

## Research article

# Port placement in thoracoscopy

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**Abstract****Background:**

Thoracoscopy reduces the morbidity of open thoracotomy. The placement of camera and working ports is crucial for successful completion of the procedure.

**Methods:**

A retrospective review of video assisted thoracoscopic surgeries performed during January 2011 to June 2013 at the university surgical unit, Peradeniya, Sri Lanka was done. Port placement of each surgery was identified and the adequacy of space for dissection, use of additional ports for retractors, successful, comfortable and safe completion of the surgery with regard to average operative time, mean blood loss and conversions to open surgery were noted.

**Results:**

9 different thoracoscopic procedures were performed on 67 patients. All procedures allowed comfortable dissection, adequate space for dissection and required no additional ports for retractors except for thymectomy and excision of retrosternal goiter. Time taken was acceptable with minimum blood loss and no conversions.

**Conclusion:**

For anterior and posterior mediastinal procedures the camera port was placed in the mid and the posterior axillary lines respectively and provided a clear display of the anatomy. The thirty degree camera was preferred as it provided a wider visual field. Working ports for anterior and posterior mediastinal procedures were placed in the anterior and mid axillary line respectively. Most effective placement for working ports were found to be two intercostal spaces above and below the camera port.

**Key words:** Thoracoscopy; Port placement

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## Introduction

Diagnostic and therapeutic procedures done by thoracotomy or median sternotomy cause a significant morbidity (1). The post-operative pain is substantial and will affect breathing. Poor respiratory effort and impaired cough reflex lead to respiratory infections (1). The need for ventilatory support may extend the stay at the intensive or high dependency care. Risk of wound infections and wound dehiscence especially in sternotomy may have disastrous outcome (2-5). The hospital stay will be prolonged with delay to report for work (6). The morbidity of open access can be reduced by the minimal access surgery; Video Assisted Thoracoscopy (7-11). An added advantage will be a clear display of anatomy. The image is magnified and it is possible to get a closer view of the anatomy by zooming in. This will allow a precise dissection with minimal blood loss within an acceptable time. Many procedures spanning from minor to major complex surgeries can be performed by thoracoscopy.

Space for dissection is obtained by collapsing the ipsilateral lung. This is by single lung ventilation with a double lumen tube. It is also possible to obtain a lung collapse by insufflating CO<sub>2</sub> while ventilating with a single lumen tube.

Once the lung is collapsed the camera port is placed and the hemithorax will be inspected. Then the working ports will be inserted usually to be in triangulation with the camera port.

One of the key factors for a successful dissection is proper placement of the camera and the working ports. This should be planned according to the site of the pathology.

## Methods

A retrospective analysis of case records of video assisted thoracoscopic surgeries performed during January 2011 to June 2013 at the university surgical unit, Peradeniya, Sri Lanka was done.

All were performed under general anaesthesia and endotracheal intubation. The ipsilateral lung was

collapsed. This was by single lung ventilation in some. In others a capnotherax of 6-8mmHg was used to obtain lung collapse.

The procedures of the anterior and superior mediastinum were performed with the patient in the supine position. The posterior mediastinal procedures were performed with the patient in the prone position. This allowed the collapsed lung to fall away from the field of dissection.

The camera and working ports were placed according to the location of pathology displayed on the computerized tomography images. Once the camera was inserted, the clarity of the anatomy visualized was noted. Zero degree and thirty degree cameras were used. Zero degree camera views straight. 30 degree camera views a wider field under an angle of 30 degrees.

The working ports were placed in triangulation with the camera. In triangulation the entry sites forms a triangle. The proper working port placement was assessed with regards to comfortable two hand dissection. Adequacy of space for dissection and use of additional ports were noted. Proper port placement is essential for completion of the procedure. As a measure of successful completion, time taken, blood loss and conversions to open surgery were recorded.

## Results

Sixty-seven video assisted thoracoscopic procedures were performed. The procedures performed are given below. (Table 1)

The used insufflation pressure in both situations were noted as 6-8mmHg.

The port placements are shown on table 2.

The visualization of the anatomy was noted to be very clear with this camera placement. The working port placement allowed a comfortable dissection with unrestricted two-hand dissection. The instruments did not interfere with each other or with the camera. Thirty-degree camera provided wider angle of vision than the zero degree.

Table 1 Procedures performed

Procedure	Number of patients	One lung ventilation	Both lung ventilation
Lymph node biopsy	10	-	10
Lymph node dissection(secondary lymph node deposits in medullary carcinoma)	2	2	-
Thymectomy	8	2(33.3%)	6(66.6%)
Thoracoscopy assisted excision of retrosternal goiter	2	-	2
Thoracic sympathectomy	8	-	8
Splanchnicectomy	6	-	6
Lung biopsy	14	-	14
Mobilization of thoracic oesophagus in three stage oesophagectomy	15	10(66.6%)	5(33.3%)
Diagnostic thoracoscopy	2	1	1
Total	67	15(22%)	52(78%)

Table 2 Positioning of the patients and the ports

Procedure	Camera port	Two working ports	Additional port
Lymph node biopsy , Lymph node dissection Thymectomy, Retrosternal thyroidectomy	5th intercostal space, mid axillary line (33%)	3rd and 7th intercostal spaces, anterior axillary line	Used in one thymectomy and in one retrosternal goiter, in the 8th intercostal space, mid axillary line
Thoracic sympathectomy,Oesophagectomy Diagnostic	6th intercostal space below the inferior angle of the scapula (37%)	4th and 8th intercostal spaces, mid axillary line	None
Splanchnicectomy	7th intercostal space, posterior axillary line (8%)	5th and 9th intercostal spaces, mid axillary line	None
Lung biopsy	7th intercostal space, mid axillary line (22%)	5th and 9th intercostal spaces, anterior axillary line	None

Table 3 Perioperative data

Procedure	Space for dissection	Use of additional ports for retractors	Mean blood loss	Average time taken	Conversion to open surgery	Intercostal
Lymph node biopsy	Adequate	Nil	Minimal	30 min	Nil	No
Lymph node dissection(secondary lymph node deposits in medullary carcinoma)	Adequate	Nil	150ml	4 hr	Nil	Yes
Thymectomy	Adequate	One	150ml	3.5 hr	Nil	Yes
Thoracoscopy assisted excision of retrosternal goiter	Adequate	One	150ml	4.5 hr	Nil	Yes
Thoracic sympathectomy	Adequate	Nil	Minimal	30 min	Nil	No
Splanchnicectomy	Adequate	Nil	Minimal	1 hr	Nil	No
Lung biopsy	Adequate	Nil	Minimal	20 min	Nil	No
Mobilization of thoracic oesophagus in three stage oesophagectomy	Adequate	Nil	100-150	2 hr	Nil	Yes
Diagnostic thoracoscopy	Adequate	Nil	Minimal	30 min	-	No

## Discussion

Thoracoscopy reduces the morbidity of thoracotomy (7,8,9,10,11). Port placement at correct site is important during thoracoscopy. The literature on thoracoscopic surgery does not give much information about port placement. However this was described in one of the atlases for Thymectomy and esophagectomy(12). In our series we used this as a guidance to plan out port placement for a variety of procedures, depending on the location of the pathology.

Visualization of intrathoracic anatomy with clarity is dependant on the placement of camera port. For anterior mediastinal dissections, camera port was placed in mid axillary line. For posterior mediastinum camera was positioned through posterior axillary line. The thirty

degree camera allowed a wider view and was preferred. The zero degree camera was used at the beginning of the series due to unavailability of 30.

The working ports, usually two, were inserted in triangulation with the camera port. Generally two spaces above and below the camera port were selected. For anterior mediastinum, working ports were placed in the anterior axillary line. For posterior mediastinum working ports were placed in the mid axillary line. These sites allowed comfortable dissection without disturbance between the instruments and with the camera.

With the described port placements a comfortable dissection with a clear vision was possible. The surgeries were completed in an acceptable time with minimum blood loss. There were no conversions.

The data we have provided was by retrospective analysis of case records which is a limitation of this study. It will provide a guideline which need further testing by prospective data.

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None

**Competing Interests**

None

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