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Study of Video Assisted Thoracoscopic Surgery

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Abstract

Background: Video assisted thoracoscopic surgery (VATS) is a well established method for diagnostics and therapeutics. Many thoracic procedures are performed minimal invasively and our aim of the study is to check the results of video assisted thoracic surgery in all thoracic diseases and find out the complications due to video assisted thoracic surgery. *Method:* This is a retrospective study of video assisted thoracic surgery in management of various thoracic diseases carried out in V.S. General Hospital, Ahmadabad with 60 patients on an indoor patient department basis during the period of November 2012 and June 2014. Proper routine workup pre-operatively was done and proper post-operative care was given to the patients. Regular initial follow-ups were taken into account. *Result:* Out of 60 patients 4 patients were required post- operative ventilator support. 2 patients in which lobectomy right upper and another left lower lobectomy was performed required ventilator support and both were extubated in the post- operative ward after 6 hours. Similarly 1 patient of hydatid cyst with multiple cysts involving left lung required ventilator support and was extubated after 4 hours. 1 patient in which thymectomy was done required ventilator support post operatively for 2 hours. *Conclusion:* Video assisted thoracic surgery is a strong pillar of modern day surgery and future trends will see its ever growing role.

Keywords: Video Assisted Thoracoscopic Surgery; Double-Lumen Endobronchial Tube.

Introduction

Video assisted thoracic surgery is enabling surgeons to perform many common thoracic procedures in a minimally invasive manner.Video assisted thoracoscopic surgery is principally employed in the management of pulmonary, mediastinal, and pleural pathology.

Another term known as "Medical" thoracoscopy is coined for using thoracoscopy for diagnostic purpose and it is carried out under local anaesthesia or conscious sedation in an endoscopy suite [1].Thoracic surgical procedure carried out with thoracoscope came to be known as Video assisted thoracic surgery [2].

In the 1990's there was a sudden increase in the use of thoracoscopy. This happened due to many reasons:

i. New technology in instrumentation.
ii. Single lung ventilation.
iii. Availability of staplers for surgery.
iv. Improvement in video equipment and light source.

The areas of exploration invideo assisted thoracic surgery are:

- Mediastinum
- Lung
- Pericardium

- Sympathetic chain
- Spine
- Heart
- Pleura

Various Indications for Video-Assisted Thoracic Surgery

Diagnostic Indication

- Biopsy of mediastinal lesions and pleural lesions
- Solitary pulmonary nodule excision in indeterminate.
- Lymph node staging phase.

Therapeutic Indication

- Benign pleural excision
- Benign lung tumors excision
- Cervical Sympathectomy for upper limb pain syndromes and hyperhydrosis
- Pleural space sclerosis
- Decortication in empyema
- Blebs stapling
- Empyema debridement

Other Indications

- Lobectomy
- Esophageal myotomy
- Thoracic duct ligation
- Pericardial biopsy [3]
- Esophageal cancer staging
- Volume reduction surgery of lung

Surgical Technique

It involves creating 1, 2 or 3 small incisions in chest wall for instrumentation and procedure. After selective ventilation of one lung trocar is introduced into the chest cavity and then thoracoscope is placed through trocar into chest. At the conclusion of the procedure a chest drainage tube is inserted and the lung is re–expanded.

Anesthetic Requirements and Consideration

It is done under general anaesthesia or regional anaesthesia. It can be done using local anesthetic infiltration in the lateral chest wall and partial pleura. Intravenous sedation may be required [4]. Controlled one lung ventilation is always better for video assisted thoracoscopic surgery.To facilitate visualization, carbon dioxide can be insufflated under pressure into the chest cavity to compress the non-ventilated lung. This may cause serious respiratory and hemodynamic changes. Gas insufflation can result in an increase in airway pressure, a rise in end-tidal carbon dioxide, mediastinal shift with hemodynamic instability and a drop in systolic blood pressure, and a decrease in haemoglobin oxygen saturation despite ventilation with 100% oxygen [5]. This clinical presentation resembles a tension pneumothorax [6]. These physiological responses to carbon dioxide insufflation into a closed chest cavity occur with pressures as low as 5 mmHg [7]. The complication can be reduced if the volume of gas is limited to 2 l/min and the carbon dioxide is insufflated slowly [8].

A single lumen tube, if used in video assisted thoracoscopic surgery under general anaesthesia offers disadvantage of partial lung collapse on operated side causing inadequate surgical exposure. However, if the lungs are not separated, positive-pressure ventilation to both lungs prevents lung collapse on the operated side, with inadequate surgical exposure. Therefore, lung separation with selective one-lung ventilation to only the contra-lateral side is usually indicated. The lung must be completely collapsed to provide optimal surgical conditions. Failure to separate the lungs, with partial inflation of the operated lung, will jeopardize the operation and may make open thoracotomy necessary.

A double-lumen endobronchial tube (DLT) or bronchial blocker should be used to collapse the lung. A double-lumen endobronchial tube is preferred because it provides selective ventilation of the contra-lateral lung, while allowing more rapid collapse of the ipsilateral lung. Carbon dioxide insufflation to compress the lung further is seldom needed. Opening the lumen of the double-lumen endobronchial tube on the operated side to room air, and intermittently suctioning the tube further augments lung collapse. A double-lumen endobronchial tube also allows the lung to be re-expanded under direct vision with a double-lumen endobronchial tube.

General anaesthesia for video assisted thoracic surgery is achieved with either intravenous or inhalational anesthetic agents, or a combination of both. The use of short- acting intravenous agents is important to allow the rapid emergence and recovery of airway reflexes.

Oxygenation

During general anaesthesia the patient's ventilation and oxygenation are easily monitored by capnography and pulse oximetry. Most video assisted thoracic surgeryprocedures are short and are not associated with significant hypoxemia. Haemoglobin oxygen saturation usually remains stable in case of proper ventilation.

Continuous direct intra-arterial oxygen monitoring demonstrated substantial fluctuations in arterial oxygen pressure (PaO2) and arterial carbon dioxide pressure (PaCO2) during routine video assisted thoracic surgery procedures [9]. The magnitude of these changes was unpredictable and was not reliably detected by non-invasive monitoring. However, changes were transient and did not appear to have any significant clinical relevance. During video assisted thoracic surgery procedures for LVRS, adequate oxygenation is not usually a problem although hypercarbia is common [10].

More serious prolonged decreases in arterial oxygen pressure can occur, which require immediate intervention. The position of the double-lumen endobronchial tube should be immediately reconfirmed. Continuous positive airway pressure is the treatment for hypoxemia during thoracotomy. Distended lung will seriously interfere with surgical exposure during a video assisted thoracic surgery procedure. Therefore continuous positive airway pressure cannot be used during video assisted thoracic surgery.

In theory, if one could increase the blood flow to the ventilated lung during one-lung ventilation by dilating the pulmonary artery on that side, shunt to the collapsed lung would be reduced and oxygenation would be improved. The combination of inhaled nitric oxide and almitrine was shown to prevent hypoxemia in patients undergoing video assisted thoracic surgery [11].

Aims and Objectives

- To study the results of video assisted thoracic surgery in all thoracic diseases.
- To study complications due to video assisted thoracic surgery.

Material and Methods

This is a retrospective study of video assisted thoracic surgery in management of various thoracic diseases carried outat our institutewith 60 patients on an indoor patient department basis during the period of November 2012 and June 2014. Proper routine workup pre-operatively was done and proper post-operative care was given to the patients. Regular initial follow-ups were taken into account.

Inclusion Criteria

- Patients with age group between 10 – 60 years having residual pleural effusion, spontaneous pneumothorax in chronic obstructive pulmonary disease, long standing pyothorax leading to non expansion of lungs, fibrothorax, thymoma, mediastinal benign lesions, fibrocavitatory lesions of lung, traumatic haemopneumathorax, hyperhydrosis, lung hydatid cyst lesion.

Exclusion Criteria

- Patients below 5 years of age.
- Patients with proved primary lung or pleural malignancy.
- Patients with oesophageal lesions were also excluded.
- Terminally ill patients.
- Patient not fit for surgery.

Observation and Analysis

This is a retrospective study of video assisted thoracic surgery in management of various thoracic diseases carried out in V.S. General Hospital, Ahmadabad with 60 patients on an indoor patient department basis during the period of November 2012 and June 2014.

The Observation Tables are as Follows

Out of total 60 patients 28 patients were of empyema, 10 patients were of lobectomy, 5 patients were of thymoma, 5 patients were diagnostic, 2 patients were of hyperhydrosis, 5 patients were of pleurodesis and 5 patients were of hydatid cyst excision (Table 2).

Average time for empyema surgery is 3.5 hours, for lobectomy surgery is 4 hours, for thymoma surgery is 2.5 hours, for diagnostic surgery is 0.25 hours, for hyperhydrosis surgery is 1.5 hours, for pleurosis surgery is 0.30 hours and for hydatid cyst excision surgery is 3 hours (Table 3).

Average duration of pain perceived in VATS (Video assisted thoracoscopic surgery) is 1 day and for thoracotomy is 2.5 days.

Out of all drains 3 were removed on day 1st, 7 were removed on 2nd, 48 were removed on day 3rd and 2 were removed on 4th day (Table 4).

Average duration of stay in hospital for empyema is 4 days, for lobectomy is 4 days, for thymoma is 3 days, for diagnostic is 1 day, for hyperhydrosis is 1 day, for pleurosis is 1 day and for hydatid cyst excision is 4 days (Table 5).

Out of 60 patients 5 patients developed air leak, 5 patients developed failure of video assisted thoracoscopic surgery, 2 patients developed wound infection, 2 patients developed post- operative arrhythmias- supra ventricular tachycardia, 3 patients developed non- expansion of lung, 2. We had to covert to thoracotomy in 5 patients. In our observation we didn't come across massive blood loss, peri - operative death and injury to large vessels (Table 6).

Out of 60 patients 4 patients were required post-operative ventilator support. 2 patients in which lobectomy right upper and another left lower lobectomy was performed required ventilator support and both were extubated in the post-operative ward after 6 hours. Similarly 1 patient of hydatid cyst with multiple cysts involving left lung required ventilator support and was extubated after 4 hours. 1 patient in which thymectomy was done required ventilator support post operatively for 2 hours (Table 7).

Table 1: Number of patients operated by VATS

	No. of Patients
Empyema (decortication)	28
Lobectomy (cavitatory destroyed lobe)	10
Thymoma	5
Diagnostic	5
Hyperhydrosis	2
Pleurodesis	5
Hydatid cyst excision	5

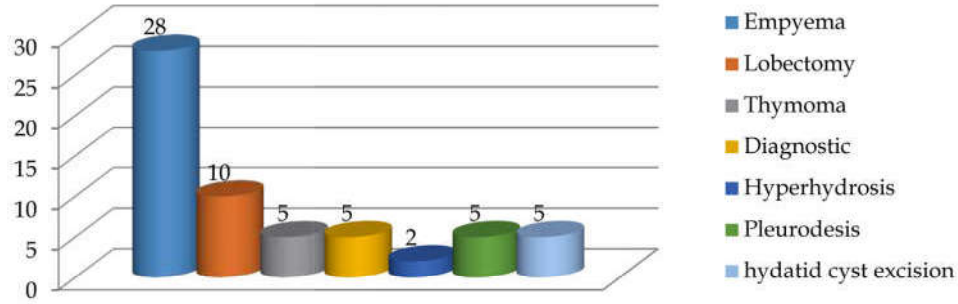


Table 2: Duration of surgery for different conditions operated

	Duration of Surgery
Empyema (decortication)	3.5 hours
Lobectomy (cavitatory destroyed lobe)	4 hours
Thymoma	2.5 hours
Diagnostic	0.25 hours
Hyperhydrosis	1.5 hours
Pleurodesis	0.30 hours
Hydatid cyst excision	3 hours

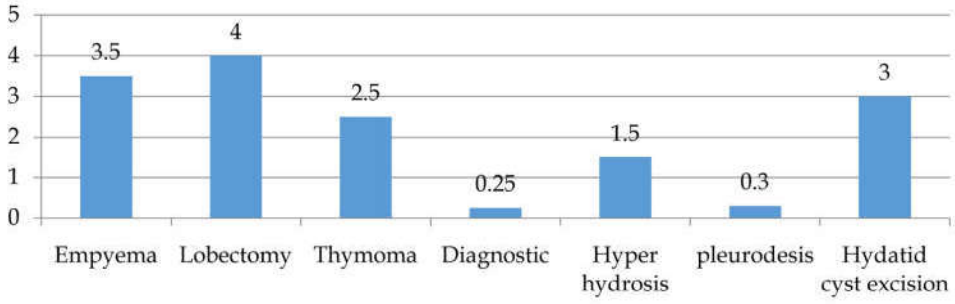


Table 3: Average duration of perception of pain in video assisted thoracoscopic surgery and comparing it with standard thoracotomy

VATS	1 day
Thoracotomy	2.5 days

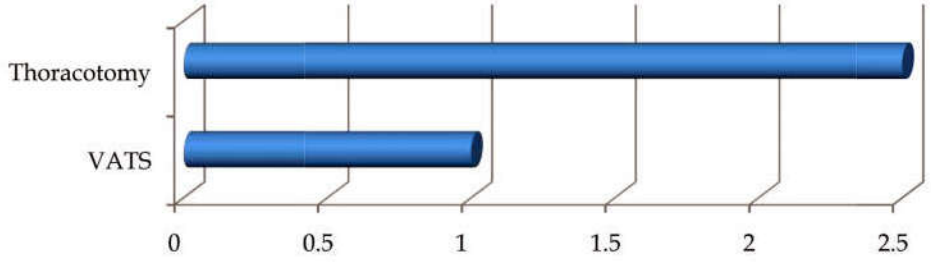


Table 4: Average time for removal of drain

	No. of Drains
Day 1	3
Day 2	7
Day 3	48
Day 4	2

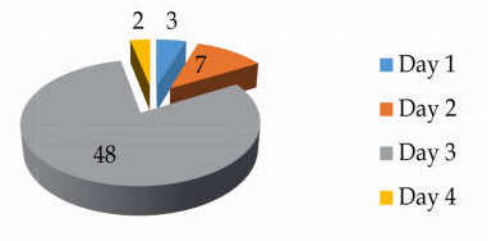


Table 5: Average duration of stay in hospital for different conditions for which operations done

	Duration of hospital stay
Empyema (decortication)	4 days
Lobectomy (cavitatory destroyed lobe)	4 days
Thymoma	3 days
Diagnostic	1 day
Hyperhydrosis	1 day
Pleurodesis	1 day
Hydatid cyst excision	4 days

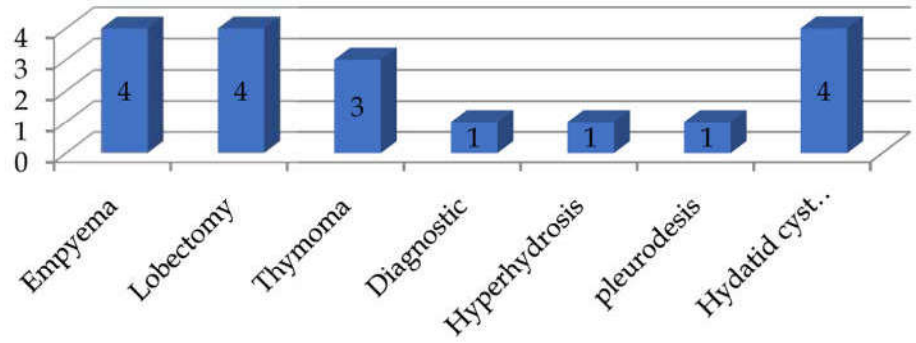


Table 6: Complications in different conditions operated

	No. of Patients
Massive blood loss	0
Air leak	5
Failure- conversion to open thoracotomy	5
Subcutanous emphysema	0
Wound infection	2
Post operative arrhythmias- supraventricular tachycardia	2
Non expansion of lung	3
Injury to large vessels	0
Peri- operative death	0

Fig. 6:

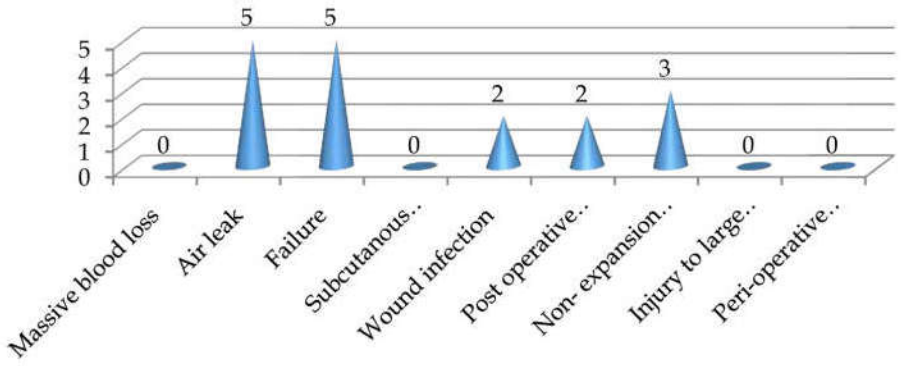
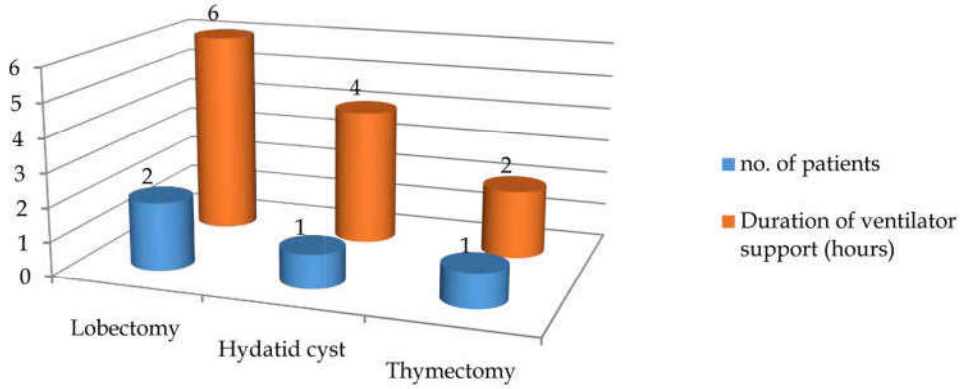


Table 7: Post-operative ventilator support

	No. of Patients	Duration of Ventilator Support
Lobectomy	2	6 hours
Hydatid cyst	1	4 hours
Thymectomy	1	2 hours



Summary and Discussion

- In this study total 60 patients were operated of which 28 patients were of empyema, 10 patients were of lobectomy, 5 patients were of thymoma, 5 patients were diagnostic, 2 patients were of hyperhydrosis, 5 patients were of pleurodesis and 5 patients were of hydatid cyst excision.
- Average time for operation was 2.8 hours.
- Average duration of pain perceived post surgery was 1 day.
- Out of all drains 3 were removed on day 1st, 7 were removed on 2nd, 48 were removed on day 3rd and 2 were removed on 4th day.
- Average duration of stay in hospital for empyema is 4 days, for lobectomy is 4 days, for thymoma is 3 days, for diagnostic is 1 day, for hyperhydrosis is 1 day, for pleurosis is 1 day and for hydatid cyst excision is 4 days. Total average stay is 2.4 days.
- Out of 60 patients 5 patients developed air leak, 5 patients developed failure of video assisted thoracoscopic surgery, 5 patients developed subcutaneous emphysema, 2 patients developed wound infection, 2 patients developed post-operative arrhythmias- supra ventricular tachycardia, 3 patients developed non-expansion of lung. We had to covert to thoracotomy in 5 patients. In our observation we didn't come across massive blood loss, peri - operative death and injury to large vessels.
- Out of 60 patients 4 patients were required post-operative ventilator support. 2 patients in which lobectomy right upper and another left lower lobectomy was performed required ventilator support and both were extubated in the post-operative ward after 6 hours. Similarly 1 patient of hydatid cyst with multiple cysts involving left lung required ventilator support and was extubated after 4 hours. 1 patient in which thymectomy was done required ventilator support post operatively for 2 hours

Conclusions

Video assisted thoracic surgery is a strong pillar of modern day surgery and future trends will see its ever growing role.

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