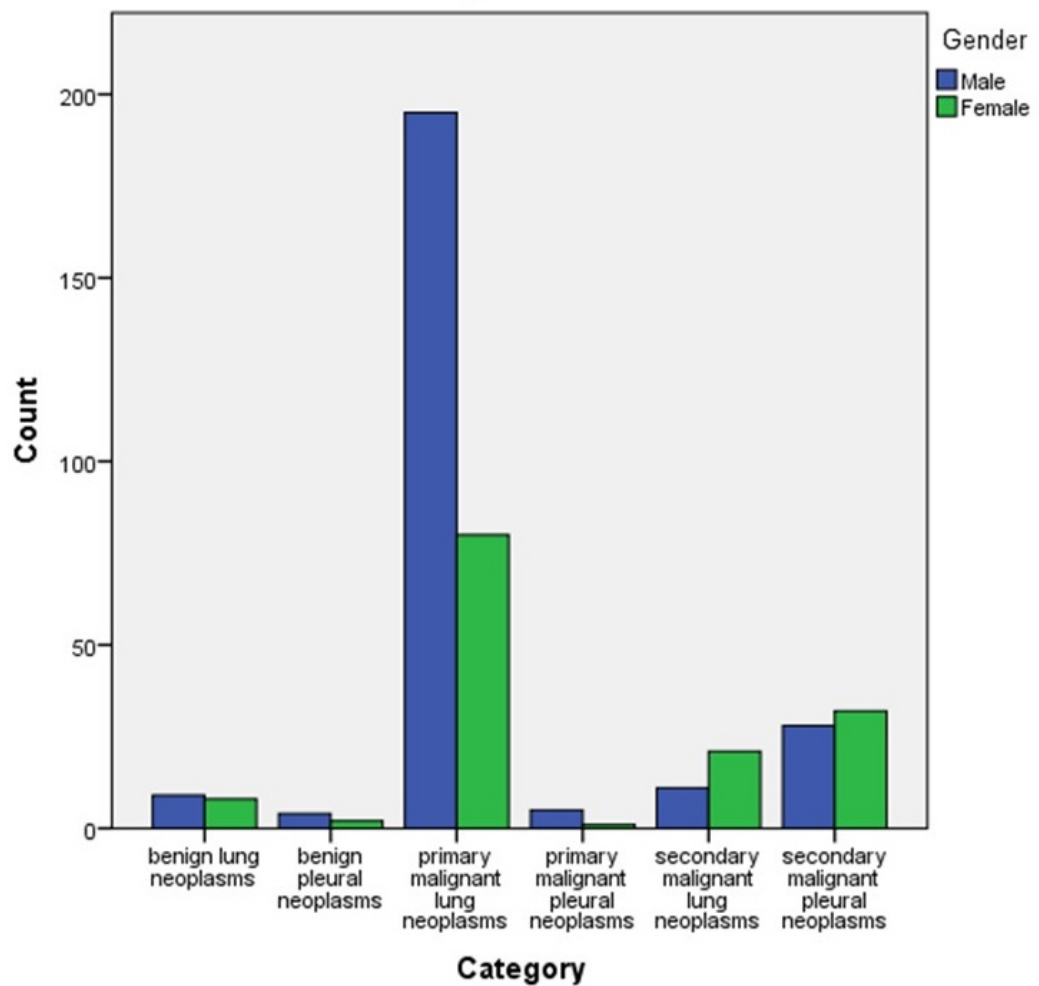
| Category of tumour                    | Number (Total) | Age at presentation (years) |             |
|---------------------------------------|----------------|-----------------------------|-------------|
|                                       |                | Mean $\pm$ SD               | Range       |
| Benign lung neoplasms                 | 17 / 396       | 51.3 $\pm$ 17.4             | 9.5 – 71.0  |
| Benign pleural neoplasms              | 6 / 396        | 54.1 $\pm$ 16.7             | 24.0 – 73.0 |
| Primary malignant lung neoplasms      | 275 / 396      | 59.0 $\pm$ 12.4             | 14.0 – 89.0 |
| Primary malignant pleural neoplasms   | 6 / 396        | 61.2 $\pm$ 6.9              | 49.0 – 70.0 |
| Secondary malignant lung neoplasms    | 32 / 396       | 52.9 $\pm$ 15.7             | 14.0 – 74.0 |
| Secondary malignant pleural neoplasms | 60 / 396       | 60.0 $\pm$ 14.0             | 8.0 – 93.0  |

the patient at presentation. Means and standard deviations of the age at presentation of different categories are given in Table 3. The test for normality, examining standardized skewness and the Shapiro-Wilks test, indicated the data were statistically normal. The Levene's F test revealed that the homogeneity of variance assumption was met ( $p=1.7$ ). An alpha level of .05 was used for all subsequent analyses. The one-way between groups ANOVA revealed a statistically significant main effect,  $F(5,396) = 2.759$ ,  $p=.018$ , indicating that the age at presentation significantly differs among histological types of lung and pleural neoplasms. Post-hoc comparisons using the LSD test showed that the age of patients with benign lung neoplasms (mean = 51.3  $\pm$  17.4 years), was less compared to the malignant pleural tumours and primary malignant lung tumours (Table 3). An independent sample t-test was conducted to compare the age at presentation between small cell and non-small cell lung tumours. There was no significant difference between small cell cancers ( $M=57.9$ ,  $SD=12.3$  years), and non-small cell cancers ( $M=59.1$ ,  $SD=12.4$  years);  $t(273) = -0.394$ ,  $p=0.694$ . A Chi-square test for independence indicated a significant association between gender and the type of lung tumour, [ $\chi^2(5,396) = 27.463$ ,  $p=.000$ ]. Figure 1 describes the distribution of lung and pleural neoplasms categorized according to gender. Primary malignant lung tumours were common among males compared to females (Figure 1).

### Discussion

Histopathological classification of lung and pleural neoplasms is complex due to tumour heterogeneity and histological diversity (9). Even though examining tumour morphology under haematoxylin and eosin stain is adequate to diagnose most of these tumours, recent advancements of





**Figure 1.** Primary malignant lung tumours compared among males to females

immunohistochemistry have facilitated accurate diagnosis of these neoplasms (9). However, late presentation of these malignancies has led to the poor prognosis of malignant pleural and lung neoplasms. There is no proper screening programme for lung and pleural malignancies in Sri Lanka to date. Hence, a high degree of clinical suspicion with a proper radiological and histopathological evaluation is essential for better outcomes.

Malignant lung and pleural neoplasms are commonly seen among the elderly (10). Secondaries are reported to be commoner in the lung compared to the primary neoplasms (9). However, in our study, we found that 89.6% of the lung malignancies were primary, whereas only 10.4% accounted for the metastatic neoplasms. The reason for this would be that the patients with advanced metastatic neoplasms are commonly treated at the National Cancer Institute Maharagama (Apeksha Hospital) and are not referred to as NHRD. Among the metastatic tumours of the lung, the commonest to be reported worldwide is adenocarcinoma (11). Considering metastatic lung malignancies reported in our study, colorectal adenocarcinoma (n=9) and soft tissue

sarcoma (n=8) were the commonest extrapulmonary malignant tumours. According to a joint point regression of the cancer registries in the United States, the commonest histopathological type of primary lung malignancy was adenocarcinoma (11). Similarly, in our study, the most common histopathological variant of primary lung malignancy was adenocarcinoma (n=124) followed by squamous cell carcinoma (n=89). Hamartoma was the most frequent benign lung tumour in our study accounting for 76% (n=13) of the benign neoplasms of the lung. Correspondingly, Hamartomas were consistently found to be the most prevalent benign lung tumour in the west (12, 13). Malignant pleural tumours are a less common entity (12). However, when both primary and secondary malignant tumours were taken together, they were commoner than benign pleural tumours (12) which was in accordance with our study. Adenocarcinoma is the commonest histological type of the pleural secondaries worldwide (12). Similarly, breast and lung adenocarcinomas were the commonest pleural secondaries found in our study.

Smoking is one of the major modifiable risk factors for lung

**Table 4.** Distribution of histopathological types of lung and pleural tumours in the study population.

| Category of tumour    | Site of Tumour | Type of Tumour                                   | Frequency (Percentage) out of 396 study participants (N=396) | Gender                                     |             | Age (years) |             |             |             |
|-----------------------|----------------|--|--|--|-------------|-------------|-------------|-------------|-------------|
|                       |                |  |  | Male                                       | Female      | Mean ± SD   | Range       |             |             |
| Benign                | Lung           | Adenoma  | 1 (0.3%)   | 1  | 0           | 50          | -           |             |             |
|                       |                | Congenital Pulmonary Airway Malformation         | 3 (0.8%)   | 1  | 2           | 27.5 ± 20.0 | 9.5 – 49.0  |             |             |
|                       |                | Hamartoma  | 13 (3.3%)  | 7  | 6           | 56.8 ± 12.7 | 29.0 – 71.0 |             |             |
|                       | Pleura         | Spindle cell tumour                              | 1 (0.3%)   | 0  | 1           | 62.0        | -           |             |             |
|                       |                | Schwannoma                                       | 3 (0.8%)   | 3  | 0           | 55.5 ± 5.5  | 49.0 – 59.0 |             |             |
|                       |                | Neurofibroma                                     | 2 (0.5%)   | 1  | 1           | 48.5 ± 34.6 | 24.0 – 73.0 |             |             |
| Malignant (Secondary) | Lung           | Adenoid Cystic Carcinoma                         | 1 (0.3%)   | 1  | 0           | 41.0        | -           |             |             |
|                       |                | Breast adenocarcinoma                            | 5 (1.3%)   | 1  | 4           | 58.2 ± 11.1 | 41.0 – 69.0 |             |             |
|                       |                | Malignant notocordal tumour (Chondroid Chordoma) | 1 (0.3%)   | 1  | 0           | 73.0        | -           |             |             |
|                       |                | Colorectal adenocarcinoma                        | 9 (2.3%)   | 2  | 7           | 56.0 ± 10.1 | 41.0 – 68.0 |             |             |
|                       |                | Malignant thymoma                                | 1 (0.3%)   | 0  | 1           | 57.0        | -           |             |             |
|                       |                | Ovarian adenocarcinoma                           | 2 (0.5%)   | 0  | 2           | 58.5 ± 4.9  | 55.0 – 62.0 |             |             |
|                       |                | Parotid carcinoma                                | 1 (0.3%)   | 1  | 0           | 50.0        | -           |             |             |
|                       |                | Renal cell carcinoma                             | 2 (0.5%)   | 1  | 1           | 65.5 ± 12.7 | 56.0 – 74.0 |             |             |
|                       |                | Sarcoma  | 3 (0.8%)   | 3  | 0           | 42.7 ± 30.0 | 8.0 – 60.0  |             |             |
|                       |                | Thymoma  | 3 (0.8%)   | 1  | 2           | 70.3 ± 7.6  | 65.0 – 79.0 |             |             |
|                       |                | Thyroid follicular carcinoma                     | 1 (0.3%)   | 1  | 0           | 69.0        | -           |             |             |
|                       |                | Malignant (Primary)                              | Lung   | Adenocarcinoma (differentiated)            | 117 (29.5%) | 72          | 45          | 61.3 ± 10.8 | 33.0 – 89.0 |
|                       |                |  |  | Adenocarcinoma (poorly differentiated)     | 7 (1.8%)    | 6           | 1           | 58.1 ± 10.7 | 47.0 – 75.0 |
|                       |                |  |  | Neuroendocrine (atypical carcinoid tumour) | 6 (1.5%)    | 2           | 4           | 43.0 ± 10.5 | 31.0 – 57.0 |

|                     |         |   |            |    |   |             |             |
|---------------------|---------|---|------------|----|---|-------------|-------------|
|                     |         | Neuroendocrine (large cell tumour)              | 2 (0.5%)   | 2  | 0 | 49.0 ± 7.1  | 44.0 – 54.0 |
|                     |         | Miscellaneous (adenoid cystic carcinoma)        | 4 (1.0%)   | 1  | 3 | 48.3 ± 11.0 | 35.0 – 60.0 |
|                     |         | Miscellaneous (Large cell carcinoma)            | 2 (0.5%)   | 1  | 1 | 57.5 ± 4.9  | 54.0 – 61.0 |
|                     |         | Miscellaneous (lymphoma)                        | 1 (0.3%)   | 0  | 1 | 30.0        | -           |
|                     |         | Miscellaneous (osteoclastoma)                   | 1 (0.3%)   | 1  | 0 | 41.0        | -           |
|                     |         | Miscellaneous (round cell tumour)               | 2 (0.5%)   | 1  | 1 | 43.5 ± 7.8  | 38.0 – 49.0 |
|                     |         | Miscellaneous (sarcoma)                         | 9 (2.3%)   | 5  | 4 | 51.2 ± 19.8 | 16.0 – 73.0 |
|                     |         | Miscellaneous (spindle cell carcinoma)          | 1 (0.3%)   | 0  | 1 | 60.0        | -           |
|                     |         | Small cell carcinoma                            | 17 (4.3%)  | 13 | 4 | 57.9 ± 12.3 | 31.0 – 77.0 |
|                     |         | Squamous cell carcinoma (differentiated)        | 64 (16.2%) | 59 | 5 | 62.6 ± 9.5  | 36.0 – 84.0 |
|                     |         | Squamous cell carcinoma (poorly differentiated) | 25 (6.3%)  | 24 | 1 | 61.8 ± 11.8 | 14.0 – 75.0 |
| Malignant (primary) | Pleural | Mesothelioma                                    | 6 (1.5%)   | 5  | 1 | 61.2 ± 6.9  | 49.0 – 70.0 |

**Table 5.** Cross tabulation of histologically confirmed benign and malignant neoplasms against the cytology finding prior to obtaining histology

|                  |           | Histological finding |        |
|------------------|-----------|----------------------|--------|
|                  |           | Malignant            | Benign |
| Cytology finding | Malignant | 299                  | 2      |
|                  | Benign    | 17                   | 20     |

**Table 6.** Cross tabulation of histologically confirmed benign and malignant neoplasms against the Computed Tomography (CT) finding prior to obtaining histology

|                             |           | Histological finding |        |
|-----------------------------|-----------|----------------------|--------|
|                             |           | Malignant            | Benign |
| Computed Tomography finding | Malignant | 299                  | 2      |
|                             | Benign    | 17                   | 20     |

cancer worldwide (14, 15). A systematic review showed that the recent changes in the trends of smoking are reflected in the prevalence of lung cancer morbidity and mortality (16). In a Sri Lankan study, smoking was found to be more prevalent among men than in women (17). This is the most likely reason for primary lung neoplasms to be 2.4 times commoner in males than females in our study population.

CECT of the chest plays a major role in diagnosing, radiological staging and assessment of resectability of lung tumours. Common radiological findings of pleural neoplasms include effusions, pleural thickening and plaques (12). Characteristics of the lesion, involvement of fissures and lobes, ipsilateral and contralateral lung metastasis, involvement of pulmonary artery, vein and mediastinal lymph nodes are considered in radiological staging and assessing the resectability of malignant tumours (18). A study conducted by Dabrowska et al concluded that CECT had high sensitivity and a negative predictive value in identifying malignant

solitary pulmonary nodules (19). In our population, the sensitivity (94.6%) and specificity (90.9%) of CECT chest in diagnosing malignant lung and pleural tumours were high. However, CECT had a low negative predictive value of 54.1%.

### Conclusions

Adenocarcinoma was the commonest primary lung tumour reported in the study population (Male: Female=1.6:1). There was a male predominance in primary malignant lung tumours. Adenocarcinoma was the commonest malignancy in males. CECT had a poor negative predictive value in discriminating malignant neoplasms of lung and pleura. Further studies with large numbers are needed to identify the patterns of socio-demographic and pathological characteristics associated with lung and pleural neoplasms in Sri Lanka.

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

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## Pathological analysis of mediastinal masses in National Hospital for respiratory diseases, Sri Lanka

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**Key words:** Mediastinum; neoplasms; anatomy and histology; pathology

### Abstract

#### Introduction

This study describes pathological findings of mediastinal masses among patients referred to National Hospital for Respiratory Diseases.

#### Methods

A descriptive cross-sectional study was conducted among patients with mediastinal masses referred to National Hospital for Respiratory Diseases, Welisara, Sri Lanka in 2017, who underwent excision or guided biopsy followed by standard histological and immunohistochemical staining.

#### Results

The population was aged 8-75[mean (SD)=42.8(17.0)] years. Of 139 patients, 80(57.6%) were males. Masses were located in anterior mediastinum in 49.6 % ( n=69), superior mediastinum in 20.1 % ( n=28), middle mediastinum in 15.1 % ( n=21) and posterior mediastinum in 14.4 % ( n=20). Majority (65.5%, n=91) were excision biopsies. The rest were core biopsies. Commonest mass was lymphoma [n=27,19.4%;Non-Hodgkin(n=20),Hodgkin(n=7)] followed by thymic tumours [n=22,15.8%;benign(n=16), malignant(n=6)], germ cell tumours (11.5%,n=16), metastatic deposits (10.8%,n=15), developmental cysts (8.6%,n=12), non-neoplastic lymphadenitis (7.9%,n=11), neuroectodermal tumours (5.8%,n=8), soft tissue sarcomas (2.9%,n=4), leiomyoma (0.7%,n=1), benign spindle cell tumour (0.7%,n=1) and plasmacytoma (0.7%,n=1). Twenty-one (15.1%) specimens were either normal or inconclusive. A one-way ANOVA showed significant differences in the distribution of age among different types of masses [Welch's F (df=7, n=115) =10.09, p=.000]. Post-hoc comparisons, showed that the age of patients with germ cell tumours (mean=29.7±11.5 years), developmental cysts (mean=38.8±16.5years) and lymphomas (mean=34.0±15.7

years) were less compared to the patients with other masses. A Chi-square test indicated no significant association between gender and the type of mediastinal mass [ $\chi^2$  (df=7, n=115) =6.561, p=.48].

#### Conclusions

Lymphoma was the commonest mediastinal mass in this population. Germ cell tumours, developmental cysts and lymphomas were commonly found among the young.

#### Introduction

Mediastinal tumours are uncommon lesions with diverse clinical characteristics. The initial presentation of these patients may vary from incidental detection to life-threatening casualty admissions (1). There has been a significant increase in the detection of mediastinal tumours with the advent of new imaging modalities. A recent Indian study concluded that 3% of the intrathoracic tumours were comprised of mediastinal tumours (2). Moreover, a high mortality is associated with the mediastinal tumours in this part of the world due to late presentation (3).

The anatomical location of the mass is crucial for the tentative diagnosis (1, 4). However, regional studies assessing the anatomical and histopathological data on mediastinal masses are sparse. Furthermore, there are no published data on clinicopathological variations of mediastinal masses in a Sri Lankan setting. National Hospital for Respiratory Diseases (NHRD), Welisara is the prime centre managing mediastinal masses and the only institution in the country which offers the general thoracic surgical services to the patients. Hence, a nationally representative sample could be obtained from this hospital. The objective of this study was to describe pathological findings of mediastinal masses among patients who were referred to the NHRD, Welisara, Sri Lankans in the year of 2017.


#### Methods

This descriptive cross-sectional study was conducted among the patients admitted to medical and surgical units at the NHRD from 1st January to 31st December 2017. The study was conducted in accordance with the guidelines set out by the Declaration of Helsinki (5).

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All patients referred to NHRD from 1st January to 31st December 2017 with mediastinal masses who had undergone histopathological analysis were included in the study. Patients with retrosternal thyroid masses in the anterior mediastinum and primary epithelial oesophageal malignancies in the posterior mediastinum were excluded from the study. Clinical, pathological and radiological data were obtained from the pathological database at the Department of Pathology, NHRD. Firstly, the patient identifiers were removed from the database by an independent person. The investigators were given access to the deidentified database including details of age, gender, microscopic and macroscopic pathological findings of biopsy specimen. Standard histological stains and immunohistochemical stains were used in the pathological diagnosis of mediastinal masses. All the diagnoses were made by a single pathologist.

Data were analysed using Statistical Package for Social Sciences (SPSS) software, version 23. Descriptive data were presented as percentages or as mean  $\pm$  standard deviations. Significance of associations among continuous variables was tested using a one-way Analysis of Variance (ANOVA) and categorical variables using chi-squared test. In all analyses a priori alpha value of 0.05 was used.

## Results

### *Socio-demographic characteristics*

The study sample size was 139. Of those, 80 (57.6%) were males and 59 (42.4%) were females. The sample was aged 8-75 (mean (SD) = 42.8 ( $\pm$ 17.0)) years. Eleven were previously diagnosed with a primary malignancy unrelated to the mediastinum. Masses were in the anterior mediastinum in 49.6% (n=69), the superior mediastinum in 20.1% (n=28), the middle mediastinum in 15.1% (n=21) and the posterior mediastinum in 14.4% (n=20). Majority (65.5%, n=91) were excision biopsies. The rest (n=48, 34.5%) were core biopsies.

### *Histological findings*

Commonest mass was due to lymphoma (n=27, 19.4%; Non-Hodgkin n=20, Hodgkin n=7) followed by thymic tumours (n=22, 15.8%; benign n=16, malignant n=6), germ cell tumours (11.5%, n=16), metastatic deposits (10.8%, n=15) developmental cysts (8.6%, n=12), non-neoplastic lymphadenitis (7.9%, n=11), neuroectodermal tumours (5.8%, n=8), soft tissue sarcomas (2.9%, n=4), leiomyoma (0.7%, n=1), spindle cell tumour (0.7%, n=1) and plasmacytoma (0.7%, n=1). Twenty-one (15.1%) specimens were either normal or inconclusive. The distribution of mediastinal masses according to the histological findings are summarized in the Table 1.

## Results of the statistical analysis

A one-way Analysis of Variance (ANOVA) was used to

examine whether the presenting age differed with respect to the histological type of the mass. The independent variables included the various types of mediastinal masses. The miscellaneous (n=3) and inconclusive tumours (n=21) were excluded from the following statistical analyses (see Table 1). The dependent variable was the age of the patient at the diagnosis (see Table 1 for the means and standard deviations for each group). The test for normality, examining standardized skewness and the Shapiro-Wilks test, indicated the data were statistically normal. However, the Levene's F test revealed that the homogeneity of variance assumption was not met (p=.000). As such, the Welch's F test was used. The one-way between groups ANOVA revealed a statistically significant main effect, Welch's F (df=7, n=115) =10.09, p=.000, indicating that the average age at presentation significantly differs among histological types of mediastinal masses.

Post-hoc comparisons using the Turkey HSD test, showed that patients with germ cell tumours (mean=29.7 $\pm$ 11.5years), developmental cysts (mean=38.8 $\pm$ 16.5years) and lymphomas (mean=34.0 $\pm$ 15.7 years) were younger compared to the patients with other masses. A Chi-square test for independence indicated no significant association between gender and the type of mediastinal mass, ( $\chi^2$ (df=7, n=115) = 6.561, p=.48).

## Discussion

Mediastinal masses are comprised of a wide variety of pathological types ranging from benign to malignant tumours and non-neoplastic lesions. Clinical features of mediastinal masses vary widely depending on the histological subtype.

The majority (75.0%) of the mediastinal masses in our study population were neoplastic lesions, of them the majority were benign. This finding is in line with the studies in the region as well as in the west where more than two thirds of the mediastinal tumours are reported to be benign (1). However, an Indian study found that most of the neoplasms in their population were malignant (2). Furthermore, primary malignant mediastinal tumours are reported to be rare (6). According to the published studies (1, 7), the origins of most common anterior mediastinal masses are from thymic, germ cell or lymphatic tissues. Middle mediastinal masses are commonly originated from lymphatic tissues while rest of the middle mediastinal masses arise as developmental cysts and neurogenic tumours. Neurogenic tumours and masses arising from lymphatic, vascular and mesenchymal tissues encompass the posterior mediastinal masses. We observed a similar pattern in our study. Furthermore, nearly half of the masses were located within the anterior mediastinum while the rest were distributed among middle, posterior and superior compartments in the proportions of 15% - 20% each.

**Table 1.** Distribution of pathological types of mediastinal masses in the study population.

| Category of tumour           | Type of Tumour                               | Frequency (Percentage) | Gender |        | Age       |       |
|------------------------------|--|------------------------|--------|--------|-----------|-------|
|                              |  |                        | Male   | Female | Mean±SD   | Range |
| Lymphoma                     |  |                        | 14     | 13     | 34.0±15.7 | 11-75 |
|                              | Non-Hodgkin Lymphoma                         | 20 (14%)               |        |        |           |       |
|                              | Hodgkin Lymphoma                             | 7 (4.9%)               |        |        |           |       |
| Thymic tumours               |  |                        | 14     | 8      | 50.4±15.1 | 13-73 |
|                              | Thymoma                                      | 15                     |        |        |           |       |
|                              | Thymic Carcinoma                             | 6 (4.2%)               |        |        |           |       |
|                              | Thymic Hyperplasia                           | 1 (0.7%)               |        |        |           |       |
| Germ Cell Tumours            |  |                        | 12     | 4      | 29.7±11.5 | 13-53 |
|                              | Teratoma                                     | 6 (4.2%)               |        |        |           |       |
|                              | Seminoma                                     | 4 (2.8%)               |        |        |           |       |
|                              | Germ Cell Tumours with Malignant Round Cells | 3 (2.1%)               |        |        |           |       |
|                              | Yolk Sac                                     | 2 (1.4%)               |        |        |           |       |
|                              | Embryonal carcinoma                          | 1 (0.7%)               |        |        |           |       |
| Metastatic Deposits          |  |                        | 10     | 5      | 55.3±8.6  | 35-69 |
|                              | Lung Non-small cell carcinoma                | 5 (%)                  |        |        |           |       |
|                              | Lung small cell carcinoma                    | 3 (2.1%)               |        |        |           |       |
|                              | Breast adenocarcinoma                        | 3 (2.1%)               |        |        |           |       |
|                              | Colon adenocarcinoma                         | 1 (0.7%)               |        |        |           |       |
|                              | Thyroid medullary carcinoma                  | 1 (0.7%)               |        |        |           |       |
|                              | Adenocarcinoma of Unknown primary            | 1 (0.7%)               |        |        |           |       |
|                              | Squamous carcinoma of unknown primary        | 1 (0.7%)               |        |        |           |       |
| Non-neoplastic lymphadenitis |  |                        | 6      | 5      | 52.5±6.4  | 41-62 |
|                              | Sarcoid                                      | 10 (7.0%)              |        |        |           |       |
|                              | Castleman Disease                            | 1 (0.7%)               |        |        |           |       |
| Developmental Cysts          |  |                        | 6      | 6      | 38.8±16.5 | 19-68 |
|                              | Bronchogenic cyst                            | 5 (3.5%)               |        |        |           |       |
|                              | Thymic Cyst                                  | 4                      |        |        |           |       |
|                              | Pericardial Cyst                             | 2 (1.4%)               |        |        |           |       |
|                              | Mesothelial inclusion cyst                   | 1 (0.7%)               |        |        |           |       |
| Non-neoplastic lymphadenitis |  |                        | 6      | 5      | 52.5±6.4  | 41-62 |
|                              | Sarcoid                                      | 10 (7.0%)              |        |        |           |       |
|                              | Castleman Disease                            | 1 (0.7%)               |        |        |           |       |
| Developmental Cysts          |  |                        | 6      | 6      | 38.8±16.5 | 19-68 |
|                              | Bronchogenic cyst                            | 5 (3.5%)               |        |        |           |       |
|                              | Thymic Cyst                                  | 4                      |        |        |           |       |
|                              | Pericardial Cyst                             | 2 (1.4%)               |        |        |           |       |
|                              | Mesothelial inclusion cyst                   | 1 (0.7%)               |        |        |           |       |
| Neuroectodermal tumours      |  |                        | 3      | 5      | 47.1±21.7 | 8-68  |
|                              | Schwannoma                                   | 7 (4.9%)               |        |        |           |       |
|                              | Ganglioneuroma                               | 1 (0.7%)               |        |        |           |       |
| Soft Tissue Sarcoma          |  |                        | 1      | 3      | 50.3±16.8 | 30-65 |
|                              | Myxoid liposarcoma                           | 2 (1.4%)               |        |        |           |       |
|                              | Leiomyosarcoma                               | 1 (0.7%)               |        |        |           |       |
|                              | Sinovial Sarcoma                             | 1 (0.7%)               |        |        |           |       |
| Miscellaneous                |  |                        | 1      | 2      |           |       |
|                              | Benign spindle cell tumour                   | 3 (%)                  |        |        |           |       |
|                              | Leiomyoma                                    | 1 (0.7%)               |        |        |           |       |
|                              | Plasmacytoma                                 | 1 (0.7%)               |        |        |           |       |
| Normal or inconclusive       |  | 21 (14.7%)             | 13     | 8      |           |       |

Baram et al. conducted a descriptive cross-sectional study in Iraq among 85 patients and found a similar distribution pattern of mediastinal masses (7). Moreover, two Indian studies concluded that the commonest site of the primary mediastinal tumours were in the anterior mediastinum (6, 8).

The mean age of presentation of mediastinal masses in our study population was 25 to 55 years. We also found a statistically non-significant slight male predominance, where male to female ratio was approximately 1.3:1. However, lymphoma (mean age = 34 years) and germ cell tumours (mean age = 29.7 years) were seen among relatively younger age groups compared to rest of the study population. Recent studies conducted in India (8), Nepal (9), Thailand (10) and Iran (11) reported comparable figures for the presenting age of lymphoma and germ cell tumours. Early detection and histological diagnosis are paramount in managing lymphoma and germ cell tumours since most of them respond dramatically to chemotherapeutic management as the primary modality of treatment (12, 13). Of the non-neoplastic lesions, developmental cysts were commonly observed in the younger age groups (mean age = 38.8 years). These cysts commonly originated from the precursors of bronchial and thymic tissues. These findings are in accordance with the published data (1). Nevertheless, there were no inflammatory masses of tuberculous origin in this study, irrespective of the fact that Sri Lanka is an endemic country for tuberculosis. One of the possible reasons would be that the tertiary care hospitals in Sri Lanka are frequently treating patients with tuberculous masses in the mediastinum and these cases are not referred to the NHRD often.

The histological assessment was conducted by a single pathologist. However the sections were not reviewed again for the study, which may have introduced an observer bias.

### Conclusions

Clinical and pathological characteristics of mediastinal masses of this study were comparable to the published data globally. Lymphoma accounted for the commonest mediastinal tumour in this population. Germ cell tumours, developmental cysts and lymphomas were commonly found among the young.

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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## Role of routine frozen sections for parathyroid exploration in a resource poor setting

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**Key words:** Parathyroid; frozen section diagnosis; parathyroid hormone

### Abstract

Removal of parathyroid is recommended for patients suffering from hypercalcemia due to excess parathyroid hormone levels. There are several causes for a hyperfunctioning parathyroid gland out of which parathyroid adenoma is the most common pathological entity. There is great variation in the number and location of parathyroid glands. Hence, intra-operative confirmation of parathyroid tissue makes it easier for the surgeon to be confident of the outcome of the procedure and assure the patient of a permanent cure.

A descriptive cross sectional study was done in a cohort of 26 patients who presented with elevated total serum calcium and parathyroid hormone concentrations. Intra-operative frozen section diagnoses were correlated with routine histological studies and post-operative parathyroid hormone concentration. The majority of patients were diagnosed as having parathyroid adenoma (88.46%). Three out of 26 patients (11.53%) had parathyroid hyperplasia involving more than one gland. Sensitivity and specificity of intra-operative frozen section diagnosis was 100%. There was a statistically significant association ( $p < 0.05$ ) with post-operative parathyroid hormone concentration was performed from the same laboratory and the intraoperative diagnosis. The concordance between the intraoperative findings and routine histological diagnoses was highly satisfactory.

In the light of the discussion on parathyroid surgery it is apparent that frozen sections play a pivotal role in resource poor settings, when facilities for novel intra-operative imaging studies such as sestamibi scan and single-photon emission computed tomography are limited. The participants of the study have been followed up during last 5 years with no evidence of residual disease or recurrence up to date.

### Introduction

Parathyroid glands were discovered for the first time in 1852 by Richard Owen in Indian rhinoceros (1). In 1880 a Swedish medical student at the Uppsala University noted its existence in humans, dogs, cats, horses and rabbits (2, 3). Removal of parathyroid dates back to 1928 and Isaac Y Olch, a medical doctor had been acknowledged for performing parathyroid surgery for the first time in human beings (4).

Parathyroid glands are usually located on the posterior aspect of the right and left lobes of thyroid, but separated from it by a delicate connective tissue capsule. Parathyroid glands are known to be derivatives of 3rd and 4th branchial pouches of the primitive foregut during embryogenesis (5). There are two pairs of parathyroid glands; superior and inferior. The vast majority has four glands although there is variation in the number (6). There is great inconsistency in the location of parathyroids in relation to the thyroid gland, thus causing difficulties in identification during parathyroid surgery for patients with effects of hypercalcemia.

Parathyroids are small, yellow-brown, ovoid shaped structures with a flattened body, weighing approximately 35 to 45mg (7). The constituent cells of parathyroid parenchyma are of three types; chief cells, oxyphil cells and clear cells. The major function of the gland is to secrete parathyroid hormone (PTH) that regulates serum calcium level (8).


During surgery, parathyroids can be easily mistaken for lymph nodes, thyroid nodules and fat globules in the near vicinity, thus resulting in misdiagnosis and a repeat operative procedure. In a minority of patient's parathyroid tissue can be ectopic, located in an unusual site such as the mediastinum (9). Role of the pathologist is to agree or disagree as to the presence of parathyroid tissue, during the surgical procedure.

Intraoperative confirmation of parathyroid tissue by frozen section diagnosis makes it easier for the surgeon to be confident of the accuracy of the operative procedure and to assure the patient of a permanent cure in most of the instances (10). Although parathyroid adenoma stands out as the most common cause of parathyroid surgery there are few less common pathological entities such as parathyroid hyperplasia and carcinoma that would also require surgical intervention (11).

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Most of the patients with parathyroid lesions present with symptoms related to a hyperfunctioning gland known as primary hyperparathyroidism (12). Clinical presentations include nephrolithiasis, nephrocalcinosis, metastatic calcification, generalized osteitis fibrosa cystica, neuropsychiatric disturbances and hypertension. Secondary hyperparathyroidism occurs due to excessive parath hormone levels resulting from a disease elsewhere. Hypocalcaemia results in compensatory stimulation of the gland in secondary hyperparathyroidism. Tertiary hyperparathyroidism is a complication of secondary hyperparathyroidism where the gland remains to be hyperactivity independent of the etiological factor. Both secondary and tertiary hyperparathyroidism are less common than primary hyperparathyroidism (13).

Medical errors in surgery is responsible for the majority of preventable in-hospital adverse events (2-4). The factors causing human errors can be classified as excessive workload, inadequate knowledge, ability or experience, inadequate supervision or instruction, stressful environment and mental fatigue or boredom (5). There is growing evidence to suggest that non-technical skills are required to overcome these human errors in a surgical team (6-10). Non-technical skills can be divided mainly into two categories; interpersonal skills and cognitive skills (7). Out of the interpersonal skills, communication plays a key role in bridging the gap in human error and continuum of patient care during surgical interventions (5, 7, 11, 12).

Inter-professional integration is essential in the field of surgery. Therefore, communication does not necessarily mean an exchange of vital patient information among consultants such as anaesthetists, radiologists and surgeons, but also sharing basic information with theatre staff, ward nurses and other relevant parties to work as a team. Mishaps in communication occur at different points in the surgical care. This is broadly divided into inaccuracies that occur in preoperative assessment and optimization phase, pre procedure/procedural phase, post-operative phase and daily ward care (13). These miscommunications among team members could lead to devastating outcomes resulting in high morbidity and mortality (14). In 2009, the World Health Organization (WHO) emphasized the importance of effective communication and exchange of critical information for the safe conduct of the surgeries (5).

Several systematic reviews and studies conducted in intra-hospital patient handover (15-19), information transfer among healthcare workers (13, 20, 21) and effectiveness of surgical checklists (22, 23) concluded that communication errors are a shared the issue throughout the world. However, presently there are no reviews evaluating communication.

## Objectives

- Correlation of frozen section diagnosis with routine histological findings.
- Assess the diversity of parathyroid lesions.
- Comparison of pre-operative and post-operative parathyroid hormone levels with the histological diagnosis.
- Determine the role of frozen sections in parathyroid surgery.

## Methodology

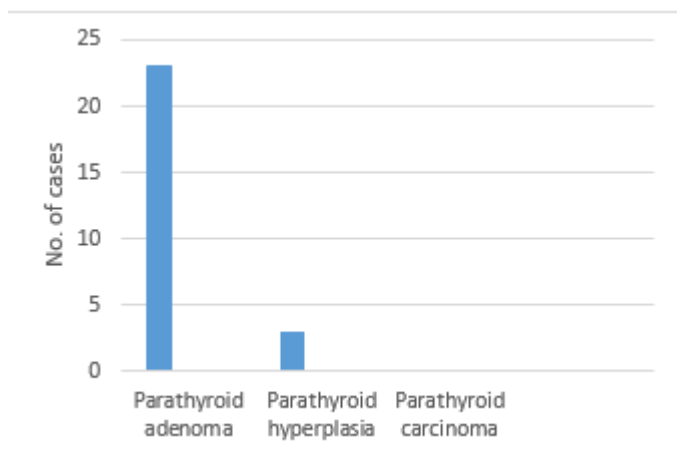
A descriptive cross sectional study was conducted, which included the parathyroid specimens during the period of January 2014 to December 2018. Laboratory procedures were done at the histopathology section of Lanka Hospital, Colombo 05, in which the basic facilities required for intraoperative frozen section diagnosis were readily available. Study sample included included 26 patients in whom the pre-operative total serum calcium concentration (normal range – 2.2 to 2.7 mmol / L) was more than 3 mmol / L and parathyroid hormone levels (normal range – 10-65 pg/ml) were elevated and in the range of 90 to 170 pg/ml. Pre-operative radiological findings have been suggestive of pathological lesions involving one or more of the parathyroid.

Following parathyroid surgery fresh specimens wrapped in gauze were immediately transported to the laboratory in screw capped bottles. Samples were handled and reported by the principal investigator. After recording the macroscopic core data items which included the size, weight and colour of the specimen, tissue sections were prepared and placed on a metal “chuck” and frozen to reach the cutting temperature which is -20 degrees Celsius. Once the tissue was frozen thin sections (1-2  $\mu$ m) were cut with the freezing microtome and stained with haematoxylin & eosin. The entire procedure took around 15 to 20 minutes thus allowing a rapid tissue diagnosis during the intraoperative period.

Following frozen section diagnosis, tissue on the chuck and any remaining tissue were submitted for routine histological procedure, for re-confirmation of the intraoperative diagnosis by two independent consultant pathologists. All laboratory procedures were of the highest standard as per the accreditation guidelines (All laboratory procedures have been accredited by the College of American Pathologists).

## Results

In the cohort of patients with hyperfunctioning parathyroids the most common intraoperative diagnosis was parathyroid adenoma (n=22; 88.46%). Parathyroid hyperplasia was seen in 3(11.53%) cases and there were no cases of parathyroid malignancies (Figure. 1).

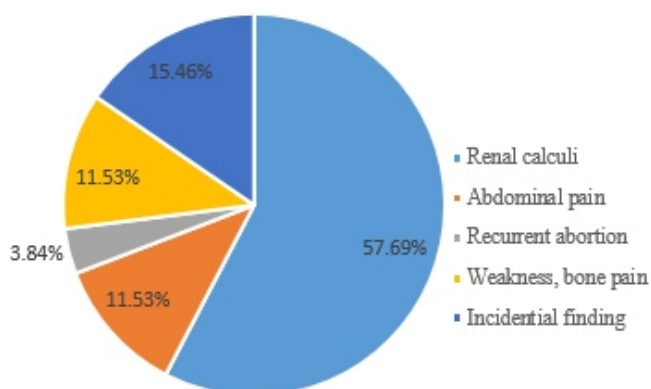


**Figure 1.** Intra-operative frozen section diagnosis

### Symptoms

Majority of the patients presented with symptoms of renal calculi. Other presenting complaints were abdominal pain, weakness and bone pain. In 15.46% the diagnosis was an incidental finding. One patient was diagnosed as having a parathyroid adenoma during the diagnostic work up for recurrent abortion (Figure .2).

Identification of parathyroid tissue by the naked eye appearance (gross examination) had a sensitivity and specificity of each 98%. The concordance of results for gross examination, between the surgeon and the pathologist was >



**Figure 2.** Symptoms

**Table 1.** Gross examination findings of surgical (parathyroid) specimens

|                                    | Sensitivity | Specificity | Concordance (between surgeon & pathologist) |
|------------------------------------|-------------|-------------|---|
| Gross examination & identification | 98%         | 98%         | >95%  |

95% (table 1).

**Table 2.** Sensitivity & specificity of intra-operative frozen section procedure

|   | Sensitivity | Specificity |
|---|-------------|-------------|
| Parathyroid abnormalities   | 100%        | 100%        |
| Non- parathyroid tissue (small lymph nodes, fat globules & thyroid nodules in the vicinity) | 100%        | 100%        |

Intra-operative frozen section diagnosis for parathyroid abnormalities had a sensitivity of 100% and specificity of 100% (table 2).

**Table 3.** Correlation with parathyroid hormone levels (Pre and post- operative values)

|                             | Pre-operative level | Post- operative level   |
|-----------------------------|---------------------|---|
| Parathyroid adenoma n=23    | 90-170 pg/ml        | <80 pg/ml (statistically significant association with the intra-operative frozen section diagnosis, p<0.05) |
| Parathyroid hyperplasia n=3 | 90-150 pg/ml        | <80 pg/ml (statistically significant association with the intra-operative frozen section diagnosis, p<0.05) |

Pre-operative parathyroid hormone levels were recorded and compared with the post-operative values. Post- operative parathyroid hormone level of <80 pg/ml showed a statistically significant association with the intra-operative diagnosis (table 3).

**Table 4.** Concordance of results (between intraoperative frozen section diagnosis and routine histology)

|                          | Concordance  | Disconcordance                    |
|--------------------------|--|-----------------------------------|
| Parathyroid lesions n=26 | 100% (statistically significant with a p value < 0.05) | <1% (statistically insignificant) |

Concordance of results between the intra-operative frozen section diagnosis and subsequent histology review was 100% with a p value < 0.05 (table 4)

### Discussion

In the cohort of 26 patients with hyper functioning parathyroid glands the vast majority was diagnosed as having

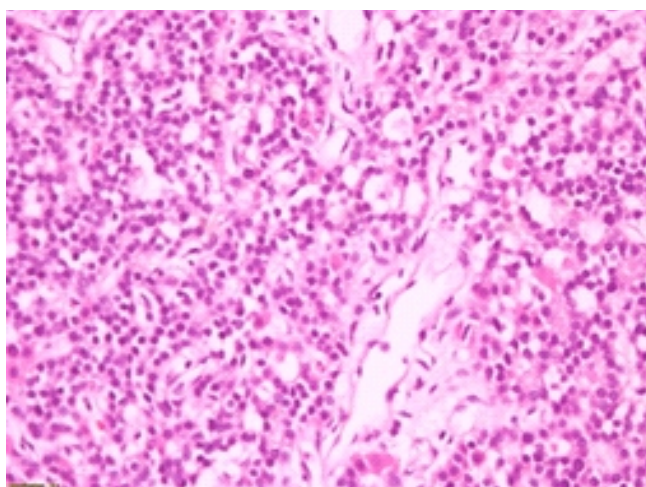


parathyroid adenoma (88.46%). There were no cases of parathyroid carcinoma and 11.53% of the study population had parathyroid hyperplasia (figure:1). The most common clinical presentation was renal calculi (57.69%). In 15.46 % of the cases the diagnosis of parathyroid adenoma was an incidental finding (figure: 2). One patient was found to have a parathyroid adenoma during the diagnostic work up for recurrent abortion.

In all of these patients the pre-operative parathyroid hormone level was above the normal range (10-65 pg/ml). Pre-operative imaging studies have been performed in all of these patients and the results were suggestive of pathological lesions in parathyroid glands.

Parathyroid specimens of all of the above patients were subjected to intra-operative frozen section diagnosis and the findings were conveyed to the surgical team within a period of 20 minutes from the time of reception of the specimen at the laboratory. Identification of parathyroid tissue by frozen section method is highly reliable and poses no difficulty as there are characteristic histological features (table 1 & 2).

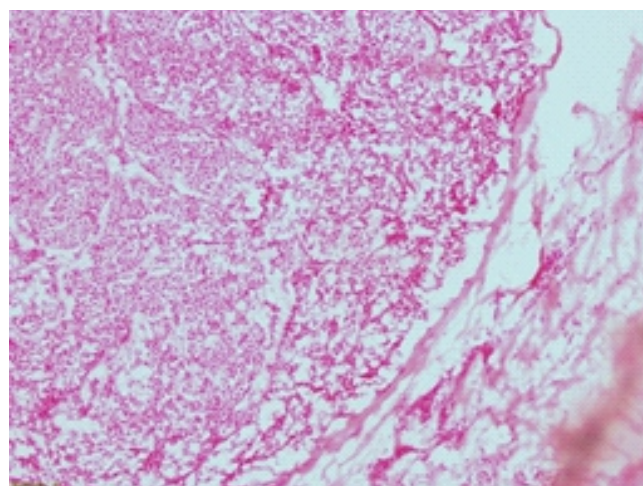
In contrast to follicular structures present with thyroid tissue, parathyroids consist of adipose tissue (25-40%) and densely



**Figure 3.** Parathyroid adenoma composed of small, round chief cells -arrow (H&E stain x 40)

packed parenchymal cells which are of two types (14). The predominant cell type is uniform, small and round chief cells having regular nuclei. Chief cells show different patterns of growth and are usually arranged in nests, clusters and sheets (figure 3). Microfollicular and trabecular patterns may also be seen. Chief cells may be admixed with a variable number of oxyphil cells having a moderate amount of eosinophilic cytoplasm (14). Twenty-three out of 26 cases had a single gland involvement and the intra-operative findings were consistent with a diagnosis of parathyroid adenoma. The frozen section findings that helped to arrive at a diagnosis of

parathyroid adenoma were the presence of an encapsulated (figure 4), cellular nodule and the identification of compressed but otherwise normal parathyroid tissue at the periphery of the lesion. There was a mild variation in nuclear size. Mitotic figures were indistinct and there was no evidence of necrosis. Complete encapsulation with no evidence of capsular or vascular invasion greatly supported a benign



**Figure 4.** Parathyroid adenoma surrounded by a thin capsule -arrow (frozen section, H&E stain x 10 magnification)

diagnosis. In view of the small size of the lesions (usually less than 25 mm in maximum diameter) an entire cross section could be examined before concluding the intra-operative results.

In the cohort of cases there were 3 patients with parathyroid hyperplasia. Parathyroid hyperplasia usually involves all four glands in an equal manner but there could be variations with regard to the number of diseased glands. One out of 3 patients with hyperplasia showed the involvement of all 4 glands. In the other 2 patients, only 3 glands from each had features of hyperplasia. Although the cellular and architectural patterns were similar to parathyroid adenoma the absence of a capsule was a useful feature that helped to distinguish hyperplasia from adenoma. There were no cases of parathyroid carcinoma in the cohort of 26 patients.

Mistakenly submitted small lymph nodes, fat globules and bulging thyroid nodules with a naked eye appearance similar to parathyroid tissue were correctly reported as “non-parathyroid” by the frozen section procedure and the findings were immediately conveyed to the surgical team. This enabled to re- send, further samples before closing up the neck incision.

Approximately 15 minutes after successful parathyroid removal, blood samples were taken for parathyroid hormone assay (15). Lowering of parathyroid hormone concentration

from the pre-operative value supported the accuracy of frozen section diagnosis (table 3). There was a statistically significant association ( $p < 0.05$ ) with the intra-operative diagnosis and post-operative parathyroid hormone levels. Concordance between intra-operative frozen section diagnosis and routine histological results was 100% (table 4).

A study done by Westra WHDD et al, (10) has shown similar results with a high intraoperative diagnostic accuracy of 99.2%. Scientific paper published by Anton RC et al, further strengthened the value of frozen section evaluation with a low false-positive rate (16). Farquin WC et al, has also emphasized the important role of intraoperative frozen section diagnosis in the context of parathyroid surgery (17). Dewan AK et al, has concluded that a decision to omit frozen sections need to be carefully balanced against the possible risk of misidentifying the actual lesion (18).

### Conclusion

Success of parathyroid exploration lies with accurate localization of the glands. There is great diversity in the location of parathyroid tissue as well as problems in relation to intraoperative identification in view of the small size of the glands. The diagnostic accuracy of the frozen section method can be highly satisfactory in the hands of experienced personnel from both medical and technical sides.

In contrast to developed countries which have readily available sophisticated techniques such as sestamibi scan, single-photon emission computed tomography, centres with limited facilities consider intraoperative frozen section diagnosis as a valuable tool for identification of the glands.

Undoubtedly the cost effectiveness of this procedure in terms of human resource, infrastructure and equipment along with high accuracy will continue to have a positive impact on parathyroid surgery in a resource poor setting. Sensitivity & specificity of frozen section diagnosis and concordance of results between frozen section and subsequent histological review can be as high as 100%. In the current study there were no false negative or false positive results. There was a statistically significant association ( $p < 0.05$ ) with the post-operative parathyroid hormone concentration and the intra-operative diagnosis, thus reinforcing the valuable contribution of frozen sections for routine parathyroid surgery.

All of these patients have been followed up during last 5 years, with serum calcium and parathyroid hormone levels and it is noteworthy to mention that there is complete cure with no evidence of residual disease or recurrence. Decision to move away from routine intraoperative frozen sections in the context of parathyroid surgery may carry a risk of

misdiagnosis and possibility of a repeat surgical intervention.

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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## Communication failures in surgery in the Asia Pacific region: a systematic review

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**Key words:** Communication error; non-technical skills; surgical team

### Abstract

#### Introduction

Communication failure among healthcare professionals causes preventable surgical morbidity and mortality. Asia-Pacific region has its own cultural norms and customs sometimes causing perplexities and acting as a barrier in communication in a surgical setup. This systematic review summarizes the communication failures in surgery in countries belonging to the Asia-Pacific Region.

#### Methods

Data were obtained by a stepwise process using electronic databases such as MEDLINE, EMBASE and Google Scholar. MeSH subheading 'Surgery' and MeSH terms such as anaesthesia, operating rooms and communication were used.

#### Results

The literature search yielded 447 articles. Additional five articles were selected from the references. Twelve eligible articles were selected for the final analysis. The causes of communication failure were identified in four domains. Those were failures in communication in teamwork, individual factors, work environment related factors and technical factors.

#### Conclusions

Professional power, hierarchical approach, gender-based discriminations and not being open for constructive criticism leading to communication failures were seen in Asia-Pacific region. Debriefing on areas in communication errors and implementations such as creating awareness through non-technical skills education, protocols, checklists, and introducing other methods to minimize the failure rates perhaps need to be done in this region.

#### Background

Alfred Cuschieri wrote, "the attitude to adverse events has changed from the defensive 'blame and shame culture' to an open and transparent healthcare delivery system, it is timely to examine the nature of human errors and their impact on the quality of surgical health care" (1).

Medical errors in surgery is responsible for the majority of preventable in-hospital adverse events (2-4). The factors causing human errors can be classified as excessive workload, inadequate knowledge, ability or experience, inadequate supervision or instruction, stressful environment and mental fatigue or boredom (5). There is growing evidence to suggest that non-technical skills are required to overcome these human errors in a surgical team (6-10). Non-technical skills can be divided mainly into two categories; interpersonal skills and cognitive skills (7). Out of the interpersonal skills, communication plays a key role in bridging the gap in human error and continuum of patient care during surgical interventions (5, 7, 11, 12).


Inter-professional integration is essential in the field of surgery. Therefore, communication does not necessarily mean an exchange of vital patient information among consultants such as anaesthetists, radiologists and surgeons, but also sharing basic information with theatre staff, ward nurses and other relevant parties to work as a team. Mishaps in communication occur at different points in the surgical care. This is broadly divided into inaccuracies that occur in preoperative assessment and optimization phase, pre procedure/procedural phase, post-operative phase and daily ward care (13). These miscommunications among team members could lead to devastating outcomes resulting in high morbidity and mortality (14). In 2009, the World Health Organization (WHO) emphasized the importance of effective communication and exchange of critical information for the safe conduct of the surgeries (5).

Several systematic reviews and studies conducted in intra-hospital patient handover (15-19), information transfer among healthcare workers (13, 20, 21) and effectiveness of surgical checklists (22, 23) concluded that communication errors are a shared the issue throughout the world. However, presently there are no reviews evaluating communication

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failures in the surgical field in the Asia-Pacific region as a whole. The present systematic review summarizes the communication failures in the Asia-Pacific region addressing the cultural and custom differences and perception variations in roles in the surgical team. Identifying the regional issues in communication will help plan active interventions through regional collaborations.

## Methods

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for reporting systematic reviews and meta-analyses.

### Search strategy

The electronic databases MEDLINE, EMBASE, Google Scholar and Cochrane Database of Systematic Reviews were used to search literature. MeSH (Medical Subject Heading) subheadings and MeSH terms were identified using available literature and related systematic reviews. A literature review was conducted by searching the online MEDLINE database (Medical Literature Analysis and Retrieval System) using MeSH term 'Surgery' as a MeSH subheading. The following MeSH terms\* (indicated in asterisk) and general terms were combined using the Boolean operation "AND" in our search. The search comprised studies until 30th July 2018.

1. Surgery (MeSH subheading), Anaesthesia\*, General surgery\*, Critical care\*, Operating room\*, Surgical procedure, operative\*, Intensive care\*
2. Interdisciplinary communication\*, Communication\*, Communication barriers\*, teamwork, information transfer, information flow
3. Safety\*, medical errors, quality, failure, errors, adverse

The search limits were; language ('English') and species ('human'). The results were filtered by the names of the individual Asia-Pacific countries as defined by the World Health Organization (Afghanistan, American Samoa, Australia, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Cook Islands, Democratic People's Republic of Korea, Fiji, French Polynesia, Guam, Hong Kong, India, Indonesia, Japan, Kiribati, Laos, Macao, Malaysia, Maldives, Marshall Islands, Micronesia, Mongolia, Myanmar, Nauru, Nepal, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Pakistan, Palau, Papua New Guinea, Philippines, Pitcairn Islands, Republic of Korea, Samoa, Singapore, Solomon Islands, Sri Lanka, Taiwan, Thailand, Timor-Leste, Tokelau, Tonga, Tuvalu, Vanuatu, Vietnam and, Wallis and Futuna)(24).

In the second stage, the articles were screened by 'title' and

'abstract'. In the next stage, full articles were read to see if they were eligible for the qualitative synthesis. Additional data were obtained using a manual search. Two independent reviewers (JS and YM) conducted this process. The selected articles which were to be included in the review was determined after an iterative consensus process among the reviewers.

### Inclusion/Exclusion criteria and Definitions

The following inclusion criteria were applied: a) institutions based studies related to pre-operative, operative and post-operative communication in surgical care b) communication failure among health care professionals (doctors, nurses and attending staff) c) geographically and temporally defined population from any of the Asia-Pacific region countries mentioned above, d) studies published in English e) studies published till 30th July 2018. Studies were excluded based on the following exclusion criteria: a) studies reporting the results of sex reassigning surgeries, b) critical care settings not involving surgery, c) delivery rooms in obstetrics, d) consent taking, e) pre-hospital care and f) if the study participants were from multiple disciplines (eg: critical care, emergency departments) and the majority was not related to surgery.

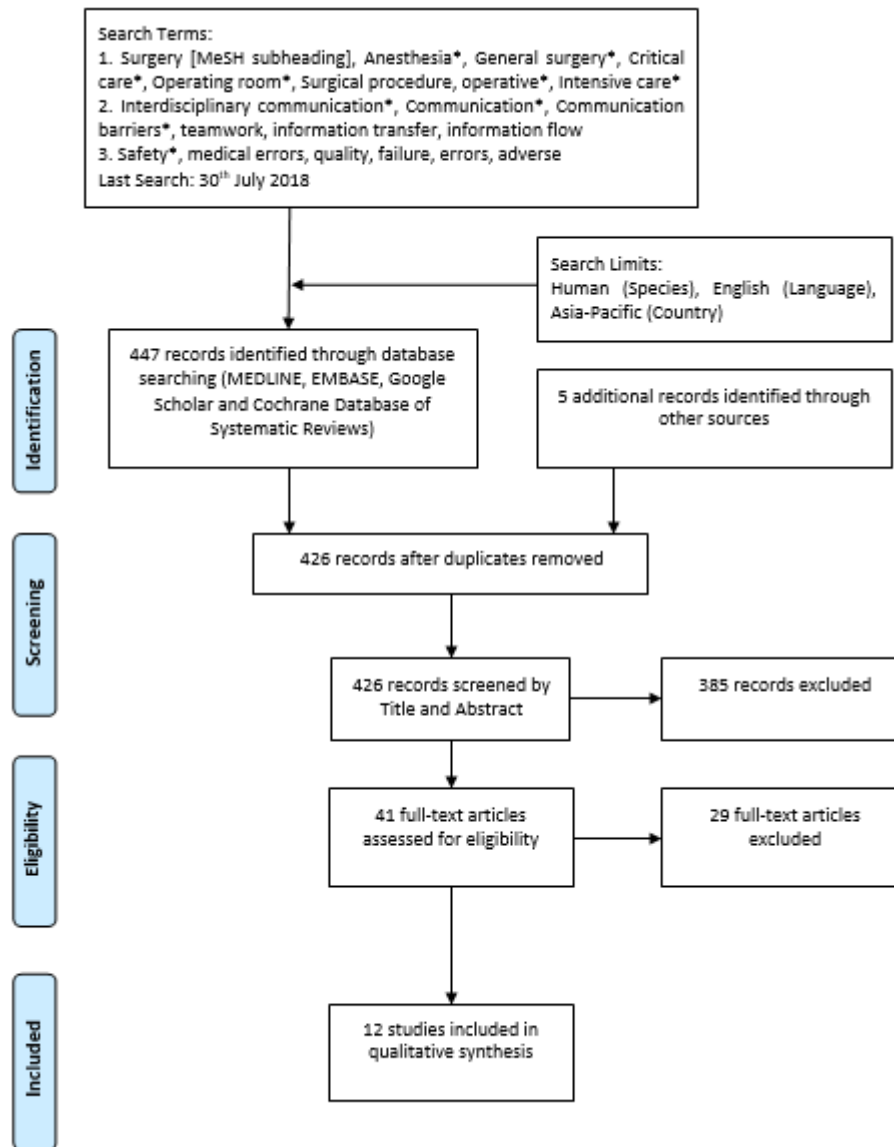
### Data extraction and analysis

Data were extracted from the included studies by one reviewer using a standardized form and checked for accuracy by a second reviewer. The data extracted from each study were: a) study details (country and study setting), b) methods (type of study, sample size, sampling method, age of subjects in years, the gender of subjects and definitions used), and c) data on communication errors. Incongruities in the selected data were discussed with a third reviewer. Corresponding authors were contacted for additional information which was not available on the published manuscripts.

## Results

A total of 447 articles were obtained from the search. Five additional articles were obtained by screening references. After removing duplicates, 426 articles remained. Full texts were obtained for 41 papers deemed to be potentially relevant. From this, 12 studies were eligible for the final analysis. The summary of the search strategy is presented in Figure 1. Of 49 Asia Pacific countries we were able to find data only for 5 countries (Australia, Japan, New Zealand, Singapore, and Sri Lanka).

The causes for communication failure in the respective countries and the sample population characteristics are summarized in Table 1. The causes for failure were divided mainly into four categories in this review. Those were a failure in communication in teamwork, individual, work environment and technical factors.



**Figure 1.** Summary of the search strategy





### ***Failure in communication due to team factors***

Gillespie et al. pointed out that in surgery, up to 30% of vital procedure related details may be lost by miscommunications (25). These were related to either content, audience, purpose or occasion (25). Programmes focussed on behaviour, organization and more predictability in work were identified as elements for the way out of miscommunications (25, 26).

'Professional misidentification' gave a high degree of independence to specific professions resulting in lack of collaborative function as a team (25). For a long time, it has been in the nature of surgeons to act as self-governing bodies or so called 'lone wolves' (27, 28). Gillespie et al. indicated that a shared understanding of only 12.5% happened among team members during surgical procedures (28).

This poor understanding was secondary to the hierarchical establishment, absence of professional respectful acknowledgement and basic communication among the surgical team members (28). A Sri Lankan study showed that involvement by the surgeons was significantly higher than the other professionals who were part of the surgical team (29). The main reasons were the surgeon's roles being entertained as 'a leader', while other professionals were considered 'assistants' (29). Not only among team members but also among the same profession itself the hierarchical obstruction was evident (29). Team leaders thought that the junior staff was overstepping by giving their input in surgical management (29). The chain of concise and accurate information flow with others in a team helps build a common situation assessment (28). Because the majority of the nurses were females while the majority of surgeons were male; surgeons tended to disregard the nurses' opinion and merely expected them to follow orders (29). The same study suggested that the WHO surgical safety checklist could be used to link the communication gap (29).

### ***Failure in communication due to individual factors***

The main individual dynamics responsible for communication failure were stress and overwork, limitations in knowledge and experience, poor decision making capacity, failure to seek advice and reluctance to accept communication failure (13, 29-31).

Cumin identified that there was inequality of information transfer among different professionals (30). While 45% of the surgeons communicated information related to surgical procedures, only 18% of surgical registrars, 17% anaesthetists, 0% anaesthesia assistants, 44% scrub nurses and 25% circulating nurses shared the same information with the others (30). Jayasuriya et al acknowledged that lack of motivation and lack of time were amongst the main determinants for lack of communication among the junior

surgeons (29). Senior surgeons believe that non-technical skills were achieved by solely being the team leader rather than learnt by paying attention and communicating with other members of the surgical team (29). Moreover, according to some junior surgeons, the senior nurses attempting to demonstrate their own knowledge and skills in surgery was considered stepping outside their required limit (29).

### ***Failure in communication due to work environmental factors***

Work environment communication failures occurred secondary to theatre room disturbances, lack of ward/theatre/intensive care unit facilities, overwork and inability to cater for heavy patient turnover (13, 25, 32). Majority of the studies in this review focussed on interruptions in the operating room. These disturbances were divided into conversational and procedural interruptions which accounted for 69.1% and 66.3% respectively (25). The main reason for this theatre disturbances was identified as lack of organization leading to excessive communication disturbances (32).

### ***Failure in communication due to technical factors***

Technical factors leading to communication failure included improper management protocol and use of documentation as the main means of communication (13, 33-35). An Australian study concluded that vital information was not communicated to the rest of the surgical team due to the burying of important facts in documents (33). Meanwhile, some of this documented information not being readily available for nurses lead to surgical disasters (33). For example, unavailability of allergic history to the anaesthetist and post-operative care staff resulted in preventable surgical morbidity and mortality. Fabila et al pointed out that "Pre-handover, equipment handover, timeout and sign-out protocol" (PETS) and "Situation, Background, Assessment and Recommendation form" (SBAR) can be used to reduce failure in information transfer (34).

In another study, 'shared mental model' in a team was the fundamental concept in successful tackling of a surgical task (27). Unavailability of the already trained nursing staff in specific specialities created difficulties for the new staff in instrument identification, unfamiliarity with the procedure and the surgeon or anaesthetist's personal requirements (27). Poor division of tasks among team members created a stressful atmosphere (35, 36). These studies suggested that education should be made central to overcoming the said issues (35, 36). Revised protocols and surgical safety checklists can be used to create a better understanding among team members (37). In addition, computer based card systems such as 'Momento' could be helpful to differentiate tasks between the members in the operation theatres (34).

## Discussion

Non-operative technical skills are critical, cognitive and interpersonal skills (7). Out of interpersonal skills, communication plays a major role. Asia-Pacific region is comprised of countries with a wide range of income and in a varied state in development (38, 39). It is, however well known that the countries of this region share common cultural and ethnic values (40). Communication is a trivial part of a country's cultural norms. Thus, we intended to assess shared risks in miscommunications in surgical care in Asia-Pacific region.

There were common features in surgical miscommunications that the Asia Pacific region shared with the rest of the world. Communication errors were responsible for 43% of the surgical errors occurred in three hospitals in the USA (2). An interview based study conducted in the United Kingdom exploring the communication and information transfer failures exhibited that, poor preoperative communication between anaesthetists and surgeons and incomplete handover from the ward to theatre and theatre to recovery were the commonest causes for information transfer failures (13). A review on surgeons' poor non-technical skills in the operating theatre summarized the following pitfalls; surgeons' failure to inform the anaesthetists, failure to anticipate events during complex procedures, failure to monitor other team activities, the consultant being distracted by problems informed of by another operating theatre, failure to brief and debrief one's own team, failure to discuss alternative procedures, hostility, frustration, failure to establish leadership in the operating theatre and conflicts with the anaesthetists(7).

Sutton et al. described a Crew Resource Management model which could significantly reduce miscommunications in multi disciplinary ward teams (41). It emphasized the importance of individual contribution in decision making process as opposed to the traditional hierarchical method (41). Verbal communication errors were responsible for 92% of surgical errors in a review of 444 surgical malpractices concluding the importance of written protocols and instructions in surgery (42). Inadequate verbal communication of health care professionals also contributed to a significant burden on the patients and their families (43). WHO published a surgical safety checklist in 2008(44).

This checklist gained much attention worldwide as well as in the South Asian region rapidly, as it readily demonstrated the evidence to minimize surgical hazards (44-52). It not only reduced the risk of miscommunications but also improved self-awareness among the team members (52). Distractions and interruptions in operating theatres were also associated with poor patient outcomes in both regional and global studies

(53-57). Thus, it is anticipated that structured, well-planned and more predictable work conditions would bring down the number of interruptions.

Although similarities identified between the Western world and the Asia-Pacific region in surgical communication failure, professional power, hierarchical approach, gender-based discriminations and not being open for constructive criticism were a few issues that were not readily seen in the other regions of the world. Emphasized below are some of the areas where communication in a team became a barrier due to cultural and custom norms. A study done in Sri Lanka portrayed that patriarchy and gender norms contributed negatively towards inter-professional collaboration (29). A research done in nine urban teaching hospitals in Korea disclosed a propensity towards technical skills and competencies of leadership roles to be more important than human factors. Additionally, an unbending culture prevents open discussion, giving feedback and sharing different opinions with colleagues (31). A high dependency on senior staff member's decisions, low recognition of the negative effects of fatigue, stress and personal problems also contribute to this issue (31). Thus, it is evident that these cultural beliefs in the Asia-pacific region should be spoken about in order to overcome the obstacles of failure in communication.

Equal contribution of all team members is a root factor in successful surgical care. Maintaining adequate communication through pre-operative pre-briefing to post-operative handover is crucial (20). The main challenges for inability to work as a team were miscommunications and professional hierarchy in many studies (58-62). The contribution by the anaesthetists, nurses and surgeons should be in sync and equal in teamwork. Without adequate participation by all the professions, effective surgery becomes unachievable. Hence, it is required that the leader takes major decisions after taking other team members' opinions into consideration rather than employing dictatorship in the surgical setting.

The knowledge and experience in the field among the various professions could have some impact resulting in the variance of information distribution. Similarly, proper and orderly documentation followed by verbal communication is mandatory to minimize operative morbidity and mortality (58-60). Another issue in team communication was the gender-based neglecting, which was in Asia- Pacific region. Olden days were a male dominant society with the concept that men were superior and were supposed to give orders for females to follow (63, 64). Though it is not well documented, it is evident that there are significant gender based differences in surgical careers worldwide (65, 66). This is another psycho social factor that needs addressing.



### **Strengths**

The present systematic review has a comprehensive search strategy which is easily replicable. Well-defined inclusion/exclusion criteria were used in this search. This systematic review gives the reader an overall view of the salient differences in Asia-Pacific region communication failure in surgical practices that is to a certain extent different from the rest of the world.

### **Limitations**

There was no uniformity on the definition and classification of communication errors used in the studies; resulting in limitations in comparability.

Article availability was limited in general in the Asia-Pacific region. Communication errors and the preventable morbidity and mortality were under reported. Therefore, the results might underestimate the communication errors in this region. Available studies only addressed one or a few phases of the communication failure in surgery. There was a marked variability among the study population, study setting, methods used and interventions. The number of studies was also limited, and definitions and classifications of communication errors were not consistent. Thus, a meta-analysis was not performed.

### **Suggestions for future studies**

Even though the data in the Asia Pacific region is sparse, available records were enough to convince the reader of the need to improved information flow from pre-operative to post-operative care. Hence, this highlights the significance of coming up with a better-quality effective multi disciplinary team communication system in Asia Pacific region and bringing down certain cultural norms to upgrade our patient management.

Structured studies with a larger sample size representing the population, would provide the foundation for a better understanding of the magnitude and inferences of communication errors in surgery in this region. Such studies will also contribute to the development of recommendations to these populations. Furthermore, accurate health care charges and economic burden of preventable morbidity and mortality due to communication errors in surgery in the Asia-Pacific region was not studied to date. It is a mandate to conduct future research to identify the direct and indirect costs of communication errors in the regional countries. Future studies also need to centre on the recognition of shared risk factors in communication in the region. Regional organizations such as the WHO could play a pioneering role in introducing such assessment standards for future research. There is a role in medical education starting with the undergraduate, to create awareness in the value of

communication in improving safety and the need to remove barriers. The use of trans-professional education could also help improve communication between professions by improving the respect and regard for each other.

### **Conclusion**

Asia-Pacific region has its own cultural norms and customs, which could cause perplexities and act as a barrier in communication in a surgical set-up. Common communication errors in surgical settings found in this region can be categorized according to team factors, individual factors, environmental factors and technical factors as in this review. Professional power, hierarchical approach, gender-based discriminations and not being open for constructive criticism leading to communication failures were unique to the Asia-Pacific region. Extensive debriefing on areas in communication errors and implementations such as creating awareness through non-technical surgical skills education, protocols, checklists, and introducing other, novel methods to minimize the failure rates need to be done in the Asia-Pacific region. Similarly, the shortage of the data available in this region suggests a need for further studies in the area.

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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## Low anterior resection syndrome (LARS)

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**Key words:** Neorectum; aetio-pathology; QOL; LARS; dyspareunia; ileostomy

### Abstract

Patients develop a variety of bowel dysfunction following low or very low anterior resection for rectal cancer. These symptoms are known collectively as low anterior resection syndrome (LARS), and the extent to which it affects the quality of life of these patients can be assessed by the LARS score. Knowledge about anorectal functional anatomy is a prerequisite to understanding the aetio-pathology and clinical manifestation of LARS. Structural and functional impairment of the internal and external anal sphincter and the anal transition zone, loss of reservoir function of the rectum, increased colonic motility, proximal diversion, enteric nervous system remodelling and neuropathy of autonomic nerves in the pelvis are known to cause LARS.

Assessment of patients with LARS with MRI scan, endoanal ultrasound and anorectal manometry will help to identify the cause for LARS. Treatment of LARS will have to be tailored to the individual patient. The treatment protocol can start with conservative measures like pelvic floor rehabilitation, colonic irrigation and biofeedback therapy. Medication with Imodium and serotonin receptor antagonists may help some patients with LARS. Sacral nerve stimulation is a minimally invasive technique that has been used to treat patients with LARS for more than one year. Stoma creation will be considered in those with major LARS persisting for more than two years. Meticulous dissection with preservation of nerves and anal sphincters and anastomotic reconstruction techniques such as an end to side anal anastomosis or a colonic-J pouch anal anastomosis can minimize the occurrence of LARS.

### Introduction and definition of the low anterior resection

Low anterior resection for cancer is defined as the operation which aims to completely remove the rectum with its tumour, including total mesorectal excision, followed by anastomosis

of the proximal colon to the anal canal. Treatment for lower rectal cancer has improved over the last two decades. This is primarily because of the use of neoadjuvant chemotherapy and radiotherapy for effective local control and advances in surgical techniques with the invention of endo-anal circular stapling devices for anastomosis and sphincter preservation (1). As a result, many patients with a low rectal adenocarcinoma are now treated with low anterior resection with total mesorectal excision. Those in whom tumour-free margins are achieved with sphincter preserving surgery will be expected to have a better quality of life (QOL) compared with those who receive a permanent stoma. In reality, up to 90 percent of patients will experience symptoms of bowel dysfunction (2). The QOL of these patients did not differ from those who had received a permanent colostomy (3).

LARS is a collection of symptoms or ailments experienced by patients following low anterior resection. These symptoms include gas and faecal incontinence, faecal urgency, frequent bowel movements, bowel fragmentation and emptying difficulties (1). Neo-adjuvant chemoradiation for rectal cancer and total mesorectal excision (TME) have been associated with severe postoperative bowel dysfunction (4).

Apart from colonic dysfunction, patients can also experience genito-urinary dysfunction such as impotence, ejaculatory dysfunction and dyspareunia following low anterior resection. There is no general agreement, yet, about the inclusion of genito-urinary symptoms in the LARS scoring system (5), which is a validated scoring system to assess the extent to which QOL is affected (6).

Attempts have been made to reduce the incidence of LARS and to improve QOL but these are yet to achieve satisfaction. Thus, understanding the basic science behind LARS and its effect on QOL is essential to focus on future developments in the treatment of lower rectal cancer and in the prevention of LARS.

### The aetio-pathology of LARS


#### *Physiology of defaecation*

The rectum is filled with faeces by colonic activity. Receptive relaxation of the upper rectum enables reservoir function (7).

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Distension of the lower rectum induces a recto-anal inhibitory reflex (RAIR), which causes relaxation of the internal anal sphincter (IAS), preparing the anal canal for defaecation. When socially inconvenient, it would be possible to recruit contraction of external anal sphincter (EAS) muscle and to halt defaecation (8). The entry of rectal content into the upper anal canal allows sampling of content in the anal transition zone (ATZ), which is able to discriminate the nature of rectal content. The RAIR is effected by the myenteric plexus, controlled by the autonomic nervous system. The IAS receives sympathetic and parasympathetic innervation by the hypogastric and pelvic nerves respectively. The IAS is mainly responsible for the maintenance of continence at rest and during sleep (9).

Continued distension of the lower rectum stimulates the mechanoreceptors in the rectum and pelvic floor, which will result in stimulation of myenteric nerves in the sigmoid colon and rectum, resulting in increased local peristalsis. The afferent impulses from stretch receptors travel to spinal segments; the parasympathetic nerves via the pelvic splanchnic nerves (Nervi erigentes) to sacral segments and sympathetic nerves via the hypogastric nerves. Stimulation of parasympathetic motor neurons in the sacral spinal cord will increase peristalsis throughout the large intestine resulting in sets of high amplitude propagated sequences (HAPS) that will generate the "call to stool". Sympathetic nerves inhibit HAPS (8).

When defaecation is not convenient, contraction of the external sphincter and pelvic floor is modulated by the somatic motor neurons at the sacral segments of the spinal cord via the pudendal nerve (S2, 3, 4). Continuation of defaecation is facilitated by contraction of anal canal longitudinal muscle leading to shortening of the anal canal and relaxation of pelvic floor muscles. Usually, the descent of the pelvic floor is confined to 2 cms. Involuntary colorectal motor activity and voluntary straining increase rectal pressure resulting in a net expulsive force that is directed postero-inferiorly. Simultaneously, the anorectal angle, which is acute in a position of rest, becomes obtuse, resulting in straightening of the anal canal. The net rise in intra-rectal pressure over anal canal pressure results in the expulsion of faeces. At the end of defaecation the pelvic floor will raise and resting anal sphincter tone will return to establish a state of continence (8).

### **The aetiological factors affecting the process of defaecation after low anterior resection**

#### *Alteration in functional anatomy of the ano-rectum in low anterior resection*

##### *- IAS*

Structural damage to the IAS can occur by stretch during

anastomotic reconstruction with circular staplers. This can also result from excision of the upper part of IAS in very low anterior resection (10). Scarring after radiotherapy can also affect the functional integrity of IAS (9). Injury to autonomic nerves supplying the IAS either during surgery or during radiotherapy, will affect RAIR and anal sampling. This functional derangement can result in a reduction in anal resting pressure and faecal soiling (10).

##### *-Anal transition zone (ATZ)*

Excision of the ATZ during intersphincteric dissection and mucosal proctectomy in extended low anterior resection has the potential to impair anal sampling resulting in flatus incontinence and soiling (9, 10).

##### *-The external anal sphincter (EAS)*

The external anal sphincter is at risk of direct injury during low and extended low anterior resection of the rectum (11) and as a result of pudendal neuropathy, which may occur following neo-adjuvant radiotherapy and in anastomotic sepsis. Urgency and faecal incontinence are sequelae of pudendal neuropathy (2).

##### *-Rectal reservoir*

Reservoir function of the rectum is lost in TME with colorectal or colo-anal anastomosis. Further, damage to autonomic nerves in TME and following neoadjuvant radiotherapy can lead to denervation of the rectal stump. This will have an impact on the reservoir function of the rectum (7). When the neorectum is filled with faeces it will contract due to its intrinsic colonic property. Radiation-induced fibrosis will further reduce the capacity and compliance of the neorectum. The outcome of these functional derangements would be frequent bowel movements and bowel fragmentation.

##### *-Colonic motility*

High ligation of the inferior mesenteric artery and mobilization of the left colon can cause autonomic denervation. Reduction in sympathetic inhibitory action can, in turn, produce high amplitude propagated sequences (HAPS) leading to increased peristalsis of the colon (2,12,13). This can manifest as the increased gastrocolic reflex, urge to defaecate and loose stools (14).

##### *-Proximal diversion*

Temporary ileostomy performed with TME causes mucosal and muscular architecture of colon. With atrophic changes muscular and villous architecture of colon, there will be impaired absorption and secretion. The diversion can also lead to neuronal changes. There will be remodelling of submucosal and myenteric plexus of the enteric nervous system. After reversal of ileostomy, the patients may experi-

**Table 1. LARS Score questioner (with points allocated to respective answers)**

|  |   |                  |
|--|---|------------------|
| Do you ever have occasions when you cannot control your flatus (wind)?                       | <input type="checkbox"/> No, never<br><input type="checkbox"/> Yes, less than once per week<br><input type="checkbox"/> Yes, at least once per week   | 0<br>4<br>7      |
| Do you ever have any accidental leakage of liquid stool?                                     | <input type="checkbox"/> No, never<br><input type="checkbox"/> Yes, less than once per week<br><input type="checkbox"/> Yes, at least once per week   | 0<br>3<br>3      |
| How often do you open your bowels?   | <input type="checkbox"/> More than 7 times per day (24 hours)<br><input type="checkbox"/> 4-7 times per day (24 hours)<br><input type="checkbox"/> 1-3 times per day (24 hours)<br><input type="checkbox"/> Less than once per day (24 hours) | 4<br>2<br>0<br>5 |
| Do you ever have to open your bowels again within one hour of the last bowel opening?        | <input type="checkbox"/> No, never<br><input type="checkbox"/> Yes, less than once per week<br><input type="checkbox"/> Yes, at least once per week   | 0<br>9<br>11     |
| Do you ever have such a strong urge to open your bowels that you have to rush to the toilet? | <input type="checkbox"/> No, never<br><input type="checkbox"/> Yes, less than once per week<br><input type="checkbox"/> Yes, at least once per week   | 0<br>11<br>16    |

***LARS Score and impact on QoL***

0-20 = No LARS , 21-29 = Minor LARS , 30-42 = Major LARS

LAR score has a sensitivity of 72.54 % and specificity of 82.52% for major LARS.

It also shows a very good correlation with severity of LARS (6).

ence diarrhoea and frequent stools affecting the QOL (15).

***-Enteric nervous system remodelling***

Remodelling of enteric nerve function and fibrosis with stricture formation at the site of coloanal anastomosis could result in obstructive symptoms such as constipation and difficulty emptying (15).

***-Neuropathy of autonomic nerves in the pelvis***

Urinary and sexual dysfunction such as dyspareunia and impotence would be due to damage to autonomic nerves during pelvic dissection during TME (16, 17, and 18).

**The LARS score in the evaluation of the severity**

Many assessment tools have been devised to objectively quantify impaired anal continence; the St Marks Faecal Incontinence Grading Score, the Wexner Incontinence Score and the Rockwood Faecal Incontinence Severity Index, the latter specifically designed to assess the quality of life in patients with faecal incontinence. The LARS scoring system, which concerns those who have had low anterior resection of the rectum, has been designed taking into consideration the diversity of symptoms affecting QOL in patients with sphincter sparing surgery (11 – Table 1).

LARS scoring system assesses the degree to which low anterior resection affects the QOL in patients treated with sphincter sparing surgery for rectal cancer. Five clinical manifestations of LARS are considered in this scoring system; incontinence to flatus, leakage of liquid stool, frequency of bowel movement, clustering of defaecation and faecal urgency. A scale is used to quantify the impact of each symptom of bowel dysfunction on the QOL of patients. The score thus obtained ranges from 0 to 42. Patients having a score ranging from 0 to 20 will be considered those who don't have LARS.

Those with a score 21 to 29 are classified as minor and 30 to 42 as major LARS respectively. The score is useful to assess the prevalence of LARS and the impact of sphincter sparing rectal excision on patients' QOL. It can also evaluate the effectiveness of various treatment modalities on the QoL of patients with rectal cancer. Further, this would be a useful tool to assess the impact of preventive interventions taken during surgery to prevent LARS postoperatively (6).

### **Diagnostic investigations**

Once the clinical diagnosis of LARS is made on subjective symptom analysis the following investigations could aid to arrive at an objective assessment for bowel dysfunction;

#### *Defaecography / MR Defaecography*

Defaecography can demonstrate the characteristic features of anorectal functional disorders in LARS. It enables visualization of contrast in the anal canal at rest, a widened anorectal angle, reduced evacuation fraction and a low volume neorectum (9). The patient could be assessed in a horizontal or vertical position by magnetic resonance (MR) defaecography depending on whether the MR magnet is closed or open respectively. Assessment of bowel dysfunction in LARS by MR defaecography could reveal detailed information about the anorectal angle, the pelvic floor descent and anal canal opening (19).

#### *Endo-anal USS (EUS)*

LARS resulting from structural damage to the anal sphincter complex is assessed by EUS. Both the internal and external anal sphincter can be visualized and defects in the sphincters predicted with an accuracy of over 98percent in experienced hands (20).

#### *Anorectal manometry*

An anorectal manometry is a standard tool for evaluation of anorectal dysfunction in LARS. Patients with LARS have decreased resting anal sphincter pressure, at times, reduced squeeze pressures and reduced rectal volume tolerability and low rectal compliance. Also, squeeze pressure may be normal in patients with LARS (21).

### **Clinical management**

#### *Non-operative*

##### *-Pelvic floor rehabilitation*

Pelvic floor rehabilitation is a standard method for the rehabilitation of patients with LARS. This consists of pelvic floor muscle training, biofeedback training and rectal balloon volume training. It has been shown that pelvic floor training significantly improves the frequency of stool and incontinence of faeces (22). Pelvic floor muscle training must be instructed to all the patients who had sphincter sparing surgery for rectal cancer irrespective of presence or absence of diverting stoma. Patients will experience improvement in symptoms of LARS when a tailored approach, using more than a single rehabilitative technique, is used (2).

##### *-Colonic irrigation*

Retrograde neo-rectal irrigation is efficacious in treating patients with LARS especially those with faecal incontinence and increased bowel frequency. In cases of delayed (more than 4-8 weeks) closure of a diverting stoma and in those with severe LARS persisting one month after low anterior resection retrograde enema irrigation of 250 ml of lukewarm tap water could be performed either daily once in 2 to 3 days. It is best that pelvic floor rehabilitation is performed along with neorectal irrigation with an enema. For patients with a diverting stoma ante-grade, trans-stomal enema irrigation or balloon volumetric training could be advocated. Patients should be periodically assessed with LARS score to evaluate improvement in LARS (2).

##### *-Biofeedback therapy (BFT)*

It is a process by which patients are trained to contract and relax the pelvic floor and anal sphincters with the help of balloons, myometry and manometry. BFT has been shown to increase rectal capacity and to reduce faecal incontinence and stool frequency (7).

##### *-Sacral nerve stimulation (SNS)*

SNS should be considered for those with major LARS score persisting even after one year (2). In brief, low voltage electrical stimulation of sacral nerve roots by trans-cutaneous implantation of an electrode at the third sacral foramen and a pulse generator placed subcutaneously in the buttock completes the assembly (23). SNS is thought to result in improvement in anorectal function via pelvic afferent and central mechanisms (24). It has been reported that SNS improves the quality of life in patients with LARS by improving the ability to hold stool and to defer defaecation. It also reduces postprandial urgency (25).

##### *-Pharmacotherapy*

Those patients with LARS with post prandial frequency



may benefit from serotonin induced 5-HT<sub>3</sub> receptor antagonists. Those patients with LARS with predominant diarrhoea have been shown to benefit from loperamide. Protective pads may be useful in those troubled by faecal soiling (1). Probiotics, steroids and nonsteroidal anti-inflammatory drugs have no benefits in LARS (22).

#### -Stoma

In those patients with major LARS even after 2 years, a stoma should be considered for better QOL. Also, in selected patients with severe LARS, neo-sphincter reconstruction might be considered (2).

### Minimizing LARS and improving functional outcome in LAR

#### *Surgical techniques*

In general, sharp dissection with minimal use of diathermy will prevent possible injury to pelvic nerves. Avoiding injury to hypogastric nerves during high ligation of an inferior mesenteric artery is an essential initial step during entry into the pelvis. TME that is performed for cancer distal to the upper rectum when compared with partial mesorectal excision (PME), which is performed for proximal rectal cancer, will have a short or no rectal stump with a low anastomosis. As such, patients undergoing TME are at greater risk of developing LARS compared with those having PME (15).

A straight colo-anal anastomosis has less compliance and capacity when compared to other techniques such as colonic-J pouch anal anastomosis or an end to side anal anastomosis, and is more likely to be associated with LARS, though the difference in function is likely to last no more than a year (7, 26).

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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## Portal vein variations in Sri Lankan patients: a computed tomographic imaging based study

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**Key words:** Portal vein branching variations; types of portal vein variation; portal vein

### Abstract

Knowledge about portal vein (PV) branch anatomy variations is essential in preventing disastrous complications following liver surgeries. Case series among Sri Lankan patients reporting variations in PV branching anatomy has not been published previously. This study reports a series of PV branch variations among patients who had a contrast-enhanced Computed Tomography (CT) is done at the Teaching Hospital Anuradhapura (THA). PV branching was classified into Types A – D. Primary PV branching variations occurred among 12.6% of patients. Type C variation was the commonest (7.8%).

### Background

Knowledge about the PV branch anatomy is essential in live donor liver transplantation, liver resection, transjugular intrahepatic portosystemic stent shunt insertion (TIPSS), portal vein embolization, etc. The primary PV branching pattern is reported to vary in 11% -21.5% of subjects even though this is less frequent than the hepatic arterial and hepatic venous anatomy variations (1-3). But detailed knowledge of the PV branching variations is important to plan the surgery and to avoid complications. No such case series of PV branching variations have been reported in Sri Lanka.

### Methods

Abdominal contrast-enhanced CT scans showing PV phase, done at The THA Sri Lanka was evaluated over a 2 month period from October 2018 to November 2018. All the images were reviewed by the author at the computed tomography console room on the computer. Images showing artifacts, inadequate PV enhancement, the inadequate extent of imaging, intra/extra hepatic lesions distorting the PV anatomy were excluded. Primary PV branching variations were evaluated (main and sectoral branches). PV branching

variations were classified as follows (figure 1)

PV branching variations were classified as follows (Figure 1).

- *Type A (classical pattern)*  
*Main PV divides into the right (RPV) and left (LPV) branches*
- *Type B (trifurcation)*  
*The main PV divides into right anterior sectoral (RAPV), right posterior sectoral (RPPV) and LPV branches*
- *Type C (early RPPV branching)*  
*RPPV originates directly from the main PV before it divides*
- *Type D*  
*All other branching patterns*

### Results

PV anatomy was evaluated on 103 CT scans. There were 49 males (47.6%) and 54 females. 90 cases showed classical anatomy (Type A- 87.4%). Thirteen (12.6 %) cases showed variations in a primary branching pattern. Type C variation (early RPPV branching) was common and seen in 8 patients (7.8%) while type B variation occurred in 3 subjects (2.9%). Type D variation occurred in 2 (1.9 %). All patients who had type B variation were females.

### Discussion


PV originates by the confluence of splenic and superior mesenteric veins posterior the neck of the pancreas. It runs in the free edge of the lesser omentum and at the liver hilum, it divides into right and left branches (RPV and LPV) (Refer Figure 1). RPV further divides into an anterior sectoral (supplying segments V and VIII) and posterior sectoral (supplying segments VI and VII) branches. The LPV supplies segments II, III and IV and its anatomy is generally consistent. Previous studies reported that the variations occur at the rate of 11 to 21% (1,3). No such case series have been reported from Sri Lanka before.

Our study showed that the classical pattern of primary PV branching occurs in 87.4% and variations occur in 12.6%. Various studies mention either type B or C as a common type of variation (1,3). In our study type C variation was common

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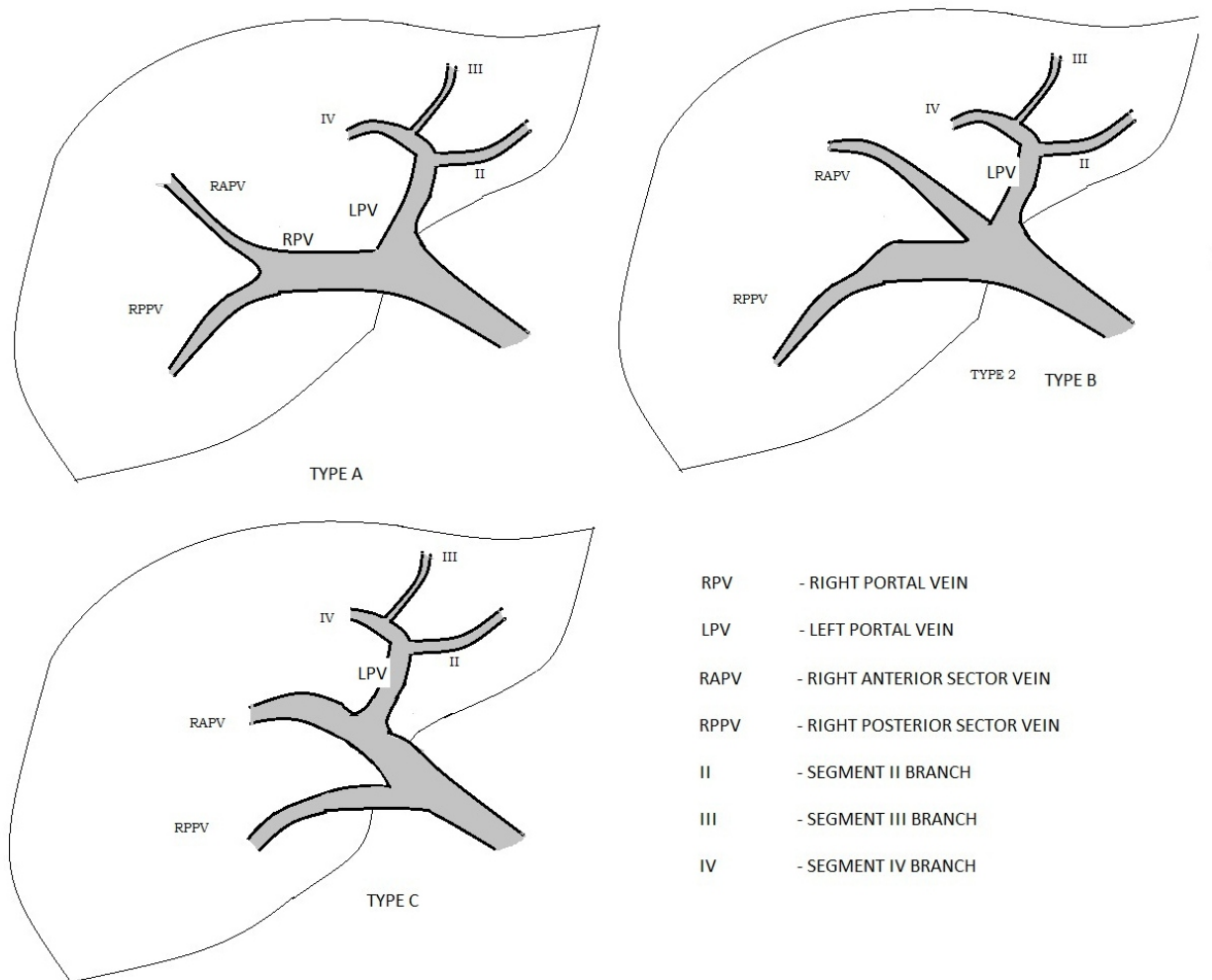
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**Figure 1. Portal Vein Branching Variations**

(7.8%). Knowledge about the existence of portal vein branching variations is essential to plan the surgeries and radiological interventions and also to prevent complications.

The limitations of this study include the small study size number and also type D variations were not further categorized. In addition all the images were read by a non-radiologist, though experienced vascular surgeon, which could be a drawback when non-anatomical concerns arise i.e. artifacts, timing of images, etc. Future studies either radiological or cadaveric can improve on these findings

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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## A case of acquired urachal pathology in a child

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**Key words:** Urachal cyst; patent urachal sinus; laparoscopy; umbilical trocar; infected urachal cyst

### Introduction

The urachus is a fibrous embryological remnant of the allantois, a narrow canal structure that connects the top of the foetal bladder to the umbilicus (1). This canal is initially patent but later closes as the bladder descends into the pelvis and stretches the urachus. The median umbilical ligament is the resultant adult remnant, which runs from the umbilicus to the dome of the bladder. Urachal pathology can present as congenital or acquired. Failure of the urachus to close leads to congenital urachal defects including urachal cyst, urachal sinus, patent urachus and vesicourachal diverticulum. Urachal anomalies usually occur as isolated defects and are typically not associated with syndromes except prune belly syndrome.

In the literature and clinically, urachal sinus and cyst are more common than a patent urachus and vesicourachal diverticulum (2). 1 in 5,000 live births lead to a urachal cyst, but only 1 in 150,000 become clinically relevant in the population (1).

The most common signs of a patent urachus are clear drainage of urine through the umbilicus, abnormal appearing umbilicus or infectious findings; these commonly are seen in the neonatal period, most other anomalies are asymptomatic unless complicated by an infection (3). Routes of infection include haematogenous and direct spread from the bladder or the lymphatic system. Ultrasound is appropriate for confirming a diagnosis of urachal pathology, computed tomography (CT) scan and magnetic resonance imaging (MRI) are alternative imaging techniques. In infants, ultrasonography has up to 100 percent sensitivity when identifying a patent urachus, 100 percent sensitivity for urachal sinus and 82 percent sensitivity in identifying urachal cysts (4). Treatment of urachal pathology is the removal of the complete structure to prevent malignant transformation in

adulthood to urachal carcinoma. In our review, there have been no paediatric cases reported of urachal pathology due to instrumentation from a previous laparoscopic procedure.

### Presentation

An eight-year-old male with a history of a laparoscopic appendectomy two years prior presented for resection of an infected patent urachus. The patient was born full-term via Caesarean section with no complications at birth nor in the first year of life. The patient's family reported no discharge from the umbilicus until three months before the elective surgery; the patient had developed cellulitis of his periumbilical area, presented to a nearby emergency room and was prescribed a ten-day course of topical antibiotics. During these ten days, the patient developed umbilical discharge that went from purulent to clear. Following these episodes, the family presented to their paediatrician who attempted to cauterize the umbilicus.

However, the drainage recurred soon after prompting surgical evaluation. Upon ultrasound and CT scan imaging, a patent urachal cyst and sinus were confirmed. The patient underwent an uncomplicated excision of a patent urachus with bladder cuff and urachal tract with placement of Penrose drain through the congenital urachal sinus at the umbilicus. Intraoperative wound cultures grew *Enterococcus coli*; the patient received three days of intravenous Piperacillin/Tazobactam and was discharged on oral Cephalexin for seven days.

### Discussion


Our patient presented for surgical removal of an infected patent urachus two years after undergoing a laparoscopic appendectomy with umbilical, right upper quadrant and left lower quadrant ports. During the appendectomy and its preoperative imaging, there was no indication of urachal pathology.

The patient's previous laparoscopic procedure, utilizing an umbilical port, could be a cause of the acquired urachal pathology requiring operative intervention. Prior to the patient's appendectomy, there was no history of umbilical pathology. It is possible the patient had an asymptomatic patent urachus that was missed on preoperative imaging, and during the appendectomy, however, it is more likely the

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urachal pathology was acquired after the laparoscopic procedure as the patient began to demonstrate symptoms after the appendectomy with imaging confirming its presence. When performing laparoscopic procedures in the paediatric population, we must be aware of the possibility of acquired urachal pathology due to trocar placement.

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:

- Most urachal anomalies are asymptomatic unless complicated by an infection. Common signs of a patent urachus are clear drainage of urine through the umbilicus or abnormal appearing umbilicus.
- Urachal pathology can present as congenital or acquired; most are seen as congenital forms due to the failure of closure of the urachus causing a urachal cyst, urachal sinus, patent urachus, and vesicourachal diverticulum.
- During laparoscopic procedures in the paediatric population, we must be cautious of the possibility of acquired urachal pathology due to trocar placement.

## Stitch erosion of small bowel: a rare delayed and avoidable complication of laparotomy

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**Key words:** Past laparotomy; abdominal wall closure; small bowel fistula; stitch erosion; non-absorbable sutures

### Introduction

Incorporation of a loop of bowel to a stitch is a devastating complication that could occur during abdominal wall closure. This is a condition that usually presents in the early post-operative period as an abdominal wall abscess or enterocutaneous fistula with varying degrees of sepsis.

A mass related to the surgical site with evidence of inflammation that is actually due to stitch erosion of small bowel from an operation performed three decades ago is a phenomenon that is not reported in literature according to the author's knowledge. However, delayed erosion of bowel caused by prosthetic mesh is a recognized entity that is reported in the literature (1)

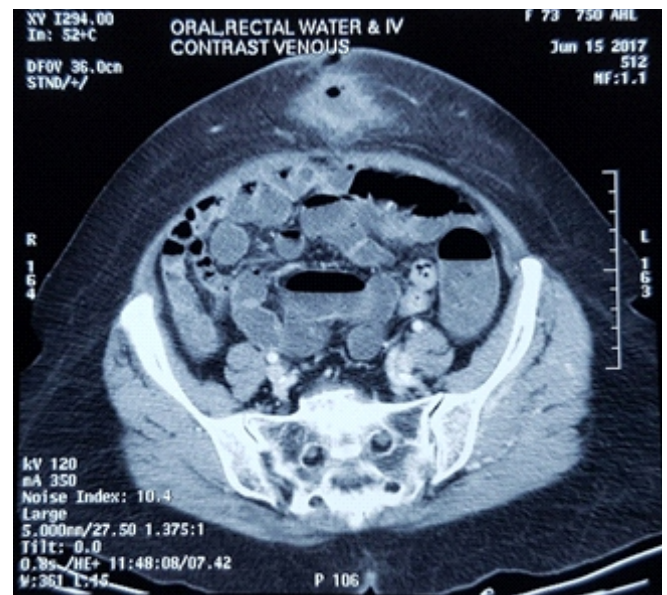
### Case presentation

We report a case of 73 years old female presenting with a painful mass around the umbilicus for 3 months duration, which was initially diagnosed as an incisional hernia ultrasonically. She gives a history of trans-abdominal hysterectomy and bilateral salphingo-oophorectomy for a benign fibroid disease through a midline laparotomy. Following that she had an uneventful recovery with no surgical site infection. The mass which developed around umbilicus almost 3 decades later, was gradually progressive with signs of inflammation.

Contrast enhanced CT abdomen showed an abscess in the subcutaneous tissues of the anterior abdominal wall communicating with a loop of the small bowel.

Elective exploratory laparotomy revealed an abdominal wall abscess with densely adhered small bowel to the previous scar and fistulation with abscess cavity. [Figure 2] Abscess was drained and the fistulated small bowel segment was completely excised with an end to end anastomosis of healthy

small bowel ends. As the rectus sheath edges were healthy primary abdominal closure was done with a polydioxanone suture. The skin was loosely approximated over a corrugated rubber drain. She had an uneventful post-operative period with no surgical site infection.



**Figure 1.** CECT abdomen showing an abscess in the subcutaneous tissues of the anterior abdominal wall communicating with a loop of small bowel (arrow).




**Figure 2.** Densely adhered small bowel to the previous scar and fistulation (forceps)

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Histology of the small bowel segment showed chronic nonspecific inflammation only.

### Discussion

Although at presentation our patient's problem was clinically suspected as an incisional hernia, the use of cross sectional imaging in the workup highlights its value in picking up an unexpected significant finding. This helped in the delineation of its anatomy for accurate surgical planning. An unplanned exploration in our patient would have led to the formation of an enterocutaneous fistula leading to more than a single operation to solve the problem.

As the histology of the excised segment of bowel showed non-specific inflammation only, conditions such as Cohn's disease of the small bowel can be ruled out. It is, therefore, most likely caused by stitch erosion of small bowel leading to a concealed collection; an enterocutaneous fistula in evolution. The question here is why was it silent for thirty years? Did the injury take place three decades ago? The most probable explanation is that the non-absorbable stitch acting as a foreign body eroded through the bowel wall three decades after the initial operation as a result of being in very close proximity to the bowel. There was no other local or systemic evidence of sepsis as it was well concealed.

This case highlights the value of the use of long term absorbable sutures rather than non-absorbable sutures in the closure of abdominal wall defects as recommended by European Hernia Society guidelines, 2015 in abdominal wall closure(2). On a different note, during abdominal wall closure, placement of omentum as a barrier between the abdominal wall and bowel is of potential use in preventing adhesions forming between the scar and bowel.

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:

- Incorporation of a loop of bowel to a stitch during abdominal wall closure is a devastating complication that usually presents in the early post-operative period as an abdominal wall abscess or enterocutaneous fistula. However, it is important to remember that a stitch erosion of small bowel following open surgery can present even many decades later as a painful mass.
- This study highlights the value of using long term absorbable sutures rather than non-absorbable sutures in the closure of abdominal wall defects.



## Splenic cyst: a rare case of massive splenomegaly with thrombocytopenia

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**Key words:** Splenic cyst; thrombocytopenia; splenectomy

### Introduction

Splenic cysts causing massive splenomegaly is a relatively rare clinical entity; only 800 cases have been reported in the English literature worldwide (1). A large autopsy report reveals an incident rate of 0.07%. Splenic cysts can be either primary or secondary. Most of the splenic cysts are asymptomatic. We present a case of splenic cyst presented with symptomatic massive splenomegaly.

### Case presentation

Our patient is a 21 years old male, presented with abdominal fullness, dyspeptic symptoms and left hypochondrial mass for one year. There was no history of trauma. His appetite was normal. He did not have any significant family illnesses. There was no attributable past medical or surgical history. Examination revealed massive splenomegaly and normal liver. Ultrasound scan showed a large cystic lesion in the left hypochondrium. A contrast-enhanced CT abdomen was done and found to have a large simple splenic cyst (20×16×16cm) with loco regional mass effect. His liver biochemistry was normal. Full blood count revealed mild thrombocytopenia (112×10<sup>9</sup>).

He was initially treated by an ultrasound scan guided aspiration and pigtail tube insertion. The aspirated fluid was clear, straw colour and its biochemical and microbiological analysis were normal. Pigtail tube functioned well with good drainage and the patient showed clinical improvement. But unfortunately, drainage volume was continuously high about 500ml / day for a week. Despite this daily high-volume drainage, A repeat ultrasound scan examination revealed a significant amount of fluid remaining in the splenic cyst. After discussing with radiologist and patient, a decision was made for open splenectomy. He underwent an elective open splenectomy after completing the relevant immunization. Intraoperative findings were massive spleen and its dilated

vessels (Figure.1). He had an uneventful post-operative recovery. Histology confirmed a simple benign cyst with no evidence of parasitic infestations.



**Figure 1.** Massive spleen and its dilated vessels

### Discussion


Splenomegaly has several aetiologies varying from congenital to neoplasms. Massive splenomegaly is defined as spleen having a craniocaudal length greater than 18-20cm or weighing more than 600g (2). A splenic cyst is a rare cause of splenomegaly. Splenic cysts are either type 1 (primary) or type 2 (secondary) (3). Primary cysts can be either parasitic or non-parasitic (epithelial) and parasitic cysts are commoner than non-parasitic cysts (6).

Congenital or epithelial cysts account for 25% of splenic cysts. They are mainly seen in young adults and children. Their pathogenesis is unknown although various theories have been postulated (2). These include involution of pluripotent cells in the splenic parenchyma, leading to squamous metaplasia, entrapment of peritoneal endothelial cells or coelomic mesothelium, and ingrowth of the surface mesothelium or dilatation of normal lymphatics (2). As most cysts are asymptomatic they are found incidentally on imaging for other abdominal pathologies. Symptoms

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correlate with size, larger the cyst more symptomatic it is. Nonspecific symptoms include dyspeptic symptoms and left upper quadrant abdominal pain. Rarely it may present with thrombocytopenia (4).

USS the abdomen is the first line of imaging followed by CT abdomen. CT abdomen is more sensitive than USS in diagnosing septae (more common in type 1 cysts) and calcifications (more common in type 2 cysts). CT scan doesn't differentiate between primary and secondary cysts. Diagnostic certitude is made only by histology.

Small asymptomatic non-parasitic cysts less than 4cm can be managed conservatively. Large, more than 4 cm and symptomatic cysts, especially parasitic cysts should be treated with surgery as they are more prone to haemorrhage, rupture, local regional pressure effects and infection although these complications are rare (1,5). Open total or partial splenectomy is safe and appropriate in many cases with a low level of recurrence (1) Minimally invasive treatments like aspiration and de-roofing carry a high degree of recurrence rate, although these methods are splenic preserving. Hence partial splenectomy is adequate in many cases especially in children as it preserves the spleen with an acceptable level of recurrence. The laparoscopic approach is gaining popularity with similar outcomes compared with an open approach.

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:

- Although complications are rare, the diagnostic confirmation of splenic cyst is made by histological assessment.
- An open or laparoscopic approach is applicable in most cases but splenic preservation approach is advisable.

## Intestinal obstruction due to the fossa of Waldeyer hernia

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**Key words:** Internal hernia; right-sided paraduodenal hernia; fossa of Waldeyer hernia

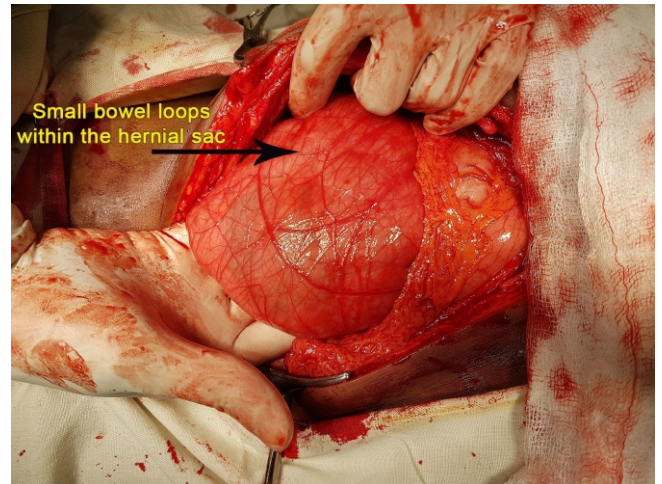
### Introduction

Internal hernia is an uncommon cause for intestinal obstruction and accounts for 1% of all such cases (1). However, a 20% risk of mortality is associated with this condition as a result of herniated bowel rapidly progressing to strangulation (2). Because this is not a common cause for intestinal obstruction, a high degree of suspicion is needed for timely intervention, especially in resource poor settings where CT scans are not readily available. Here we present a case of a 16-year-old boy who developed small bowel obstruction due to a right-sided para duodenal hernia.

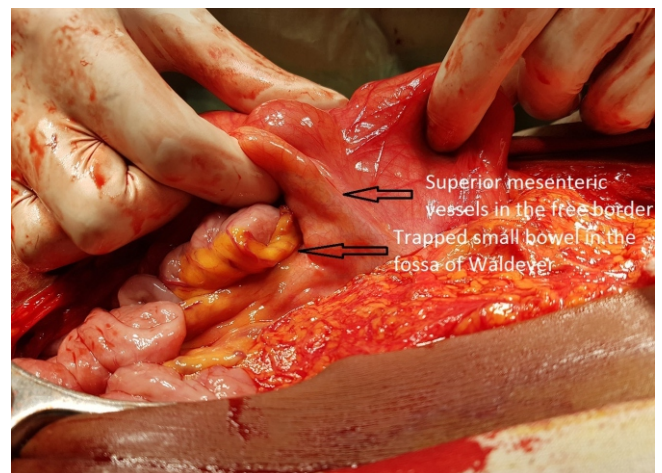
### Case presentation

A sixteen-year-old male patient was admitted to the surgical casualty unit at Base Hospital Awissawella with a 3-day history of colicky abdominal pain and repeated episodes of vomiting. His symptoms were worse after meals. He had not opened bowel for the past 3 days but had passed flatus. There was no associated fever. Two months back he has had a hospital admission with an episode of similar symptoms and had been discharged after one day following spontaneous improvement. He did not have a history of any past abdominal surgeries.

On this admission, he was found to be dehydrated but with stable haemodynamic parameters, the abdomen was minimally distended with non-specific tenderness over the epigastric region. The external hernia orifices were normal. Bowel sound was exaggerated and digital rectal examination revealed an empty rectum. Blood investigations revealed a mild leucocytosis of  $12.35 \times 10^9 \mu\text{L}$  (normal  $4.0-10.0 \times 10^9 \mu\text{L}$ ) with 77.8% neutrophils, low serum potassium (3.2 mmol/L, normal 3.5-5.3 mmol/L) and a normal serum amylase level. A metabolic alkalosis was noted on the arterial blood gas analysis, which was supportive of repeated emesis. Supine X-ray of the abdomen revealed a double bubble appearance



**Figure 1.** The hernial sac containing small bowel loops



**Figure 2.** The opening to the fossa of Waldeyer


suggestive of an upper small bowel obstruction. An ultrasound scan of the abdomen was arranged as CT was not available at our centre. Apart from confirming the presence of a distended stomach, it was uninformative.

As the patients' symptoms progressively worsened with time, an exploratory laparotomy was planned. He was kept nil by mouth and resuscitated with intravenous 0.9% NaCl solution with added potassium. A nasogastric tube was inserted to decompress the stomach and it was kept on free drainage. After fluid resuscitation, the patient was taken to the operating theatre.

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At laparotomy, we found a mass of small bowel loops ensheathed within a thin membranous sac (Figure 1). The mass was placed right to the midline. The opening of the sac was facing left and the superior mesenteric artery was running on its free anterior border (Figure 2). Our intraoperative diagnosis was a right-sided para duodenal hernia leading to small bowel obstruction. The trapped small bowel was reduced from the sac and was found to be healthy and viable. The peritoneal sac was excised and routine closure of the abdomen was done.

The recovery of the patient was uneventful apart from a fever spike on a postoperative day 1. He was gradually started on oral feeds and was discharged from hospital on postoperative day 3.

### Discussion

An internal hernia is defined as the protrusion of intraabdominal viscera into a normal or abnormal aperture within the peritoneal cavity (2). The aperture may be congenital or acquired. The commonest cause for acquired internal hernia is mesenteric defects secondary to Roux-en-Y loops. As obesity-related Roux-en-Y gastric bypasses are becoming more common, the incidence of acquired internal hernia appears to be on the rise (3).

Para duodenal hernia is the commonest site for congenital internal hernia and account for 53% of them. Pericaecal (13%), transmesenteric (8%), foramen of Winslow (8%), intersigmoid (6%), transomental (1- 4%), supravescical and pelvic (6%) foramina and recesses are other possible sites through which internal hernia can occur (1). Seventy-five percent of paraduodenal hernia is left-sided. The less common right sided variety which was seen in our patient has a 3:1 male preponderance while left-sided hernia have an equal gender distribution (4).

In a right-sided paraduodenal hernia the small bowel herniates into the fossa of Waldeyer, which lies below the transverse segment of the duodenum and behind the superior mesenteric artery. It is a rare but normal anatomical variation, present only in 1% of the population (3).

The hernia sac extends behind the ascending mesocolon and the herniated small bowel may have normal rotation or partial malrotation (1).

The presentation of a paraduodenal hernia can range from nonspecific abdominal pain to full-blown acute intestinal obstruction. Occasionally the herniated viscera can spontaneously reduce leading to relief of symptoms (3). This may explain the first hospital admission of our patient. Worsening of pain after meals are described as a typical feature of para duodenal herniation and this was noted in our patient as well (5).

In the patient with subacute or chronic symptoms due to a suspected internal hernia, oral contrast studies of the small bowel were the first line imaging modality in the pre CT era (3).

The classic finding of a paraduodenal hernia on a contrast study was an empty pelvis devoid of small bowel in the upright position with small bowel loops trapped in a smooth mass. The mass will be predominantly right or left-sided depending on the laterality of the paraduodenal hernia (4).

At present, the use of contrast-enhanced CT (CECT) has simplified the diagnosis. On CECT, in addition to distended small bowel loops trapped within an abnormal location the abnormal appearance of the mesenteric vessels in the form of engorgement, crowding, twisting or stretching supports the diagnosis (3).

In a patient who presents with acute symptoms, it is vital to act in a timely manner to prevent life-threatening complications. A contrast CT which is quick to perform is the ideal investigation in this situation (2). However, in the resource-poor setting such as ours where CT is not available proceeding to laparotomy with the clinical diagnosis may be in the best interest of the patient.

For a right-sided paraduodenal hernia two surgical approaches have been described. The first method involves the opening of the sac laterally and reducing the trapped small bowel followed by excision of the sac. The second method involves the right medial visceral rotation to deliver the herniated small bowel (4). We utilized the first method in our patient. It is important to bear in mind the relationship of the superior mesenteric vessels to the opening of the sac to prevent inadvertent damage (4).

### Conclusion

Acute intestinal obstruction due to internal herniation of small bowel is uncommon but should be entertained as a cause for small bowel obstruction, especially in the young patient with a virgin abdomen. A high degree of clinical suspicion and timely surgical the intervention will prevent the life-threatening complications that may result from a delayed diagnosis.

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

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**Learning Points:**

- Congenital or acquired internal hernia accounts for 1% of all intestinal obstructions.
- Herniation of the small bowel into the paraduodenal recesses is the commonest location for a congenital internal hernia.
- A high degree of clinical suspicion with supportive evidence from CECT will clinch the diagnosis and timely intervention will prevent the complications of intestinal strangulation and perforation.

## SELECTED ABSTRACT

### Ventriculoperitoneal shunt infections and re-infections in children: a multicentre retrospective study

British Journal of Neurosurgery Volume 32, 2018 - Issue 2

#### Abstract

##### Purpose

Ventriculoperitoneal shunt (VPS) is the most common treatment modality for hydrocephalus. However, VPS infection is a common and serious complication with high rates of mortality and morbidity. The objective of this study was to investigate causative agents and the management of VPS infections and to identify risk factors for re-infection in children.

##### Materials and methods

Retrospective, multicentre study on patients with VPS infection at paediatric and neurosurgery departments in four tertiary medical centres in Turkey between January 2011 and September 2014.

##### Results

A total of 290 patients with VPS infections were identified during the study period. The aetiology of hydrocephalus was congenital malformations in 190 patients (65.5%). The most common symptom of shunt infection was fever in 108 (37.2%) cases. At least one pathogen was identified in 148 VPS infections (51%). The most commonly isolated pathogen was coagulase-negative staphylococci, which grew in 63 cases (42.5%), followed by *Pseudomonas aeruginosa* in 22 cases (14.9%), *Klebsiella pneumoniae* in 15 cases (10.1%), and *Staphylococcus aureus* in 15 cases (10.1). The median duration of VPS infection was 2 months (range, 15 days to 60 months) after insertion of the shunt, with half (49.8%) occurring during the first month. VPS infection was treated by antibiotics and shunt removal in 211 cases (76.4%) and antibiotics alone without shunt removal in 65 patients (23.5%). Among the risk factors, CSF protein level greater than 100 mg/dL prior to VPS insertion was associated with a potential risk of re-infection (OR, 1.65;  $p = .01$ ).

##### Conclusion

High protein levels ( $>100$  mg/dL) before the re-insertion of a VPS may be a risk factor for VPS re-infection.

##### Commentary

Dr. Ruvini Abeygunaratne

Consultant Neurosurgeon

Lanka hospitals PLC and Salford Royal NHS Trust

TVentricular peritoneal shunting is common neurosurgical procedure routinely performed for hydrocephalus in children

and adults. The incidence of shunt infections is a serious complication. Any noninvasive methods available to identify those shunts that will get reinfected prior to re-insertion is a valuable tool. This review and meta-analysis has identified that identifying a high level of CSF protein is an indication that early re-infection is a risk factor. This may prompt change of practice to treat the infection for longer, use an external ventricular drain for a longer period of time and waiting till the levels are suitably low.

The most important factors to be considered in shunt surgery needs to be emphasised repeatedly, and principles of shunt insertion followed rigorously to minimise the risk of infection. This involves listing the procedure first on the list, minimising theatre staff and clear indication to reduce passage of personnel through theatre. The surgeon should be experienced in shunt surgery. Meticulous skin preparation and draping and glove change after preparation, skin incision and shunt handling. No touch technique and shunt priming with an antibiotic preparation unless antibiotic impregnated shunts are being used. A CSF sample should always be sent during ventricular catheterisation for a baseline value of cell counts and protein.

### The clinical and cost-effectiveness of corticosteroid injection versus night splints for carpal tunnel syndrome (INSTINCTS trial): an open-label, parallel group, randomised controlled trial

Linda S Chesterton, Milica Blagojevic-Bucknall, Claire Burton, Krycia S Dziedzic, Graham Davenport, Sue M Jowett, Helen L Myers, Raymond Oppong, Trishna Rathod-Mistry, Danielle A van der Windt, Elaine M Hay, Edward Roddy.

Published 20th October 2018, *Lancet* 2018; 392: 1423–33

#### Background

Until now comparative effectiveness of steroid injection vs night splinting has not been compared in treating carpal tunnel syndrome

The Authors compared the two modalities of treatment in a primary care setting.

#### Methods

A randomised control trial was done involving 25 centres in UK primary health care units from 17th April 2014 to 31st December 2016 with a total of 234 participants. 118 had night splints and 116 had corticosteroid injection. Injection group had single injection of 20 mg methylprednisolone acetate (from 40 mg/mL) and the night splint group had a night-resting splint to be worn for 6 weeks.

The primary outcome was the overall score of the Boston Carpal Tunnel Questionnaire (BCTQ) at 6 weeks. Intention-to-treat analysis was used with multiple imputation for missing data, which was concealed to treatment group allocation.

### Results

The BCTQ score was significantly better at 6 weeks in the corticosteroid injection group (mean 2.02 [SD 0.81]) than the night splint group (2.29 [0.75]; adjusted mean difference -0.32; 95% CI -0.48 to -0.16;  $p=0.0001$ ). No adverse events were reported.

### Conclusion

Based on above findings the author's concluded that "A single corticosteroid injection shows superior clinical effectiveness at 6 weeks compared with night-resting splints, making it the treatment of choice for rapid symptom response in mild or moderate carpal tunnel syndrome presenting in primary care."

### Commentary

Hiran Amarasekera

Consultant Orthopaedic Surgeon,  
Neville Fernando Teaching Hospital  
Malabe, Sri Lanka

Compared with compression neuropathies, such as tarsal tunnel, cubital tunnel, suprascapular syndromes and meralgia paresthetica, carpal tunnel syndrome is the commonest compression neuropathies encountered in clinical practice.

Mainly with modern life styles with computers and work related activities, predominant diabetes, osteoarthritis, and past injuries all seem to be risk factors for developing the disease. The disease is commonly diagnosed and managed by many professionals including, rheumatologists,

Neurologists, orthopaedic surgeons, general surgeons, physiotherapists, general practitioners, and neurosurgeons, hence there is difference in opinion on how this is best managed. The gold standard of managing advance disease remain surgical decompression of carpal tunnel, however there is less consensus on best managing early and moderate disease. Non-operative management include analgesics, local analgesic creams, physiotherapy, lifestyle modification, steroid injections and night splint.

Are steroid injections better than night splints in managing early disease?

Linda S Chesterton et al, through the above RCT (Randomised control trial) published in Lancet tried to answer the question. It appears according to her results the steroid injection appear to be better than night splint and

patients have a better tolerance with the injection. Should this evidence change our clinical practice?

A comment published by Isam Atroshi on the above article in Lancet sums up this well ([www.thelancet.com](http://www.thelancet.com) Vol 392 October 20, 2018 (1383-1384) as given below,

"This trial might justify a change in clinical practice in that patients with mild or moderate carpal tunnel syndrome can choose a single steroid injection in primary care instead of night splinting. A policy of initial treatment with steroid injection and considering surgery in case of inadequate improvement or recurrence of symptoms is reasonable and supported by evidence."

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### Estimating the sample size for a pilot randomised trial to minimise the overall trial sample size for the external pilot and main trial for a continuous outcome variable.

Whitehead AL, Julious SA, Cooper CL, Campbell MJ. *Stat Methods Med Res.* 2015; 25(3): 1057-1073. doi:10.1177/0962280215588241

**Keywords:** Pilot trial; RCT; sample size; power; continuous outcome

### Abstract

Sample size justification is an important consideration when planning a clinical trial, not only for the main trial but also for any preliminary pilot trial. When the outcome is a continuous variable, the sample size calculation requires an accurate estimate of the standard deviation of the outcome measure. A pilot trial can be used to get an estimate of the standard deviation, which could then be used to anticipate what may be observed in the main trial.

However, an important consideration is that pilot trials often estimate the standard deviation parameter imprecisely. This paper looks at how we can choose an external pilot trial sample size in order to minimise the sample size of the overall clinical trial programme, that is, the pilot and the main trial together. We produce a method of calculating the optimal solution to the required pilot trial sample size when the standardised effect size for the main trial is known. However, as it may not be possible to know the standardised effect size to be used prior to the pilot trial, approximate rules are also presented. For a main trial designed with 90% power and two-sided 5% significance, we recommend pilot trial sample sizes per treatment arm of 75, 25, 15 and 10 for standardised effect sizes that are extra small (0.1), small (0.2), medium (0.5) or large (0.8), respectively.

### Commentary

Dr. Rasika Jayatillake

Senior Lecturer, Department of Statistics,  
Faculty of Science, University of Colombo.

Pilot studies play an important role in estimating parameters necessary to calculate required sample sizes for research studies, especially in clinical trials. However, pilot studies, due to inherent small sample sizes, may produce imprecise estimates of these parameters. In this article the authors investigate existing methods that allows a researchers to adjust the sample size by adjusting for imprecise estimates and several rules of thumb commonly used. Furthermore, in many studies, pilot studies are considered as standalone studies conducted only to obtain estimates of parameters necessary for sample size calculations for main study which makes it difficult to minimize the overall number sample size needed for both pilot study and the main study. Therefore, the authors provide an interesting approach that considers the pilot study as part of the main study and a novel method to estimate the optimal pilot trial sample size that minimizes the overall sample size for a given main trial. However, application of these methods are demonstrated only for comparison of means and for known standardized effect size.

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### **Adjuvant chemotherapy guided by a 21-gene expression assay in breast cancer (TAILORx trial)**

Sparano JA, et al. *New England Journal of Medicine*. 2018;379(2):111-21.

#### **Background**

The recurrence score based on the 21-gene breast cancer assay (Oncotype DX) predicts chemotherapy benefit if it is high and a low risk of recurrence in the absence of chemotherapy if it is low; however, there is uncertainty about the benefit of chemotherapy for most patients, who have a midrange score (intermediate risk).

#### **Methods**

A prospective trial involving 10,273 women with hormone-receptor-positive, human epidermal growth factor receptor 2 (HER2)-negative, axillary node-negative breast cancer was performed. Of the 9719 eligible patients with follow-up information, 6711 (69%) had a midrange recurrence score of 11 to 25 and were randomly assigned to receive either chemoendocrine therapy or endocrine therapy alone. The trial was designed to show noninferiority of endocrine therapy alone for invasive disease-free survival (defined as freedom from invasive disease recurrence, second primary cancer, or death).

#### **Results**

Endocrine therapy was noninferior to chemoendocrine therapy in the analysis of invasive disease-free survival (hazard ratio for invasive disease recurrence, second primary cancer, or death [endocrine vs. chemoendocrine therapy], 1.08; 95% confidence interval, 0.94 to 1.24;  $P=0.26$ ). At 9 years, the two treatment groups had similar rates of invasive disease-free survival (83.3% in the endocrine-therapy group

and 84.3% in the chemoendocrine-therapy group), freedom from disease recurrence at a distant site (94.5% and 95.0%) or at a distant or local-regional site (92.2% and 92.9%), and overall survival (93.9% and 93.8%). The chemotherapy benefit for invasive disease-free survival varied with the combination of recurrence score and age ( $P=0.004$ ), with some benefit of chemotherapy found in women 50 years of age or younger with a recurrence score of 16 to 25.

#### **Conclusions**

Adjuvant endocrine therapy and chemoendocrine therapy had similar efficacy in women with hormone-receptor-positive, HER2-negative, axillary node-negative breast cancer who had a midrange 21-gene recurrence score, although some benefit of chemotherapy was found in some women 50 years of age or younger.

#### **Commentary**

Dr. Sanjeeva Seneviratne

Colombo & Honorary Consultant Surgeon,  
National Hospital of Sri Lanka.

Findings from the this TAILORx trial has shown that for approximately 70% women with hormone receptor positive, HER2-negative, axillary lymph node-negative breast cancer, treatment with chemotherapy and hormone therapy after surgery is not more beneficial than treatment with hormone therapy alone.

These results give good-quality data to inform personalized treatment recommendations for women as it confirms that using Oncotype DX test to assess the risk of cancer recurrence can spare women unnecessary treatment if the test indicates that chemotherapy is not likely to provide benefit.

Based on evidence from earlier trials, women in the trial who had a score in the low-risk range (0–10) received hormone therapy only, and those who had a score in the high-risk range (26 and above) were treated with hormone therapy and chemotherapy. Women in the trial who had a score in the intermediate range (11–25) were randomly assigned to receive hormone therapy alone or hormone therapy with adjuvant chemotherapy.

The researchers found that invasive disease-free survival and overall survival were very similar in the two groups. They also confirmed that women with a score of 0–10 had very low recurrence rates with hormone therapy alone at nine years (3%). In addition, they found that women with a score of 26–100 had a distant recurrence rate of 13% despite receiving both chemotherapy and hormone therapy. This finding indicates the need to develop more effective therapies for women at high risk of recurrence. However, premenopausal women and those younger than 50 years old at the higher end of the intermediate-risk range (16–25), the results showed



there may be a small benefit from chemotherapy, and thus these women should be considered for chemotherapy.

Although Oncotype Dx test has been made available in Sri Lanka recently it comes at a significant cost to the patient. The cost of approximately Rs. 800,000/= it is way beyond the affordability of many Sri Lankan patients. However, chemotherapy also comes at a cost; both the cost of chemotherapy agents and major side effects which may

require expensive therapy including ICU care for some patients. In addition, there are many new and cheaper alternative genomic profiling tests becoming available in the market (e.g. EndoPredict, Prosigna, Mammostrat, etc.). As these cheaper tests become more widespread certainly there is hope for 'average' Sri Lankan patients to get the benefit of genetic risk profiling and to receive personalized medicine.

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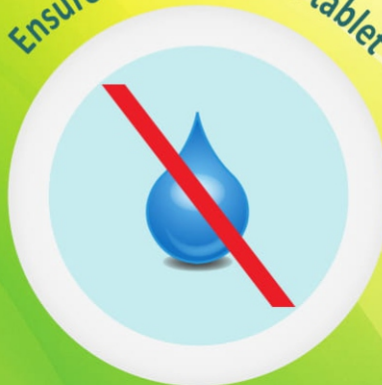


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