YIELD OF CERVICAL MEDIASTINOSCOPY IN DIAGNOSIS OF INDETERMINATE MEDIASTINAL lYMPHADENOPATHY/MASSES AND STAGING OF LUNG CANCER

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Abstract

Objective: To determine the yield of cervical mediastinoscopy in indeterminate antero-superior mediastinal lymphadenopathy or masses and in staging of non small cell carcinoma lung.
Study Design: Descriptive prospective study
Place and Duration of Study: Thoracic Surgical unit of Combined Military Hospital Rawalpindi from Jan 2007 to June 2009.
Patients and Methods: Patients were placed in group I for diagnostically indeterminate antero superior mediastinal lymphadenopathy/masses and in group II for staging of non small cell lung cancer (NSCLC) with enlarged mediastinal lymph nodes on CT scan (greater than 10 mm on short axis). All patients underwent the procedure under general anaesthesia. A plane anterior to trachea was developed using blunt finger dissection until carina. Biopsies of the mass or lymph nodes were taken and sent for histopathology. In case of staging for Carcinoma lung, lymph node stations 2L, 2R, 4L, 4R and 7 were searched and biopsied and sent in appropriately labelled containers for histopathology. Patients were usually discharged on the same day.
Results: Forty eight cases were included in this study during the course of 2 ½ years of period. Twenty nine cases were included in group I and nineteen in group II. In group I chronic caseating granulomas due to tuberculosis were the most cause in 45 % of cases followed by 24% cases of lymphoma. In group II, 4 (21%) cases revealed no evidence of malignancy in any lymph nodes and in 11 (57.9%) cases only ipsilateral mediastinal lymph nodes were involved by tumor making it N2 disease. In 4 (21%) cases contra lateral mediastinal lymph nodes were involved by tumor making it N3 disease. Mortality in this study was only one case (3.4%).
Conclusion: Mediastinoscopy is minimally invasive, cost effective and simple procedure in trained hands for both diagnosis and staging purpose.

Keywords : Lung Cancer, Mediastinoscopy, Mediastinal masses/lymphadenopathy.

Article

INTRODUCTION

Surgical exploration of the mediastinum was first developed by Harken et al1. Through a supraclavicular incision, Jackson laryngoscope was inserted into the mediastinum and lymph node biopsies were obtained. They revealed that the presence of involved mediastinal lymph nodes in patients with lung cancer would preclude successful resection of the cancer. More than 60 years later their reasoning still proves to be valid. Cervical Mediastinoscopy through a pretracheal suprasternal incision was developed by Carlens in Sweden in 19592 and subsequently popularized by Pearson in North America3. The prognostic importance of the level and extent of nodal involvement has led to the development of an internationally used mediastinal lymph node map introduced by Mountain and Dressler4.

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Cervical mediastinoscopy is the endoscopic minimally invasive simple, safe and effective exploration of the superior and middle mediastinum utilizing the lighted rigid instrument, the mediastinoscope. It

enables the surgeon to directly visualize and biopsy lymph nodes or other abnormal tissues in the mediastinal compartment within the instruments reach. It allows for simultaneous biopsies of the right and left mediastinal lymph nodes through one small incision. Cervical mediastinoscopy has a high accuracy. Its specifity is 100% and sensitivity is dependant upon surgeon's experience but sensitivity rates of 90% are usually reported5. Cervical mediastinoscopy remains the gold standard to which all other techniques like CT scan, PET scan, TBNA and EUS guided aspiration are to be compared6,7. This study was carried out to determine the yield of cervical mediastinoscopy in indeterminate antero superior mediastinal lymphadenopathy or masses and in staging of non small cell carcinoma lung.

PATIENTS AND METHODS

This study was conducted at Thoracic Surgical unit of Combined Military Hospital Rawalpindi from Jan 2007 to June 2009. All cases of indeterminate antero superior mediastinal lymphadenopathy or masses and cases of non small cell lung cancer with enlarged mediastinal lymph nodes on CT scan (greater than 10 mm on short axis) for staging of the disease were included in the study.

Patients referred from pulmonology, oncology or radiology departments of military and civil hospitals of Rawalpindi/Islamabad were included in the study using non probability convenience sampling. Patients were placed in group I for diagnostically indeterminate antero superior mediastinal lymphadenopathy/masses and in group II for staging of non small cell lung cancer (NSCLC). Routine baseline investigations were performed for all the patients. Blood grouping was done and one unit blood arranged in all the cases. CT scan Chest with intravenous contrast was done in all the cases. Patients were prepared for surgery after written informed consent. Pre-anaesthesia assessment was obtained in all the cases.

All cases were performed under general anaesthesia. All cases received a single dose of 750 mg of 2nd generation cephalosporin about 30 mins before induction. Patient was placed supine on the operating table with bolster under the patient's shoulders and the neck was extended. The endotracheal tube was positioned at the left corner of the mouth, with the anaesthesia equipment on the patients left side. Pulse oximeter probe was placed on right hand so as to assess the pressure on innominate artery during the procedure. The table was level or slightly tilted foot downwards to reduce venous congestion. Neck and chest upto xiphisternum was scrubbed with pyodine and draped. Thoracotomy/sternotomy set was always kept in same operating room. A 2 to 3 cm long transverse incision was made about 1 cm above suprasternal notch, platysma was incised and strap muscle separated laterally and thyroid tissue retracted superiorly. Pretracheal fascia was grasped and incised. A plane anterior to trachea was developed using blunt finger dissection until carina. Surgeon standing at the head of the table passed the rigid mediastinoscope under vision in the space using the anterior tracheal rings as a guide. The plane in front of the mediastinoscope was developed with the use of blunt dissection, using a metal sucker through the channel of the mediastinoscope. The tissue planes were developed to the level of the carina and both tracheobronchial angles. Biopsies of the mass or lymph nodes are taken and sent for histopathology. In certain cases tissue was also sent for AFB culture and sensitivity and fungal culture. In case of staging for Carcinoma lung following lymph node stations were searched and biopsied and sent in appropriately labelled containers for histopathology:-

1.Left and Right upper para tracheal lymph nodes (Station 2L and 2R)
2.Left and Right lower para tracheal lymph nodes (Station 4L and 4R)
3.Subcarinal lymph nodes (Station 7)

Haemeostasis was ensured and wound closed with absorbable sutures and skin with non absorbable sutures. Patient was usually discharged on the same day or if procedure was done later in the day or effects of anaesthesia lingered, patient was sent home next day.

RESULTS

Forty eight cases were included in this study during the course of 2 ½ years of period. Twenty nine cases were included in group I and nineteen in group II. Mean age of the patients in group I was 32 years varying from 20 to 48 years. Group II mean age was 57 years varying from 47 to 69 years. Male to female ratio was 21:8 in group I and 14: 5 in group II

Mean operating time in group I was 30 minutes, range 25 to 210 minutes whereas mean operating

time in group II was 45 minutes ranging from 38 to 75 minutes. One patient in group I had massive bleeding and immediately median sternotomy and repair of bleeding from superior vena cava and pulmonary artery was done. This one case had long operating time of 210 minutes.
Histological break up of cases in group I is given in table 1.

Table-1: Histopathology in group I cases of indetermina mediastinal masses/lymphadenopathy (n 29)

HISTOPATHOLOGY	Frequency (%)
Chronic caseation (TB)	13 45%
Lymphoma	7 24.1%
Malignant Germ cell tumor	2 6.9%
Sarcoidosis	2 6.9%
Castlemans disease	1 3.4%
Lymphangioma	1 3.4%
Idiopathic fibrosing mediastinitis	1 3.4%
Acute on chronic inflammation (cause not known)	2 6.9%

Chronic caseating granulomas due to tuberculous bacilli were the most common cause in 45 % of cases followed by 24% cases of lymphoma. Malignant germ cell tumours and sarcoidosis were diagnosed in 6.9% of cases each. Relatively rare diagnosis of lymphangioma, idiopathic fibrosing mediastinitis and Castleman's disease were diagnosed in one case each. In two cases, no definitive diagnosis was reached and the patients had to undergo, later on, further invasive testing like VATS biopsy or mediastinotomy.
In group II, four (21%) cases revealed no evidence of malignancy in any lymph nodes harvested and only showed hyperplasia/acute inflammation. In eleven (57.9%) cases only ipsilateral mediastinal lymph nodes were involved by tumor making it N2 disease. In four (21%) cases contra lateral mediastinal lymph nodes were involved by tumor making it N3 disease (Table-2).

Table 2: Histopathology in group II cases of NSCLC staging (n 19)

	Frequency (%)
No nodal involvement by tumour	4(21%)
Ipsilateral lymph node involvement by tumour	11(57.9%)
Contra lateral lymph node involvement by tumour	4(21%)

Complication encountered in both groups are shown in table 3.

Table 3: Complications and mortality

	Group I (n 29)	Group II (n 19)
Massive haemorrhage	1*(3.4%)	-
Tracheal injury	-	-
Oesophageal injury	-	-
Recurrent nerve injury	-	-
Pneumothorax	-	-
Lung injury	-	-
Wound infection(minor)	2(6.9%)	1(3.4%)
Mortality	1(3.4%)	-

*Same case later on died

Minor bleeding was controlled by packing of adrenaline soaked swabs. One case had massive bleeding managed by immediate median sternotomy and repair of tear in bleeding vessels. Minor wound infection occurred in three cases, two in group I and one in group II. All were managed by opening the skin stitches and daily dressing in outdoor department.

One (3.4%) patients died in group I who had massive bleeding during the procedure. Immediate median sternotomy was done and tear in superior vena cava and right pulmonary artery was repaired. Patient remained on cardio respiratory support for two days and died of effects of massive bleeding. Bleeding occurred due to tethering of the lymph node mass to these vessels and pull caused the tear. Later on, the histopathology report revealed it to be a tuberculous mass.

DISCUSSION

Mediastinal nodal status is the major prognostic factor in assessing resectability of lung cancer. The need to perform invasive mediastinal staging on every patient is controversial. It is accepted that histological evaluation of enlarged lymph nodes identified by CT scan is required to confirm staging. McLoud and associated found that 37% of nodes 2 to 4 cm in diameter did not contain metastatic disease on thoracotomy. Like wise false positive PET scan can result from granulomatous and other infections disease processes8. The Canadian Lung Cancer Oncology Group reported that selective mediastinoscopy in patients with enlarged lymph nodes was more cost effective than invasive mediastinal staging9. Kernstine and associates reported that N2 disease was still found at thoracotomy in 2- 8 % of cases if PET scan were negative10. Patz, Lowe and colleagues compared PET scanning to mediastinoscopy results and found that 11.7% of patients with negative mediastinal PET had N2 or N3 disease demonstrated at mediastinoscopy7. In our study we did not have the facility of PET scan and only contrast enhanced CT scan was performed. We also followed the protocol of Canadian lung cancer oncology group and only mediastinal lymph nodes larger than 1 cm in short axis were subjected to mediastinoscopy in staging of NSCLC.

Most of the cases of indeterminate mediastinal masses/lymphadenopathy in our study were already taking anti tuberculous therapy started by different physicians. Our study has shown that only 45% of cases were caused by tuberculous bacilli and rest did not need the anti tuberculous therapy.

Mean operating time was slightly more in group II as the surgeon had to look for the lymph nodes as per their stations. However with learning curve improving surgeons took about 15 minutes more to sample these nodes.

The false negative rate of mediastinoscopy is generally less than 10% and there should be no false positives. Funatsu and colleagues reported that sensitivity of mediastinoscopy was lowest for subcarinal lymph nodes (64%). The false negative results were low for the para tracheal regions (1-2%) but were 6% for the subcarinal lymph nodes11. In our study we also had no false positive result.

Cervical mediastinoscopy is a low-risk procedure but the potential for catastrophic complications is apparent. Ginsberg reported that in two analyses of 2259 mediastinoscopies, the total complication rate was 2%12. There were no deaths. Only 0.3% of life threatening complications (haemorrhage, tracheal injury and oesophageal injury) required surgical intervention, consisting of thoracotomy or sternotomy. On the right side, the azygos vein and the anterior branch of the right pulmonary artery are at risk of injury. The azygos vein can be mistaken for an anthracotic lymph node. Recurrent nerve injury and pneumothorax occurred in 0.9% of mediastinoscopies. Other major complications are injury of the oesophagus, damage to the recurrent laryngeal nerve (usually the left) and tracheobronchial tree injuries. In experienced hands, cervical mediastinoscopy has no mortality and minimal morbidity.

In another study over a period of twenty-years, well over 4000 cervical mediastinoscopies were performed13. There was no hospital mortality. Major bleeding requiring immediate intervention occurred in four patients, injury to the oesophagus was seen in one patient in whom the mediastinum was drained through the mediastinoscopy incision and this fistula dried up after a few days of conservative treatment. In one case a tear of the left main bronchus was made by the biopsy forceps. This was sutured by the endoscopic suturing technique using the videomediastinoscope and healed without any problems.

In a recent review of over 20000 cases, complications did not surpass 2.5% and mortality was under 0.5%12.

In our study mortality rate appears high due to smaller size of the study as compared to international studies. However we were able to avoid major complications listed in table 3.

In our study patient hospital stay was one day which is comparable to international studies which perform this procedure as day care13.

We did not perform the mediastinoscopy in cases of superior vena cava obstruction, however it is not an absolute contraindication. Even some centres with lots of experience in mediastinoscopies are performing redo mediastinoscopies15.

Small lymph nodes on CT scan can harbour metastatic disease of clinical importance. There is consensus that positive predictive value of both CT and PET scan is low and need to be proven histologically16. Other less invasive techniques like TBNA and EUS guided aspiration are available at highly specialized centres with high sensitivity in clinically obviously involved mediastinal lymph nodes however negative predictive value of these techniques is significantly lower than mediastinoscopy17.

CONCLUSION

Mediastinoscopy is minimally invasive, cost effective and simple procedure in trained hands for both diagnosis and staging purpose. All mediastinal masses are not tuberculous and injudious use of anti tuberculous medication should not be started without objective evidence. Staging of cancer affects the treatment modality as well as prognosis and enlarged lymph nodes on CT scan are not always involved by tumor. However a larger study size would validate our conclusions in our set up.

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