

Cervical Mediastinoscopy: Re-evaluation of an Old Technique in Era of New Imaging Technology

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ABSTRACT

Context. With the advent of modern anatomical and functional imaging technologies, application of cervical mediastinoscopy has decreased in diagnosis and staging of mediastinal diseases.

Aim. To evaluate the usefulness of cervical mediastinoscopy in assessing the mediastinal disease when imaging modalities are non-diagnostic.

Settings and Design. Retrospective analysis of records of a tertiary care hospital.

Patients and Methods. Thirty-nine patients with mediastinal pathology of varied aetiologies underwent cervical mediastinoscopy. Pre- and post-operative diagnosis was compared.

Results. In 34 out of 39 cases (87.5%), cervical mediastinoscopy provided a confirmatory final diagnosis. One case had a major complication in the form of recurrent laryngeal nerve palsy.

Conclusion. Cervical mediastinoscopy is useful, minimally invasive modality in a scenario where anatomical and functional imaging tools are non-diagnostic. [Indian J Chest Dis Allied Sci 2012;54:169-173]

Key words: Cervical mediastinoscopy; Mediastinum.

INTRODUCTION

Cervical mediastinoscopy is an invasive modality that is used for examining the superior and middle mediastinum for staging of carcinoma lung, as well as establishing a histological diagnosis of mediastinal masses of uncertain aetiology. First described by Harken *et al*¹ in 1954, Jackson laryngoscope was inserted into the mediastinum through a supraclavicular incision and lymph node biopsies were taken. Cervical mediastinoscopy, through a pre-tracheal, suprasternal incision as practiced today, was developed by Carlens² in Sweden. In the past, cervical mediastinoscopy has been described as a fairly reliable tool for the diagnosis of isolated mediastinal adenopathies and those associated with a pulmonary or a hilar lesion of unknown aetiology with an overall sensitivity, specificity and accuracy being 94%, 100% and 95%, respectively.³ With recent advances in imaging technology, modalities such as helical computed tomography (CT) and contrast enhanced magnetic resonance imaging (MRI) have become available. More recently, there has been the advent of combined anatomical and functional imaging in the form of

fusion fluorine-18 fluorodeoxyglucose-positron emission tomography-computed tomography (¹⁸FDG-PET-CT) imaging. Further, there has been a refinement in the techniques of transbronchial fine needle aspiration using oesophageal and tracheal endoscopic ultrasound. As a consequence, the use of cervical mediastinoscopy has reduced drastically. Nevertheless, it remains an important diagnostic tool in certain clinical situations. We describe our experience of using this technique and review the current literature regarding its utility.

PATIENTS AND METHODS

A retrospective analysis of records of patients who underwent cervical mediastinoscopy at a tertiary care centre between January 2008 to August 2009 was carried out. Pre-procedure clinical diagnosis, indications for cervical mediastinoscopy, non-invasive diagnostic procedures carried out and other investigations done were recorded. Post-procedure complications, if any, and final diagnosis based on histopathology were noted.

Cervical mediastinoscopy was performed under general anaesthesia. A direct laryngoscope was used to perform the procedure (Figure 1, inset). After

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positioning, cleaning and draping, a 3cm transverse cervical incision was made one-finger breadth above the suprasternal notch. Using sharp dissection, a plane was developed upto the dense white pre-tracheal fascia. This fascia was incised and dissected off the trachea exposing the cartilaginous rings (Figure 1). The finger was advanced along the pre-tracheal plane and dissection done down to the carina.

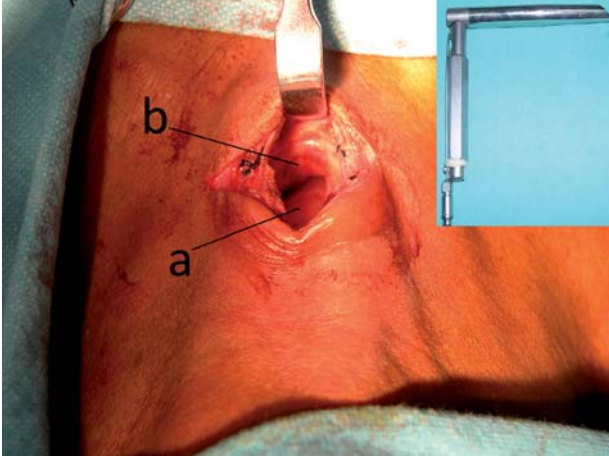


Figure 1. Incision in suprasternal notch, (A) trachea, (B) pre-tracheal plane; (Inset): Chevalier-Jackson direct laryngoscope.

The mediastinum was carefully palpated for the presence of nodal disease/mediastinal mass. The finger was then withdrawn and the mediastinoscope was advanced. A metal sucker was introduced through the channel of the mediastinoscopy and used to develop the plane in front of the mediastinoscope,

for cautery as well as suction (Figure 2). The tissue planes were developed to the level of the carina and in both the tracheobronchial angles. Sequentially, the para-tracheal and sub-carinal region were entered to expose the lymph nodes at the various stations and biopsy was taken (Figure 2, inset). Suction drain was left if required depending on the bleeding seen.



Figure 2. The scope introduced into pre-tracheal space; (Inset): laryngoscope visualising left para-tracheal groove.

RESULTS

Over the study period, 39 procedures of cervical mediastinoscopy were carried out at our centre. The clinical diagnosis/indication and final histopathological diagnosis are shown in table 1. Comparison of

Table 1. Clinical diagnosis and histopathological correlation obtained after cervical mediastinoscopy

Per Procedure Diagnosis/Examination	Number of Cases (n)	Histopathological Diagnosis	Number of Cases (n)
Asymptomatic mediastinal lymphadenopathy	13	Lymphoma	05
		Sarcoidosis	02
		Tuberculosis	02
		Castleman's disease	01
		Non-diagnostic	03
Pyrexia of unknown origin with mediastinal lymphadenopathy	14	Lymphoma	04
		Sarcoidosis	03
		Tuberculosis	04
		Fungal granuloma	01
		Non-diagnostic	02
Lymphoma, post-chemotherapy with mediastinal nodes	03	Recurrence	02
		Tuberculosis	01
Non-small cell carcinoma with mediastinal lymphadenopathy	06	Metastases	04
		No metastases	02
Ca cervix, post-therapy, with mediastinal lymphadenopathy	02	No metastases	02
Ca ovary, post-therapy, with mediastinal lymphadenopathy	01	Metastases	01
Total	39		39

Ca=Carcinoma

pre-operative and histopathological diagnosis in cases of isolated mediastinal lymphadenopathy is shown in table 2. There was one major complication, a recurrent laryngeal nerve palsy that recovered over a six month period, an incidence of 2.5 percent. There was no major vessel bleed or tracheal injury. There was no mortality in our series.

Majority of cases in our series (27/39, 69%) had presented as isolated mediastinal adenopathy without any other signs of the disease elsewhere. These were either asymptomatic or had pyrexia of unknown origin. Cervical mediastinoscopy yielded a definitive diagnosis in most of these cases (22/27, 81%), and thus, specific therapy could be commenced.

Table 2. Comparison of pre-operative and histopathological diagnosis in cases of isolated mediastinal lymphadenopathy (n=27)

Pre-operative Diagnosis	Diagnosis Confirmed on Histopathology	Alternative Diagnosis on Histopathology
Tuberculosis (13 /27 cases)	6	3 cases of lymphoma 2 cases of sarcoidosis 1 case of Castleman's disease 1 case non-diagnostic
Lymphoma (6/27 cases)	3	1 case of sarcoidosis 1 fungal granuloma 1 case non-diagnostic
Carcinoma (4/27 cases)	0	2 cases of lymphoma 1 case of sarcoidosis 1 case non-diagnostic
Unknown	—	1 cases of lymphoma 1 case of sarcoidosis 2 cases non-diagnostic

DISCUSSION

The continuity of cervico-mediastinal fascial planes provides the anatomical basis for cervical mediastinoscopy. There are two such planes, both accessible through a single small neck incision: the retrosternal plane (for standard cervical mediastinoscopy) and the prevascular retrosternal plane (the zone of extended mediastinum exploration).⁴ Radiological images often do not provide information about the pathological features of the lesions and consequently fail to provide enough certainty to enable therapeutic decisions.⁵ Surgical exploration of the mediastinum by mediastinoscopy provides an accurate information by inspection and palpation and allows biopsies of lymph nodes or tumours affecting the mediastinum for a definitive diagnosis.

Standard cervical mediastinoscopy assesses the upper mediastinum, including para-tracheal and subcranial nodal stations. Gentle finger dissection in pre- and para-tracheal planes creates space for advancement of the mediastinoscope besides permitting palpation of nodes. This is important, as para-tracheal nodes are more easily palpated rather than being visualised. Hence, palpation provides a direction for the mediastinoscope to be advanced. Parasternal mediastinoscopy is a complementary technique to reach sub-aortic and para-aortic lymph nodes, which cannot be accessed with standard cervical mediastinoscopy.⁶

The pre-procedure clinical diagnosis (including radiology) was accurate in less than 30% cases. This is similar to the experience reported by MacManus *et al*⁷ who reported a sensitivity of 87% and accuracy of 98% of cervical mediastinoscopy in the diagnosis of isolated mediastinal adenopathy. Lymphoma was the commonest histological diagnosis (9/27, 26%) obtained in our series of cases followed by sarcoidosis in five (18%). This disease is often confused with tuberculosis which is much more prevalent in India and these patients are often given empirical anti-tuberculosis treatment.⁹ Three out of the five cases in our series had already received full course of anti-tuberculosis treatment.

In our series, six adult cases of primary mediastinal tuberculosis were diagnosed based on histopathological examination of tissue sample obtained by cervical mediastinoscopy. Mediastinal and hilar lymphadenitis as manifestations of primary pulmonary tuberculosis are usually seen in childhood and are infrequent in adults. Absence of characteristic parenchymal and intrabronchial lesions, and low diagnostic yield of routine laboratory methods such as sputum examination and the tuberculin skin test makes diagnosis difficult. Hence, invasive diagnostic procedures are required for a certain diagnosis.¹⁰

Cervical mediastinoscopy was resorted to in six cases who had an established diagnosis of non-small cell carcinoma (NSCLC). The ¹⁸F-FDG-PET-CT and contrast enhanced computed tomography (CECT)

findings were equivocal for staging in these cases. The results of primary surgery in cases of NSCLC with involved ipsilateral or subcarinal lymph nodes (N2 disease) are poor.¹¹ Integrated PET-CT has been shown clearly superior to the other imaging methods, especially with respect to identifying the disease in the hilar, mediastinal and supraclavicular lymph nodes.^{12,13} However, the resolution of PET is not sufficient to detect microscopic lymph-node metastases.¹⁴ In the six cases of NSCLC that underwent cervical mediastinoscopy, four had micrometastasis in N2 nodes. Thus, we could spare these patients from unnecessary surgery.

On the other hand, it is also recognised that ¹⁸FDG can be taken up by inflammatory processes resulting in false positive results. In the presence of enlarged lymph nodes, PET-CT becomes less specific, less accurate though more sensitive in detecting metastatic spread to the lymph nodes.¹⁵ Hence, in patient with NSCLC with enlarged nodes by CT criteria, who are PET-CT negative, may require cervical mediastinoscopy to rule out metastatic spread to these nodes. Indeed, in the other two cases of NSCLC, PET-CT positive mediastinal nodes turned out to be negative on histological examination after cervical mediastinoscopy and biopsy. Thus, these patients could be taken up for curative surgery. Similarly, in the three cases of lymphoma who had received first-line therapy and who showed up positive mediastinal nodes on PET-CT, cervical mediastinoscopy correctly identified recurrence in two and absence of recurrence in the third. Further, cervical mediastinoscopy correctly identified absence of recurrence in the two cases of carcinoma of cervix, thus, sparing unnecessary chemotherapy while it confirmed recurrence in one case of carcinoma of ovary permitting institution of palliative chemotherapy. In all of the afore-mentioned cases of malignant diseases, PET-CT and CECT had been equivocal as to nature of the lesions detected in the mediastinum. Cervical mediastinoscopy clarified the situation by providing a histological diagnosis.

Four out of 23 (17%) cases of isolated mediastinal lymphadenopathy did not reveal any histological diagnosis. This may represent false negative rate in our series. It is possible that the nodes sampled were not representative. This may happen if the disease is localised to the lymph nodes that not normally biopsied during cervical mediastinoscopy (aortic or inferior mediastinal). The false negative rates reported with cervical mediastinoscopy in other series has ranged from 13 percent to 57 percent.^{3,5}

The procedure is safe with minimal morbidity. We noticed only one case of recurrent laryngeal palsy in our series. However, haemorrhage, vocal cord dysfunction, tracheal injury, pneumothorax and vascular injury are other major complications that have been described with this procedure with a

reported incidence of one percent to 3.5 percent.^{5,6} Other possible complications include phrenic nerve injury, oesophageal injury and chylothorax. Cervical mediastinoscopy is reported to be safe even in the presence of superior vena cava syndrome.¹⁶ Scarring from previous mediastinoscopy, thoracic aortic aneurysm and distorted airways are some of the conditions that increase the risks and may be construed as contraindication for this procedure.

With the development of minimally invasive procedures for obtaining tissue diagnosis, viz endobronchial ultrasound directed-fine needle aspiration cytology (EBUS-FNAC), endoscopic ultrasound-directed FNAC (EUS-FNAC) and CT guided FNAC, cervical mediastinoscopy may appear an outdated modality.

The equipment and expertise for these ultrasound modalities are available in few specialised centres only in India. The CT-guided FNAC, though more commonly available, is not frequently resorted to for the fear of injuring the major vascular structures in the mediastinum. Moreover, a histopathology examination of tissue obtained through a biopsy is usually more accurate than cytology smears obtained through a fine needle aspiration.^{17,18} Cervical mediastinoscopy represents a time tested modality to obtain an accurate tissue diagnosis and remains contemporary even in the present era.

To conclude, cervical mediastinoscopy is a safe, highly specific and minimally invasive procedure recommended to be utilised in such a clinical conundrum.

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