Role of Emergency Vats in Blunt Chest Trauma Patients

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ABSTRACT

BACKGROUND: The technique of thoracoscopy was first described in 1910 by jacobeus. The development of endoscopic instruments, particularly endoscopic staplers, enabled surgeons to perform major operations using minimally invasive techniques.

MATERIAL AND METHODS: From Jan. 2009 to Dec. 2012, 80 blunt chest trauma patients underwent emergency video-thoracoscopy in thoracic surgery unit, King Saud Hospital, KSA. Clinical patterns were: 50 hemothorax, 10 hemopneumothorax, 15 pneumothorax, and 5 flail chest with suspected diaphragmatic injuries or other pathologies. When diagnostic thoracoscope was negative and no lesion was found a drainage tube of 32 french size was placed. Ten from our patients underwent diagnostic thoracoscope with local anesthesia and only sedation.

RESULTS: All VAT procedures were performed within 24 hours except for 3 cases with retained haemothorax as the procedure was repeated again at day 7. 50 patients had haemothorax not more than 800 ml, in 4 patients the pathology was not clear. 15 patients had pneumothorax, and a simple rib fracture was detected among 10 of them. In 15 patients the diagnosis was haemopneumothorax (5 with flail chest and 10 with multiple rib fracture). Seven patients required conversion to an open thoracotomy. ICT stayed in our patients from 2 to 15 days .The average length of stay in the hospital after VATS was 9.1±2.73 days.

CONCLUSION: In our study we found that VATS in haemodynamically stable patients with blunt chest trauma is safe and effective, and it can be performed with some diagnostic benefits in sedated patients.

Keywords: Blunt chest trauma, Video-assisted thoracoscope.

INTRODUCTION

The technique of thoracoscopy was first described in 1910 by jacobeus, a Swedish physician who used a cystoscope to examine the pleural space. Although thoracoscopy was initially performed for diagnostic purposes, it later evolved into a therapeutic procedure[(1)]. During the 1930s and 1940s, it was used to lyse intrapleural adhesions after collapse therapy for tuberculosis.

The development of endoscopic instruments, particularly endoscopic staplers, enabled surgeons to perform major operations using minimally invasive techniques[(8)].

Thoracic injury directly accounts for 25% of the deaths due to trauma, and is a contributing factor in another 25% of trauma related deaths. Although most such patients do not require a thoracotomy, a significant number of delayed deaths occur secondary to the complications of thoracic trauma. Many of these complications could be avoided if earlier diagnosis and treatment of the injury were accomplished[(9)].

As the role of thoracoscopy continues to expand in the practice of thoracic

surgery, its role in the management of the trauma patients is also expanding. Thoracoscopy had added a new tool for diagnosis and therapy in the setting of both penetrating and blunt trauma[11].

PATIENTS AND METHODS

From Jan. 2009 to Dec. 2012, 80 blunt chest trauma patients underwent emergency video-thoracoscopy in thoracic surgery unit, King Saud Hospital, KSA.

The patients charts were reviewed for demographic data, mechanism of injury, procedures performed, outcome, and length of hospital stay.

All patients underwent preoperative evaluation (CBC, Chemistry, Blood gas analysis, ECG, Chest radiology, CT chest and abdomen with and without IV contrast, and other diagnostic procedures according to the need).

Trauma origin varied: 65 road traffic accidents, 11 fall from height, and 4 trauma by heavy object.

Clinical patterns were: 50 hemothorax, 10 hemopneumothorax, 15 pneumothorax, and 5 flail chest with suspected diaphragmatic injuries or other pathologies.

Patients were hemodynamically stable, conscious, and with blood gas analysis compatible with monopulmonary ventilation.

Exclusion criteria:

- Unstable patients, or patients can not tolerating single lung anesthesia.
- Bilateral chest injury.
- Patients with fracture pelvis, or with multiple long bone fractures.
- Associated abdominal injuries.
- Associated head injury.

VAT technique:

The patients were placed in the standard thoracotomic position, in case thoracotomy became necessary.

An 10 mm trocar was positioned in the sixth or seventh space through 2cm incision in the midaxillary line, to provide for 120 degree optical camera, another 5mm trocar was positioned in the same space posterior axillary line for suction tube placement. The pleural cavity along with other organs (lung, chest wall, diaphragm and pericardium) was inspected for damage. One or two further trocars were inserted for dissection and repair according to the need. Hemothorax was aspirated and blood clots were removed after breaking up. When diagnostic thoracoscope was negative and no lesion was found a drainage tube of 32 French sizes was placed. Selective intubation was performed under general anesthesia with careful monitoring for 70 patients. The remaining 10 patients (5 with simple pneumothorax, and 5 with simple hemothorax), underwent diagnostic thoracoscope with local anesthesia and only sedation, drainage of pleural cavity with careful inspection for any lesions was done for them, and no lesions were detected.

RESULTS

All VAT procedures were performed within 24 hours except for 3 cases with retained haemothorax as the procedure was repeated again at day 7, and all the patients were haemodynamically stable at the time of the procedure.

All our patients were male; the mean age of the patients was 40±1, with average age (range 15-70 years).

The mechanism of injury was (road traffic accidents in 65 patients (81.25 %), 11 falls from height (13.75%), and 4 trauma by heavy object (5 %).

The presentation in 50 patients was haemothorax not more than 800ml, the causes of haemothorax varied from:

1-Parenchymal laceration, and intercostal muscle bleeding, in most cases,

2-In some patients haemothorax was due to (diaphragmatic injuries – pericardial tear – and intercostal artery lesion),

3-In 4 patients the pathology was not clear.

In 15 patients pneumothorax was the diagnosis, simple rib fractures was detected among 10 of them , the procedure in those patients with pneumothorax did not identify any parenchmal or vascular lesions.

The remaining 15 patients were diagnosed as haemopneumothorax (5 with flail chest and 10 with multiple rib fracture).

Table 1: Clinical pattern

Pathology	No.	%
Hemothorax	50	62.5
Pneumothorax	15	18.75
Hemopneumothorax	15	18.75

Hemostasis was achieved in VATS by endostaplers 30 or 60mm, for any lung laceration, or cauterization if small lung tear was detected. Coagulation of the pleural surface or intercostals muscle ooze was carried out by direct cauterization or ligasure. Direct clipping of bleeding intercostals artery was done for one case.

Seven patients required conversion to an open thoracotomy

- 3 patients with diaphragmatic rupture one in the right side and two in the left side.
- 1 patients with 8cm length pericardial tear with apical herniation of the heart.
- 3 patients with inadequate evacuation of clotted haemothorax.

Conversion to an open thoracotomy was due to:

1- Inability to manage as we decided during the procedure,

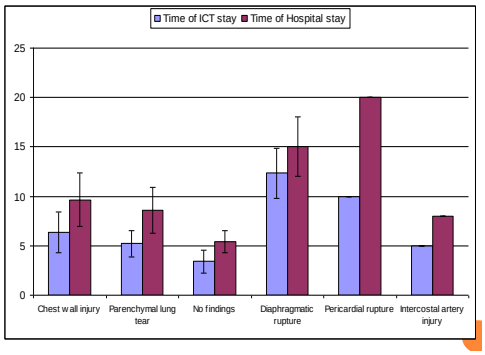
2- Failure of complete lung expansion due to inadequate evacuation of the collection.

Table 2: Causes of conversion to thoracotomy

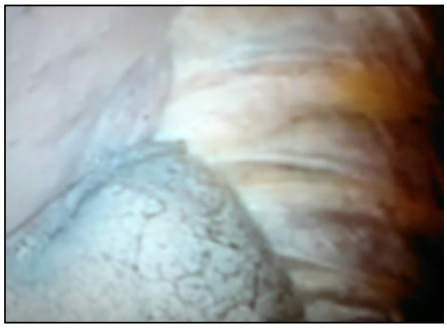
Cause	No.	%
Diaphragmatic rupture	3	3.75
Inadequate evacuation of clotted hemothorax	3	3.75
Pericardial rupture	1	1.25

ICT stayed in our patients from 2 to 15 days (average 5.91±2.6)

The average length of stay in the hospital after VATS was 9.1 ± 2.73 days (vary from 4 to 21 days).



There was no mortality among our patients.



Monopulmonary ventilation

Table 3: Correlation between VAT findings, time of ICT removal and hospital stay time

No. of patients	VAT findings	Time of ICT stay	Time of Hospital stay
36	Chest wall injury	6.33±2.06d	9.66±2.73d
20	Parenchymal lung tear	5.2±1.3d	8.6±2.3d
19	No findings	3.4±1.14d	5.4±1.14d
3	Diaphragmatic rupture	12.33±2.51d	15±3d
1	Pericardial rupture	10d	20d
1	Intercostal artery injury	5d	8d
		Average 5.91±2.6	Average 9.1±3.54

DISCUSSION

The expanding role of VATS has caused many thoracic surgeons to re-evaluate their approach to the management of trauma patients, as it can obviate the need for thoracotomy and its associated complications[(4)].

The improvement of endoscopic materials permitted an exact dissection and exhaustive exploration of the pleural cavity, to which lower postoperative pain and excellent aesthetic auditing may be added, a variety of pathologic situations of the chest, exclusively treated with thoracotomy was managed in VATS. This technique can be applied in conscious, hemodynamically stable patients with a blood gas analysis compatible with monolateral exclusion[(5)]. Clinical and/or radiological suspicion of cardiac or big vessels lesions, or tracheo-bronchial injury must induce a thoracotomic or sternotomic approach in primary intention[(1)].

According to the literatures VATS can be used in an acute setting as a diagnostic or therapeutic tool.

In our experience chest CT, contrast studies and ultrasound have not been able to detect injuries to the diaphragm in two cases and was suspicous in the third patient.

The rate of missed diagnosis using VATS for chest trauma is 0.8%, with 2% rate of procedure –related complications[6].

Regarding missed diagnosis and rate of failure or complications ,it was higher in our study (we can not reach accurate diagnosis in three patients with hemothorax until thoracotomy was done 3.75%) than other puplished studies, and this was for two reasons , the first that we have 10 cases done under local anesthesia with light sedation only ,in those patients the movement of the lung restrict our field of vision , the second cause was that we have two difficult cases diagnosed accuratly during thoracotomy, (one patient with complete pericardial rupture, and one patient with right sided diaphragmatic rupture with big haematoma on herniated liver dome).

Placement of intercostal tube drainage under direct vision was done for all patients with complete evacuation of blood clots if present, and this was safe and easy for those patients done under local anesthesia with light sedation reducing the hazards of general anesthesia, and reducing complications of improper positioning with associated sequelae with prolonged hospital stay, but it was of diagnostic value mainly for those patients.

In the study of **Meyer et al.**, the mean chest tube duration was under three days and the mean length of stay under six days despite the fact that the patients had significant injuries[13]. These outcomes are similar to those reported by in a study in which patients who failed nonoperative management with tube thoracostomy were randomized to VATS or thoracotomy at 72 hours after injury[2, 7].

In our study the average chest tube duration was (5.91±2.6 days), and the average length of hospital stay was (9.1±3.54 days), and this was concomittent with the study of **Duilio Divisi et al**. These results was longer than other studies, and was related to the type of lesion founded[12].

Haemodynamic stability was a must for doing VATS in our study, which is in a agreement with other literatures[3, 10].

Our rate of conversion to thoracotomy was (8.75 %), and this was near the results of other studies.

Conclusion:

In our study we found that VATS in haemodynamically stable patients with blunt chest trauma is safe and effective, and it can be performed with some diagnostic benefits in sedated patients avoiding the hazards of general anesthesia, but further studies will be needed to establish its usefulness.

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REFERENCES

1- **Jacobeus HC:** The practical importance of thoracoscoy in surgery of the chest. Surg Gynecol Obstet 34: 289, 1922.

2- **Ben-Nun A, Orlovsky M, Best LA.** Video-assisted thoracoscopic surgery in the treatment of chest trauma: Long-term benefit. Ann Thorac Surg. 2007; 83: 383-7.

3- **Manlulu AV, Lee TW, Thung KH, Wong R, Yim AP.** Current indications and results of VATS in the evaluation and management of hemodynamically stable thoracic injuries. Eur J Cardiothoracic Surg. 2004; 25: 1048-1053.

4- **Feliciano DV.** The diagnostic and therapeutic approach to chest trauma. Semin Thorac Cardiovasc Surg 1992; 4: 156-62.

5- **Casos SR, Richardson JD.** Role of thoracoscopy in acute management of chest injury. Curr Opin Crit Care. 2006; 12:584-9.

6- **Carrillo EH, Richardson JD.** Thoracoscopy in the management of hemothorax and retained blood after trauma. Curr Opin Pulm Med 1998; 4:243.

7- **Ahmed N, Jones D.** Video-assisted thoracic surgery: state of the art in trauma care. Injury. 2004; 35:479-489.

8- **Szentkereszty Z, Horkai P, Furka A, Sapy P, Sz Kiss S, Fekete K.** The role of the VATS in the treatment of blunt thoracic trauma. Magy Seb. 2007; 60: 510 - 3.

9- **Paci M, Annessi V, de Franco S, Ferrari G.** Videothoracoscopic evaluation of thoracic injuries. Chir Ital. 2002; 54: 335-339.

10- **Villavicencio RT, Aucar JA, Wall MJ.** Analysis of thoracoscopy in trauma. Surg Endosc. 1999; 13:3-9.

11- **Lieber A, Pons F, Dusel W, Glapa M, Machemehl T, Rohm B, et al.** The value of thoracoscopy in thorax trauma. Chirug. 2006; 77: 1014-21.

12- **Duilio Divisi, Carmelo Battaglia., et al.** Video assisted thoracoscopy in thoracic injury: early or delayed indication? Acta Bio Medica Ateneo Parmense 2004; 75:158-163.

13- **Meyer DM, Jessen ME, Wait MA, Estrera AS.** Early evacuation of traumatic retained hemothoraces using thoracoscopy: a prospective, randomized trial. Ann Thorac Surg 1997; 64:1396.