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THE ROLE OF VIDEO ASSISTED THORACOSCOPIC SURGERY IN THE MANAGEMENT OF THORACIC INJURIES AND PATHOLOGIES

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INTRODUCTION

Video assisted thoracoscopic surgery (**VATS**) is a minimally invasive procedure that does not use a formal thoracotomy incision. VATS provides adequate visualization of the thorax despite its limited access to the thorax, allowing the procedure to be performed in a state of debilitation and for patients who have a marginal pulmonary reserve.[1]

VATS was introduced in 1993 to diagnose diaphragmatic injuries.[1] In the early 1990s, with the evolution of minimally invasive surgery and video technology, VATS was introduced in the trauma setting, in a series evaluating diaphragmatic injuries. This became possible due to the invention of the fibre optic light source, advancement in the development of video technology and the development of refined instruments. VATS is now widely accepted as a safe and effective procedure for the diagnosis and treatment of a multitude of blunt and penetrating chest injuries.[1] Its use will undoubtedly increase as more surgeons become aware of its utility and become familiar with the technical aspects of the procedure.

Thoracic trauma accounts for 25% of all trauma deaths. Those who get admitted, 85% can be managed conservatively with a chest tube and remaining 15% require an invasive procedure to deal with the injuries sustained.[3,4]

At our hospital we manage about 65% of the total hospital admissions of acute thoracic injuries with an insertion of a chest tube. The average hospital stay in such patients is about 9 to 10 days. Through this study we wanted to see the safety and efficacy of VATS.

OBJECTIVES

Broad

To study the role of video assisted Thoracoscopic surgery in the management of Thoracic injuries and Chronic infections of thorax.

Specific

1. To study the role of VATS in patients with traumatic chest injury who require immediate thoracoscopy within 24 hours of presentation
2. To determine the role of VATS in patients with acute thoracic injuries
a) Where tube thoracostomy failed
b) With complications of tube thoracostomy

3. To determine the role of VATS in chronic empyema thoracis.

MATERIALS AND METHODS

Thesis involved: Humans
Study Design: Cross sectional Descriptive study
Setting: Tertiary referral centre, B.P.Koirala Institute of Health Sciences, Dharan
Duration of study: One Year
Subjects: Patients with thoracic injuries and chronicinfectionsof the thorax

Inclusion Criteria

1. Any age or gender
2. Haemodynamically stable traumatic chest injuries, empyemathoracis
3. Patients giving informed consent and who met the criteria for failure of tube Thoracostomy
4. Cases where further intervention might be needed like diaphragmatic tear or oesophageal perforation

Exclusion criteria

1. Haemodynamically unstable
2. Patients who previously underwent VATS or thoracotomy
2. Co-existing pathology which required other interventions
3. More than one attempt at tube thoracostomy or withmanipulation of chest tube
4. Severe injury to heart and great vessels
5. Inability to tolerate single lung ventilation and not able to bepositioned in lateral decubitus

6. Not willing to give consent

Research Methodology

Over a period of 1 year, all the patients who presented to our centre with thoracic injuries or chronic empyema thoracis were included in this study. Their management was done according to the VATS protocol. The initial condition of the patient was assessed as per the ATS (Australian triage score) scoring system followed in our centre. They were initially managed by the team of emergency doctors. The history taking and the clinical examinations were done by the surgical team. The diagnosis was achieved by the use of imaging modalities like x-ray, ultrasound and CT scan deemed necessary.

When a diagnosis of haemothorax, pneumothorax, empyma thoracis was made, informed consent was taken and then the patient underwent tube Thoracostomy. Tube Thoracostomy was done with the patient in supine or inclined position. A 28F chest tube was inserted under local anaesthesia at the fifth intercostals space in the mid axillary line and connected to an underwater seal bag.

Once the patient was on tube thoracostomy, if the criteria for open thoracotomy was met, Video assisted thoracoscopic surgery was done and if VATS failed open thoracotomy was to be done. The criteria for open thoracotomy were:

a. More than 1500ml of blood drained on chest tube insertion
b. More than 300ml/hour of blood drained for 3 hours
c. Massive air leak associated with pneumothorax
d. Drainage of oesophageal or gastric contents in chest tube

Once the patient was on tube thoracostomy, if criteria for open thoracotomy was not met, then the patient was admitted in the ward or intensive unit in relation to the patient status and regular intensive monitoring of parameters such as pulse, blood pressure, respiratory rate, temperature, along with clinical and radiological assessment of the cardiovascular and the respiratory systems was made with the help of X-ray and ultrasound as and when needed. If the tube thoracostomy failed VATS was done.

The criteria for failure of tube thoracostomy was following:

a. Failure of re-expansion of the lung following placement of the chest tube within 3 hours of tube thoracostomy
b. Misplacement of tube
c. Iatrogenic injuries caused due to tube thoracostomy
d. Persistent air leak
e. Unresolved pneumothorax
f. On 4th day of admission of there is clinical and radiological evidence of fluid collection
g. Retained hemothorax(more than 500ml)
h. Developing empymathoracis
i. Fibrothorax

Video Assisted Thoracoscopic Surgery Equipment's required

a. 10 mm video thoracoscope with a '0' or '30' degree lens and three chip coupled device video camera
b. Sponge holding forceps
c. Long blade diathermy pen
d. Endoscopic biopsy forceps and transaction devices
e. Rigid or flexible trocar cannula
f. Thoracotomy tray
g. Chest tube drainage device with water seal
h. Suction source and tubing

a. Sterile gloves, drapes and gauze

Anesthesia

General anesthesia with selective single lung ventilation using a double lumen endobronchial tube was used.

Preparation

Informed consent was taken from the patient. Adequate typed and cross matched blood was arranged. Two intravenous lines and an arterial line was placed before the procedure. Epidural catheter was placed before the procedure under adequate aseptic precautions

Positioning

The patient was turned to full lateral decubitus position and the operating table was flexed to widen the rib spaces on the operating side. The patient is then strapped to the operating table by sterile adhesive tapes, after placing adequate sterile cushions over his bony prominences.

The position of the surgeon and assistant depended on the site of pathology. The surgeon stood facing the site of the pathology with the video camera holding assistant on the same side the television monitor is positioned so that the surgeon, the site of pathology and the monitor were aligned to allow the surgeon to look straight ahead when operating.

Port placement

With the patient in lateral decubitus position the thorax and upper abdomen was painted with betadine and sterile drapes were placed. The previous chest tube was removed and a 10 mm port was inserted through the same opening and video camera was inserted through the same port. Then the lung was deflated and the entire thoraciccavity on the affected side was visualized. Under vision the other two ports were created one intercostal space above or below the chest tube incision in mid clavicular and posterior axillary lines depending on the intra operative findings.

Operative procedure

Depending on the pathology the appropriate surgical procedure was performed. A 28 / 32 F chest tube is placed in the thoracostomy site and connected to under water seal. Other ports close with sutures and sterile air tight butterfly dressing was done.

At the end of the procedure the patient was re-positioned to supine and extubation was done at the discretion of the anesthesia team and the patient was shifted to the ward or ICU depending on his medical condition.

Post operative care

After the surgery regular vital monitoring was conducted. Patient was put on intra venous fluids and an adequate analgesic regime of diclofenac sodium and tramadol was given alternatively every 4 hours along with epidural morphine, antibiotic coverage was started with ampicillin and sulbactum with amikacin and continued for five days. Patients were encouraged to do intensive spirometry as soon as possible along with gentle chest physiotherapy. Feeding started as soon as possible along with ambulation. Daily sterile dressing was done under aseptic precautions. Patients were assessed daily clinically and also the radiological investigations were done as and when necessary.

The chest tube output was monitored daily and its content and air column movement were monitored. Chest tube was removed once the content of its drain becomes less than 25 mL / day, absent air column movement, adequate lung expansion which was assessed by auscultation and chest x-rays and absence of pleural loculations or collection. The sutures were usually removed on the seventh post operative day and the patients were discharged once they become fit for discharge. The patients were asked to come for regular follow up in surgery outpatient department on weeks1, 2, 4 and 6 months after surgery.

Statistical analysis

Collected data was entered in SPSS info. For descriptive statistics, Mean, SD, Percentage, Proportion was calculated. For inferential statistics, appropriatestatistical test like Chi square test and student T Test was applied whenevernecessary.

RESULTS

There were a total of 25 patients with thoracic injuries and pathologies who underwent video assisted thoracoscopic surgery during the one year study period.

Age and Gender

Majority 16(64%) patients were in the age group < 40 years. There were 7(28%) patients between 40 to 60 years of age and 2(8%) were above 60 years of age. The youngest patient was 17 years and the oldest was 75 years. The mean age of the patients was 36.08 ±16.79 years. There were a total of 8(32%) females and 17 (68%) males in the study and the mean age for females was 32.62 years and for males it was 37.70 years. The male to female ratio was 3.09:1.

Mode of presentation

Out of the 25 patients included in our study, majority 21(84%) of the patients presented with a history of trauma. Those with chest pathology were 4(16%) patients. 21(84%) patients were due to blunt trauma to the chest. There were no cases of penetrating injuries.

Duration of presentation after trauma

Out of the 21 traumatic cases; the duration of presentation to our centre after trauma ranged from 2 - 24 hours. The average time of presentation was 7.38 hours after trauma. The minimum time of presentation after trauma was 2 hours and the maximum time of presentation was 24 hours.

Clinical manifestations

Majority of the patients presented with: chest pain i.e., 22(88%) patients followed by breathlessness in 21(84%) patients, 3(12%) patients had cough, 1(4%) patient presented with excessive sweating in the palmar surface. Out of 21 patients who presented with trauma 21 had chest pain and 18 had breathlessness. Out of 4 patients who presented with chest pathologies: 3(75%) had breathlessness, 3(75%) had cough, 1(25%) had chest pain and 1(25%) had excessive sweating of palmar surface. The symptoms have been illustrated in table 3 and figure 4 below:

Table 3: Clinical Manifestations.

Symptoms	Trauma (n)	Chest pathology (n)	%
Chest pain	21	1	88
Breathlessness	18	3	84
Cough	0	3	12
Sweating	0	1	4

Clinical Presentation

Seventeen (68%) patients had symptoms confined to the right chest and 7(32%) patients had symptoms confined to left chest. In traumas 15 patients had symptoms in right side chest and 6 patients had symptoms in left side chest. In the chest pathologic group 2(50%) patients had pathology in right side chest and 1(25%) had pathology in left side chest. 1(25%) patient did not have any pathology in chest.

Hemodynamic stability

All the 25 patients were triaged at the ER. The primary and secondary survey was done for them. All the 25 patients were hemodynamically stable at the time of presentation.

Vital parameters

Table 5: Vital Parameters.

Pulse rate (beats per min)		Traumatic (n)	Chest pathology (n)	%
60	– 90	15	2	68
90 – 100		3	2	20
100	– 110	2	0	8
110	– 120	1	0	4
Blood pressure				
Normal		20	3	92
Increased		1	1	8
Respiratory rate (breath per min)				
16	– 20	8	1	36
20	– 25	8	2	40
26	– 30	2	0	8
31	– 35	2	0	8
More than 35		1	1	8
Pallor				
Present		6	0	24
Absent		15	4	76
Cyanosis				
Present		1	1	8
Absent		20	3	92
Clubbing				
Present		1	1	8
Absent		20	3	92

Associated injuries

Seventeen (68%) patients did not have any other associated injuries. In traumas 8(32%) patients had associated injuries viz. clavicle fracture, scalp laceration, face laceration and abrasion on the forearm.

The most common injury was clavicle fracture in 4(16%) patients followed by 2(8%) patients with abrasion on the forearm, 1(4%) patient had scalp laceration and 1(4%) patient had laceration on face.

Chest examination / Auscultation

Chest compression test was positive in 21(84%) with trauma.

Twenty four (96%) patients had a reduced air entry on auscultation. In pathologic chest 3(75%) patients had reduced air entry and 1(25%) patient had normal air entry. It is illustrated in table 8 below:

Table 8: Chest Auscultation.

Auscultation findings	Trauma (n)	Chest pathology (n)	%
Normal	0	1	4
Reduced air entry	21	3	96
Lower zone	16	1	68
Mid + lower zone	5	1	24
Crepitations	0	2	8
Silent chest	0	1	4

Chest x – ray findings

Rib Fracture

Twenty one (84%) patients suffered from rib fracture. Amongst the traumatic patients, 15(60%) had 2 to 4 rib fractures, 4(16%) patients had 4 to 6 rib fractures and 2(8%) patients had more than 6 rib fractures. It is illustrated in tables 9, 10 and figures 13, 14 below:

Thoracic Cavity

Eighteen (72%) patients had haemothorax on chest x ray, 1(4%) patient had pneumothorax alone, 5(20%) patients had haemo-pneumothorax and 1(4%) patient had a normal chest x ray. In traumas 16 patients had haemothorax and 5 patients had haemo pneumothorax. In the pathological chest, 2 patients had haemothorax, 1 patient had pneumothorax and 1 patient had normal chest x ray.

Associated morbidity

Out of the 25 patients included in our study 3(12%) patients had hypertension, 3(12%) patients had COPD and 2(8%) patients had diabetes mellitus. In chest traumas group 1(4%) patient had diabetes mellitus and 1(4%) patient had hypertension. In the chest pathology group 3(12%) patients had COPD, 2(8%) patient had hypertension and 1(4%) patient had diabetes mellitus.

Ultrasound findings

Ultrasound showed 21(84%) patients having blood in the pleural cavity, 3(12%) patients had pus in the pleural cavity and 2(8%) patients had a normal pleural cavity. In trauma all the 21(100%) patients had blood in pleural cavity. In pathology of chest 2(50%) patients had pus in the pleural cavity and 2(50%) patients had a normal pleural cavity.

Diagnosis

Twenty one (84%) patients were diagnosed to be suffering from haemothorax, 2(8%) patients were diagnosed as empyema thoracis, 1(4%) patient was diagnosed as broncho pleural fistula and 1(4%) patient was diagnosed as palmar hyperhydrosis. It is illustrated in table 14 and figure 18 below:

Table 14: Diagnosis.

Diagnosis	Traumatic (n)	Chest pathology (n)	%
Haemothorax	21	0	84
Pyothorax	0	2	8
Broncho pleural fistula	0	1	4
Palmar hyperhydrosis	0	1	4

Management

Initial volume of chest drain following tube thoracostomy

Out of the 25 patients in our study 24 patients underwent tube thoracostomy as soon as they presented.

Table 15: Initial Volume of Chest Drain.

Chest drain output ml/day	Number of patients (n)	%
< 100	6	24
100 – 150	4	16
150 – 200	5	20
200 – 250	3	12
250 – 300	3	12
300 – 350	2	8
>350	1	4

Character of Chest Drain

Out of the 25 patients in our study 24 patients underwent tube thoracostomy at the time of presentation. The character of chest drain in 16(64%) patients was hemorrhagic, 5(20%) patients was hemorrhagic with air bubbles, 2(8%) patients had purulent discharge, 1(4%) patient had only air bubbles. This is illustrated in table 16 and figure 20 below:

Table 16: Character of Chest Drain.

Character	No of patients(n)	%
Hemorrhagic	16	64
Hemorrhagic + air bubbles	5	20
Purulent	2	8
Air bubbles only	1	4

Number of days with chest tube 'in situ' prior to VATS

Twenty four patients had chest tube 'in situ' prior to the procedure. The number of days with chest tube 'in situ' prior to the procedure ranged from 6 to 15 days. Mean of 5.45 days + 3.07 days.

Chest tube output prior to procedure

The daily drain output ranged from 140 to 2600 ml per day. The average chest drain output was 225.41 ± 95.68 ml / day.

Complications due to tube thoracostomy

Five (20%) patients developed complications after insertion of chest tube in the form of pyothorax. The time required to develop pyothorax ranged from 3 - 5 days. Three (12%) patients developed pyothorax in 3 days, 1(4%) patient developed in 4 days and 1(4%) patient in 5 days after tube thoracostomy. It is illustrated in table 17 and figure 21 below:

Table 17: Pyothorax post Tube Thoracostomy.

Post ICD days	No of patients (n)	%
3	3	12
4	1	4
5	1	4

VATS within 24 hours

There were no patients who underwent VATS within 24 hours of admission.

Indication of VATS

Sixteen (64%) patients underwent VATS due to the high output from chest drain more than 100ml even after 3 days of tube thoracostomy, 5(20%) patients for developing complications after tube thoracostomy and in the pathological side: 2(8%) patients for empyema thoracis, 1(4%) patient for bronchopleural fistula, one (4%) case of palmar hyperhydrosis was managed by therapeutic VATS. This is illustrated in the table 18 and figure 22 below:

Table 23: Indication of VATS.

Indication	Number of patients(n)	%
Persistent high chest drain output (>100 mL)	16	64
Pyothorax post thoracostomy	5	20
Empyema thoracis	2	8
Broncho pleural fistula	1	4
Palmar hyperhydrosis	1	4

Duration of the procedure

The duration of the procedure ranged from 80 to 150 mins. The mean duration of the procedure was 112.20 ± 19.14 min. In traumas the duration of the procedure ranged from 80 to 150 mins with a mean duration of 110 ± 19.46 mins. In the pathological chest the duration of the procedure ranged from 90 to 130 mins with a mean duration of 115 ± 17.32 mins. It is illustrated in table 19 below:

Intra operative findings

In patients who underwent VATS, the intra operative findings were: minimal haemothorax in 11(44%) cases, 4(16%) cases had moderate hemothorax, 1(4%) had massive haemothorax, 7(28%) patients had a pyothorax, 2(8%) patients had lung laceration, 1(4%) had an emphysematous bulla, 5(20%) had internal septations in the pleural cavity. It is illustrated in table 20 and figures 21 and 22 below:

Table 20: Intra Operative Findings.

Intra-operative findings	Trauma (n)	Chest pathology (n)	%
Minimal haemothorax	11	0	44
Moderate haemothorax	4	0	16
Massive haemothorax	1	0	4
Pyothorax	5	2	28
Lung laceration	1	1	8
Emphysematous bullae	0	1	4
Internal septations	3	2	20
Intact sympathetic trunk (R)	0	1	4

Post operative course

Majority of the patients had an uneventful post operative period with 23(92%) patients who were extubated at the end of the procedure and were transferred to the ward, 2(8%) patients were not extubated and were shifted to the intensive care unit with ventilator support. 1(4%) patient was extubated after 2 days and 1(4%) patient had to be assisted with ventilator support for 30 days in the intensive care unit.

Conversion Thoracotomy

There were no conversions to thoracotomy intra operatively. Thoracotomy had to be done for 1(4%) patient in 17 days after VATS procedure as he had a massive hemothorax with septations with high output from his chest drain. His average output was 225 ml per day.

Chest tube 'in situ' post VATS

After the surgery patients with chest drain 'in situ' ranged from 2 to 35 days with a mean period of 7.72 ± 8.41 days. The chest tube was removed when the output was less than 25 ml per day with absence of air column movement and with adequate lung expansion which was assessed both clinically and radiologically. In trauma the period ranged from 2 to 35 days with a mean period of 7.72 ± 8.41 days. In the chest pathology the period ranged from 2 to 30 days with a mean of 6.58 ± 6.08 days.

Post operative chest drain output
In 25 patients who underwent VATS, their chest tube drain output ranged from 20 to 350 ml per day. The average chest drain output was 43.80 ml per day.

Post operative complications
In 25 patients who underwent VATS 4(16%) patients developed pyothorax. The number of days to develop pyothorax ranged from 5 – 9 days. The average was 6.5 days. 1(4%) patient in chronic lung condition and 3(12%) patients with trauma developed pyothorax. The commonest organism was Staphylococcus aureus in 3(12%) and 1(4%) had Klebsiella pneumonia. It is illustrated in tables 23, 24 and figures 23 below:

Table 25: Organisms Isolated.

Organisms	No of patients (n)	%
Staphylococcus aureus	3	12
Klebsiella pneumonia	1	4

No of days of hospital stay
The duration of hospital stay ranged from 3 to 51 days with a mean of 15.48 ± 11.43 days. In the traumatic cases the hospital stay ranged from 5 to 51 days with a mean of 13.47 ± 9.46 days. In the chest pathology, the hospital stay ranged from 3 to 42 days with a mean of 26 ± 16.55 days. It is illustrated in table 26 below:

Table 26: Duration of hospital stay.

Duration of hospital stay	Traumatic (n)	Chest pathology (n)
Range	5 – 51 days	3 – 42 days
Mean	13.47 ± 9.46 days	26 ± 16.55 days

Follow up
Out of 25 cases with VATS; 24(96%) patients attended follow up clinic after 7 days and 15 days of discharge. There were no recurrence of symptoms. The patients with longer hospital stay and 32% of patients complications were not too satisfied. One with thoracoscopic sympathectomy was very pleased as his symptoms had abated.

DISCUSSION

The mean age of patients was 36.08 ± 16.79 which is similar to other studies Manlulu et al[1], Smith et al,[21] Eddy et al[23], Konstantinos et al[15] where their average age was between 32 to 42 years of age.

In our study the male: female ratio was 3.09: 1. There is a strong male predominance in the patients who presented with chest injuries or pathologies. This is similar to Manlulu et al,[1] Smith et al,[21] Eddy et al[23], Konstantinos et al[15] who had displayed a similar male predominance. This can be due to the fact that males are employed in an occupation and indulge in a lifestyle which puts them at a higher risk of sustaining traumatic chest injuries viz. motor vehicle accidents, fall from height, physical assaults.

Mechanism of injury
In our study all traumatic cases were due to blunt trauma to chest. There were no penetrating injuries to the chest. In comparison to Manlulu et al[1] who had 57 cases of penetrating injury and 42 cases of blunt trauma to the chest. Smith et al[21] had all cases of blunt trauma chest. Eddy et al[23] had 7 cases of blunt trauma and 4 cases of penetrating injury to the chest. The reason for having a higher number of blunt injuries may be due to the fact that motor vehicle accidents are now the leading cause of trauma worldwide. We had patients with road side accidents and history of fall as well.

Site of Clinical Manifestation
In our study the site of clinical manifestation was 68% in right chest and 32% in the left side. It is contrary to Manlulu et al[1] who had stab injuries 63%: 36% left to right. There are no details regarding the site of manifestation in blunt trauma of the chest. In other studies there is no mention of site of thorax involved. In other studies there was no mention of side of thorax involved, as we have researched in the literature.

Chest tube drain output prior to VATS
In our study the average chest tube drain output prior to VATS was 225.41 ml per day. Initial chest drain output after tube thoracostomy was 40 to 700 ml per day. The average chest drain output was 191.25±138.69 ml per day after tube thoracostomy. In comparison to Manlulu et al[1] whose initial chest drain output was in the range of 40 to 1600 ml per day and the average output was 814 ml per day. The reason could be due to the fact all our patients had a blunt trauma to the chest where as in Manlulu et al[1] there were both blunt and penetrating injuries to the chest leading to a higher average output. It also depends on magnitude of injury, underlying healthy lung, age, breathing exercises etc.

Number of days with Chest Tube Prior to VATS
In our study the number of days with chest tube prior to VATS ranged from 6 to 15 days with an average of 5.45 ± 3.07 days. This is similar number of days when compared to Y P Chou et al[24] whose average time was 6.79 days. Our range is slightly higher when compared to

Manlulu et al[1] whose range was 1 to 2.50 days. We waited and watched for subsequent days if the output decreased in three days time. The difference in days is determined by a number of factors like injury, underlying lung condition, parenchyma, spirometry etc.

Chest tube complications

In our study 5(20%) patients with haemothorax developed empyema after placement of chest tube. The time required to develop empyema ranged from 3 to 5 days after tube thoracostomy. In comparison Etoch et al[25] 2-10% of cases developed empyema after thoracic trauma. The reason could be as all the patients in our study had tube thoracostomy done in emergency room which could be the reason for developing empyema as antibiotic prophylaxis is frequently omitted as it is done as a life saving procedure. If the chest tube is placed 'in situ' for a long duration there is more chance of nosocomial infections. If the chest tube is blocked or not in place the retained blood serve as an excellent medium for the growth of micro-organisms leading to the development of pyothorax.

Indication for VATS

In our study the most common indication for VATS was haemothorax 64% of cases followed by pyothorax 28% of cases, 4% for recurrent pneumothorax with broncho pleural fistula and 4% for palmar hyperhydrosis. These findings are similar to Smith et al[21] who did VATS in 73% cases of haemothorax, 18% empyema and 10% for persistent air leak. In Manlulu et al1 who did VATS in 63% cases of retained haemothorax and acute hemorrhage, 15.7% cases of diaphragmatic injury and 5.2% cases of pericardial injury, intra thoracic foreign body, recurrent pneumothorax and chronic empyema each respectively. We may be able to see and manage the wide range of chest ailments, traumatic and non traumatic once we make VATS a routine in our centre.

Duration of procedure

In our study the duration of the procedure ranged from 80 – 150 mins. The mean duration of the procedure was 112.20 ± 19.14 mins. The patient with simple evacuation of haemothorax within 3 days of blunt trauma chest had the shortest operative time of 80 mins and the patient who had a massive haemothorax with septations had the longest operative time of 150 mins. This is similar to Michel et al[2] whose mean operating time was 116 mins ± 16 mins and the procedure duration ranged between 47 to 381 min. The cause of our slightly prolonged operative time was due to the beginning phase of a new operation, associated learning curve for a new procedure, getting accustomed to thoracic conditions, orientation etc.

Conversion to open thoracotomy

None of the patients in which VATS was done needed a conversion to open thoracotomy. This is similar to Manlulu et al[1], Smith et al[21], Eddy et al[23], Michel goodman et al.[2] Whereas Konstantinos et al[15] had a 17% conversion to thoracotomy for diaphragmatic repair and decortications. However for one (4%) patient we had to do thoracotomy 17 days after VATS as he had a massive haemothorax with multiple septations. It was a case of lung parenchymal injury.

Post operative course

In our study 92% of the patients were extubated and transferred to the ward after the procedure. 8% of the cases were transferred to intensive care unit with ventilator support, in which 4% of cases were in intensive care unit for 2 days only and 4% of cases needed prolonged ventilatory support for more than 30 days. This is similar to Manlulu et al[1] where 10% of cases needed intensive care for ventilatory support for 1 to 2 days.

Post operative chest tube duration and output

The post operative chest tube drain output ranged from 20 to 350 ml per day. The average chest drain output was 43.80 ml per day. After surgery those with chest drain 'in situ' ranged from 2 to 35 days with a mean period of 5.28 ± 3.14 days. In comparison to Michel et al[2] study the post operative mean total chest tube output was over a mean duration of 2.9 ± 0.3 days which ranged between 1 to 7 days.

Complications

In our study 16% patients had developed pyothorax after VATS. The number of days to develop pyothorax ranged from 5 – 9 days. The average number of days to develop pyothorax was 6.5 days. In the study done by Y.P.Chou et al[24] 9% of cases had post operative complications with reaccumulating pleural collections.

Hospital stay

In our study the duration of hospital stay ranged from 3 to 51 days with a mean of 15.48 ± 11.43 days. This is very much similar to Smith et al[21] the mean hospital stay ranged from 11 to 16 days. Other studies such as, Manlulu et al[1] whose mean hospital stay was 7 days for traumatic chest injuries, Konstantinos et al[15] the average post operative hospital stay was 7.6 days which ranged from 4 to 15 days. The patient who underwent therapeutic VATS for palmar hyperhydrosis had the shortest hospital stay of 3 days and the patient who underwent re thoracotomy for massive haemothorax with septations had the longest hospital stay of 51 days.

CONCLUSION

Video assisted thoracoscopic surgery is safe and feasible in our patients and set up. With this research project we should be able to increase the spectrum and range of diagnostic and therapeutic VATS in the future.

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