Cervical Mediastinoscopy as a Diagnostic Tool for Mediastinal Lymphadenopathy

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ABSTRACT

Objective: To determine the yield of cervical mediastinoscopy in determining causes of mediastinal lymph node enlargement.
Study Design: Observational study.
Place and Duration of the Study: CMH Rawalpindi, Lahore and Multan, from January 2010 to December 2021.
Methodology: Patients who underwent lymph node biopsy through cervical mediastinoscopy approach were included. Record of the patients including age, gender, clinical presentation, and findings on CT scan chest were noted along with the record of preoperative complications and duration of surgery. Histopathology report was also recorded.
Results: Out of 398 patients, 259 (65%) were males and 139 (35%) were females. Out of 338 patients who were operated for diagnostic purpose, 157 (46%) had tuberculosis and 34 (10.1%) had sarcoidosis. Fifty-two (15.3%) were diagnosed to have malignancy including non-small cell lung cancer (NSCLC), small cell lung cancer (SCLC), and metastatic carcinoma of unspecified origin. Amongst staging group (n=60), 33 (55%) patients had negative mediastinal disease. Complication rate was 3.8%, including hoarseness of voice in three patients while 2 patients had wound infection requiring intervention.
Conclusion: Cervical mediastinoscopy is a safe and efficacious means of diagnosis in indeterminate mediastinal lymphadenopathy and staging of lung malignancy.

Key Words: *Mediastinoscopy, Lymph nodes, Tuberculosis, Lung cancer, Staging.*

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INTRODUCTION

Cervical mediastinoscopy is a common procedure used for diagnosis and the staging of lung cancer.[1-3] It allows biopsy of paratracheal lymph node stations bilaterally, anterior subcarinal lymph nodes as well as direct biopsy of retro vascular mediastinal tumours. It was not until the mid-1960 that Pearson and colleagues began performing mediastinoscopy routinely in the pre-thoracotomy staging of non-small cell lung cancer (NSCLC). Even in today's era, cervical mediastinoscopy has maintained its position as a diagnostic and staging investigation for patients with mesothelioma, lung cancer and lung metastases.[4]

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The indications for mediastinoscopy include preoperative nodal staging of lung cancer, evaluation of mediastinal lymphadenopathy in the absence of discrete lung masses or in the presence of diffuse lung disease of undetermined aetiology, re-staging of NSCLC after neoadjuvant therapy, evaluation of middle mediastinal mass,[5] the patients referred by physicians requiring diagnostic surgical biopsy, N2 staging in NSCLC without distant metastasis,[6] and lymph nodes not amenable to CT guided biopsy.

Immunohistochemistry is possible in larger chunks of tissue which cannot be carried on samples taken by needle biopsies such as endobronchial and ultrasound guided transthoracic FNA. Minor haemorrhage, most recurrently related to the bronchial arterial supply to the mediastinal lymph node, is the most common complication and is usually controlled with electrocautery or gauze packing. Massive haemorrhage from injury to a major blood vessel is potentially life-threatening and requires prompt recognition, tamponade, conversion to midline sternotomy, and repair. Therefore, preparation for urgent midline sternotomy is vital in each case of mediastinoscopy. Tracheobronchial injury is a rare complication of mediastinoscopy. Other structures at risk are the recurrent laryngeal nerve, the mediastinal pleura, and the esophagus.

The aim of this study was to determine the incidence of various diseases involving the mediastinal lymph nodes or presenting as mediastinal masses along with evaluating the accuracy of mediastinoscopy in staging carcinoma lung and the frequency of complications during or after the procedure.

METHODOLOGY

This observational study included a total of 398 patients who underwent cervical mediastinoscopy over a period of 12 years, from January 2010 to December 2021 at CMH Rawalpindi, Lahore and Multan. Patients were retrospectively categorised in two groups. Group 1 included 338 patients, who were referred by physicians requiring surgical biopsy of mediastinal lymph nodes for diagnostic purpose, and Group 2 included 60 patients with histopathological diagnosis of NSCLC, having no evidence of distant metastasis and requiring determination of mediastinal involvement. Inclusion criteria was surgical accessibility to mediastinal lymph nodes/mass by cervical mediastinoscopy and no peripheral lymph node enlargement amenable to surgical biopsy. Exclusion criteria was peripheral mediastinal lymph node enlargement which was amenable to surgical biopsy and medically unfit patients.

Data regarding age, gender, detailed history, clinical examination, relevant laboratory tests, and CT scan findings (Figure 1) were retrieved from the hospital database. Written Informed consent was taken from the patients regarding surgical procedure. All patients were subjected to the standard cervical mediastinoscopy under general anaesthesia. Specimens were sent for histopathological evaluation, bacterial, mycobacterial, and fungal cultures. Their histopathological diagnosis was obtained and recorded.

Categorical variables were expressed in terms of frequency and percentages whereas the quantitative data was expressed as means and standard deviations. Data were analysed using SPSS 23.0.

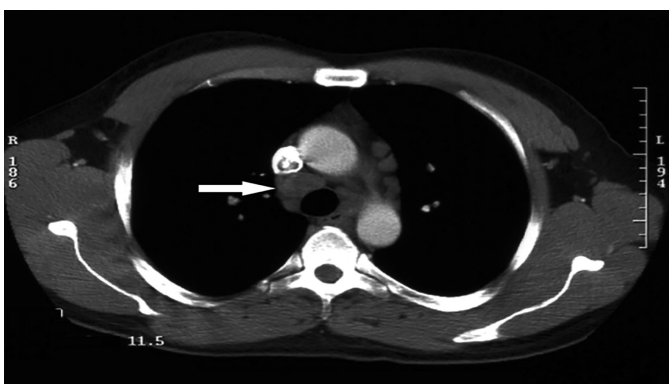

Figure 1: CT scan of the chest.

RESULTS

A total of 398 patients who met the inclusion criteria from January 2010 to December 2021 were included in the study. Amongst all the patients, 65% (n=259) were males and 35% (n=139) were females. Mean age was 44.6 ± 8.2 years ranging from 13 to 80 years. The mean operative time was 31.6 ± 4.2 minutes. Patients were further subdivided into diagnostic and staging mediastinoscopy.

In 338 (85%) patients, the procedure was carried out for diagnostic purpose in cases of mediastinal lymph node enlargement. Normal lymph nodes tissue / non-representative biopsy was encountered in 1.8% of patients. Tuberculosis was the most common diagnosis as it was found in 46% (n=157) patients. The next most common diagnosis was sarcoidosis in 10.1% (n=34) of patients of this group. One hundred and forty-eight (43.9%) patients were found to have neoplastic involvement including lymphomas, germ cell tumours, SCLC, NSCLC, spindle cell tumour, mesothelioma, mantle cell neoplasm, and unspecified metastatic disease (Table I).

Table I: Results of diagnostic cervical mediastinoscopy (n=338).

Histopathology	Numbers (n)	Percentage
Tuberculous lymphadenitis	157	46%
Lymphoma	29	8.5%
Hodgkins	12	3.5%
Non-Hodgkins	17	5.0%
Malignant Germ Cell Tumour	8	2.4%
Sarcoidosis	34	10.1%
Castlemans Disease	02	0.6%
Lymphangioma	7	2.1%
Idiopathic Fibrosing Mediastinitis	1 3	3.8%
Thymoma / Ca	9	2.7%
Acute on Chronic Inflammation (cause not known)	10	2.95%
Metastatic NSCLC	16	4.7%
Metastatic SCLC	25	7.4%
Metastatic unspecified	11	3.25%
Non-representative or Normal histopath	6	1.8%
Benign thyroid	1	0.3%
Mantle cell neoplasm	1	0.3%
Spindle cell neoplasm (nerve sheath growth)	1	0.3%
Fungal growth	5	1.5%
Mesothelioma	3	0.9%

In 60 (15%) patients, the procedure was carried out for staging mediastinal lymph node in patients with histopathological diagnosis of NSCLC. Out of these, 27(45%) were found to have positive lymph node disease and were referred to an oncologist for the further management while in 33(55%) patients, there was no involvement of mediastinum and hence, underwent surgical resection and mediastinal lymph node sampling. Four of these patients had mediastinal involvement on specimens sent after lung resection and mediastinal lymph node sampling (Table II).

Thus, the negative predictive value of cervical mediastinoscopy in this study was 97%. Specificity remained 100% with 96.4% sensitivity in staging mediastinal nodes.

Overall complication rate was 3.8 % (Figure 2), with no operative mortality. No conversion to partial sternal split was required. Only 2 patients developed the surgical site infection requiring incision and drainage. Three patients developed hoarseness of voice which resolved over the next 5 weeks.

Table II: Staging mediastinoscopy for NSCLC.

Result	Management	n = 60
Mediastinal lymph node involvement	Referred to oncologist	27(45%)
Mediastinal lymph node uninvolvement	Resection plus LN sampling done	33(55%)

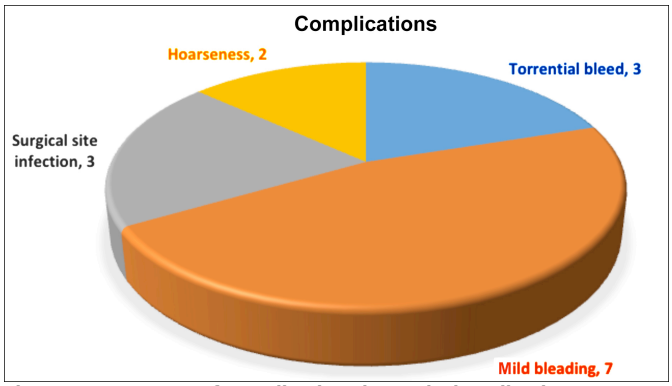

Figure 2: Frequency of complications in cervical mediastinoscopy.

DISCUSSION

Cervical mediastinoscopy was originally described by Carlens in his landmark article in 1959.[2] Since then, it has been employed as a diagnostic tool in indeterminate mediastinal lesions. It also serves to be an adjunct to other diagnostic modalities while staging lung cancer to determine N2 status.[7] If handled aptly, mediastinoscopy has an excellent diagnostic yield, a significantly low morbidity, and a negligibly low mortality rate. Moreover, it is a cosmetically acceptable procedure.

Cervical mediastinoscopy, even though invasive is frequently required to diagnose both neoplastic and inflammatory diseases. Among inflammatory diseases, tuberculosis remains a very common disease in South Asia. It can involve almost any organ of the body. It can present as isolated mediastinal lymphadenopathy or in addition to other manifestations of disease elsewhere in body. Through surgical biopsy, in addition to confirmation of disease, tissue cultures can be taken for sensitivity and thus, improvement upon routine anti-mycobacterial regimen. This series had 157 (46%) patients with confirmation of tuberculosis similar to the study by Baran *et al*.[8] In a local study conducted by Sulaiman *et al*., tuberculosis was found in 29.5% of patients.[9] In this study, 7 patients had growth of AFB cultures, 2 had positive fungal, and 1 had bacterial culture. Jacob *et al.* in a study in England advocated against cervical mediastinoscopy for tuberculosis in the presence of positive tuberculin skin tests but in this setup, this test becomes irrelevant due to the exposure of population as tuberculosis is endemic.[10]

Sarcoidosis was the next most common inflammatory condition involving mediastinal lymph nodes with 34 (10.1%) cases. Sarcoidosis is rarely reported in Pakistan, partly because of the absence of mass screening programs and also because of the more commonly recognised granulomatous diseases (tuberculosis, fungal infection) that obscure the recognition of sarcoidosis. In contrast to a study by Lemaire *et al.* in Durham, USA where only 26% of patients had a benign aetiology, this study has an incidence of 69%.[11] This was perhaps because of the relatively frequent prevalence of tuberculosis.

Neoplastic lesions outnumbered sarcoidosis with a total of 103 cases in this group. Lymphoma was diagnosed in 29 while thymoma in 9, germ cell tumours in 8 and mesothelioma in 3 patients. Out of the 52 metastatic lung cancers, 25 were SCLC and 16 were NSCLC, while 11 metastatic carcinomas remained from the unspecified origin.

Another observation was that 7 cases of sarcoidosis and 9 cases each of lymphoma and SCLC were on ATT prior to the confirmation of diagnosis. Since tuberculosis is endemic in Pakistan and the presentation of disease is diverse, medication is started even on insufficient clinical data for tuberculosis, thus wasting valuable time. Another local study in Karachi found to have a similar observation. In this study for staging of NSCLC, 33(55%) cases came out to be negative for mediastinal involvement by mediastinoscopy. Resection of the involved lobe or lung as per merit of the individual case along with lymphadenectomy was carried out in these patients. Out of these 33 patients, 4 (12%) were found to have evidence of involvement in mediastinal nodes after resection and lymphadenectomy. The negative predictive value of cervical mediastinoscopy in this series was 97%. A significant percentage (96.4%) of sensitivity was seen in staging mediastinal nodes. These figures are comparable to a similar study by Abdel Rahman and colleagues in Cairo, Egypt.[12]

Morbidity and mortality related to the procedure remained low (3.8%) as in the other studies.[13,14] There was no operative mortality. Minor haemorrhage from lymph node is not uncommon but can be effectively managed by gauze packing at the end of the procedure. This complication rate was comparable to the most similar studies. Filho and associates have reported zero morbidity and mortality in their study.[15]

Endobronchial ultrasound guided transbronchial needle aspiration (EBUS-TBNA) is now being widely used in the developed world, but its unavailability and high cost is hindrance for its wide use in the third world countries. Moreover, high false negative rates of EBUS show that a negative result with endosonographic procedures still requires confirmation by a surgical technique i.e simple or video-assisted mediastinoscopy.[16] The latter also has increased yield, reduced complications, and resulted in shorter learning curve.[17,18]

Positron Emission Tomography (PET) is a newer technique with promising results when used to detect malignancy involving mediastinal lymph nodes. PET is not widely available, and it entails a high cost. Moreover, due to a definite incidence of false positive results in PET, mediastinoscopy is still required for the confirmation of spread of disease. Despite the development of PET and EBUS, mediastinoscopy still remains safe and the gold standard for mediastinal lymph node staging of lung cancer.[19] The main limitation of this study is that it is a retrospective observational study and hence, lacks analysis. A more robust study can be carried out to validate the results of cervical mediastinoscopy.

CONCLUSION

Despite the fact that newer diagnostic procedures are being utilised for diagnosis of various mediastinal diseases, mediastinoscopy is still a safe and effective method for the diagnosis of mediastinal lymphadenopathy and accurate staging of NSCLC.

ETHICAL APPROVAL:
Ethical approval before the start of study was obtained from the Ethical Review Committee at CMH, Rawalpindi.

PATIENTS' CONSENT:
Written Informed consent was taken from the patients regarding surgical procedures.

COMPETING INTEREST:
There was no conflict of interest in this study.

AUTHORS' CONTRIBUTION:
FAM: Conceptualisation, framework, and overall supervision.
KR: Proofreading and mentoring.
UZ: Data collection.
SSC: Manuscript writing.
AR: Literature search.
AR: Data analysis and record keeping.
All authors have approved the final version of the manuscript to be published.

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