REVIEW ARTICLE

MEDICAL THORACOSCOPY

Ashoka Panjwani, Nadeem Rizvi

ABSTRACT:

Medical pleuroscopy is a minimally invasive and safe procedure to enter pleural space under local anesthesia. It can be performed for diagnosis and management of different pleural diseases. This review highlights, history, methodology and role of pleuroscopy in various pleural pathologies. The diagnostic yield and treatment success of pleuroscopy is higher with less complications.

HISTORY & BACKGROUND:

The first thoracoscopy was performed using a cystoscope in 1866 by F.R. Cruise in Ireland[1]. It was followed by a paper from a Swedish intern Hens-Christian Jacobaeus in 1910, entitled "On the possibility to cystoscope in the examination of serious cavity" detailing his first experience of a thoracoscope[2].

INTRODUCTION:

Medical thoracoscopy is a minimally invasive procedure to enter into pleural cavity. It is done under local anesthesia and conscious sedation in an endoscopy suit for diagnostic and therapeutic intervention[3]. Similar and advance procedure done under general anesthesia by surgeons is called surgical thoracoscopy or video-assisted thorocic surgery.

The term thoracoscopy is used for both the medical and surgical procedures, this has created a degree of uncertainty. To avoid confusion the term pleuroscopy should be favored over medical thoracoscopy[4].

Equipment:

Two types of instruments are available: Rigid medical thorascope and semi- Rigid pleuroscope. Semi-rigid pleuroscope has several disadvantages over rigid one, mainly inadequate biopsy specimens and unclear views inside the pleural cavity[5,6,7]. Other accessory instruments such as puncture needle, cautery electrode, probe, combined suction, scissors and cautery canula with valves and various biopsy forceps are available. For talc pleurodesis, a talc optimizer is used[8].

Technique:

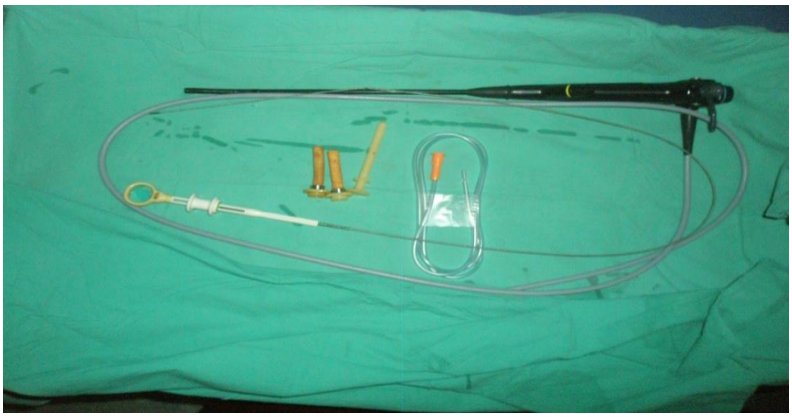
Two different techniques are used for pleuroscoy or medical thoracoscopy:

1) **Single entry site:** It is usually used with semi-rigid pleuroscope[5,6,7].

2) **Two entry site:** In this technique one site is used for entry of thoracoscope and the second site is for accessary instruments such as biopsy forcep[8].

Department of Chest Medicine, Jinnah Postgraduate Medical Center, Karachi, Pakistan.

PATIENT PREPARATION:



Procedure evaluation:

After proper clinical history and examination, radiological evaluation including a posterio-anterio and lateral chest radiograph should routinely be performed. Chest ultrasonography is useful for the localization of pleural effusion and the adhesion in pleural space. A CT scan chest is not mandatory but if available with contrast enhanced, it may support the diagnosis of tumors and the localization of lesion like empyema.

For respiratory status evaluation, arterial blood gases should be analyzed.

For cardiac evaluation like myocardial infarction or significant arrhythmias, echocardiography should be performed.

Other laboratory parameters like complete blood counts, serum electrolytes, blood sugar, blood group typing and coagulation profile should be assesed.

Procedure:

Pleuroscopy is usually performed in the lateral decubitus position with the disease site facing upward[9,10,11]. For further ease of procedure and proper localization, a pillow is placed under the patient's flank, causing the spine to flex laterally and widening the intercostal space. Then with the help of ultrasonography, the site of lesion should be localized. After all aseptic measures, local anesthesia using 1% to 2% lidocaine is performed. After giving a small incision, the trocar is advanced with a fairly forceful corkscrew motion till the resistance of the internal thorasic facia has been overcome. Usually the site for incision of pleural fluid is 6-7th intercostal space and for pneumothorax is 4th intercostal space. The canula of the trocar should be atleast 0.5 cm wide in the pleural cavity. For examination of pleural cavity, if pleural fluid is present, it should be removed without the occulusion of the canula, so that the air may enter the pleural space to equilize pressure then the pleuroscope should be introduced.

Generally a single site of entry is sufficient; a second site may be useful for biopsies or to coagulate. Second site of entry is determined by viewing through the 50^0 scope while depressing the possible entry site with the index finger. Sometimes inserting the needle through the same site and viewing it through thoracoscope may be helpful to determine its location. After giving local anesthesia, a 5 mm incision is made and a small trocar is introduced directly into this incision.

CLINICAL INDICATION:

1) **Talc pleurodesis:** Talc poudrage (instalation of fine dry talc powder in pleural cavity) is a widely used method of pleurodesis (for malignant, recurrent pleural effusion[6,12,13] and in persistent or recurrent pneumothorax[14]. For this purpose, an angled optical device and flexible suction catherter that is connected to a small bottle containing talc after which a pneumatic automizer is connected to a working channel of either a thoracoscope[8,11] or a semi-rigid pleuroscope[6].

   In case of pleural effusion, complete evication of pleural fluid has to be done before talc enters. Incase of talc insuffilation lung has to be collapsed in order to achieve uniform distribution. An endobronchial lesion can cause lung collapse which inturn results in the failure of pleurodesis. Complete lung expansionis necessary for successful pleurodesis.

   The optimal dose of talc for poudrage is not known but for recurrent or malignant pleural effusion it is 5 grams[15] and for pneumothorax, 2 grams[14] is usually used.

   After talc insuffilation chest tube should be inserted. The chest tube can be removed once fluid drainage is less than 100 ml per day or when air leak associated with pneumothorax has stopped. One recent study suggests that the chest tube can be removed within 24 hours irrespective to daily fluid production[16].

2) **Exudative pleural effusion:** Medical thoracoscopy or pleuroscopy is an excellent way to establish the cause of undiagnosed exudative pleural effusion after pleural fluid analysis[6,7,15,17].

   The biopsy should be taken from the macroscopic lesion at the anterior chest wall, the diaphargm and posterior chest wall and at time even from lungs for histologic evaluation. If there is suspicion of tuberculosis then it may be used for mycobacterial culture. If no macroscopic lesion is seen then multiple biopsies from parital pleura are taken.

3) **Malignant pleural effusion:** Pleuroscopy is the leading diagnostic and therapeutic intervention in malignant pleural effusion[3,6,18].

   In a study on 208 malignant pleural effusions the diagnostic yield of pleural fluid cytology was 62%, of closed pleural biopsy was 44% and pleuroscopy was 95%. The sensitivity of pleuroscopy was higher than that of cytology and closed pleural biopsy combined (95% vs 74% P≤001)[3].

Staging:

Medical thoracosocpy may be helpful in staging of lung cancer, diffuse or malignant mesothelioma and metastatic cancer. Pleuroscopy can help in differenciating whether the effusion is malignant or para-malignant effusion[13]. In one study 8 out of 44 patients with lung cancer have no pleuroscopic evidence of pleural involment with lung cancer[19].

Medical thoracoscopy can provide earlier diagnosis and better histologic classifications as compared to closed pleural biopsy, for diffused malignant mesothelioma[20].
In metastatic pleural disease pleuroscopy can be helpful in taking biopsies under direct visualization, large sized biopsies may provide earlier diagnosis of primary site and hormonal receptor determination[21]. Further extent of intrapleural involvement can correlate well with the surival[23].

Therapy:
Talc pleurodesis has a success rate of over 90% in malignant pleural effusion[15]. One study showed that talc is superior then tetracyclin. The succes rate after one month was 90% for talc and 80% for tetracyclin[8].
Talc poudrage is the most effective method of pleurodesis and has showed excellent results in chylothorax secondary to lymphoma as well[24].

Tuberculous pleural effusion:
A study from South Africa has shown the diagnostic yield to be 98% for pleuroscopy in contrast to 80% by Abram's needle[25].The high yield of closed needle biopsy in high T.B. burden countries suggests that it should be the first intervension. Pleuroscopy should be considered if closed needle biopsy shows negative results.
However, pleuroscopy can help in complete drainage of the effusion which is associated with better symptomatic relief and the culture yeild of pleuroscopic biopsies is also higher.

Other pleural effusion:
In undiagnosed pleural effusion, in which the cause is undetected, the main diagnostic value of pleuroscopy lies in its ability to exclude malignant and tuberculosis disease[3,26]. With the help of pleuroscopy the proprotion of so-called idiopathic pleural effusion is less than 10% compared to over 20% where pleuroscopy is not used.
Talc poudrage can be considered in non-malignant refractory pleural effusion caused by hepatic and renal hydrothorax, cylothorax and systemic lupus erythematosus[37,38].

Empyema:
Empyema can be managed with the help of pleuroscopy, which can achieve early and complete drainage[8,27,28,29]. Medical thoracoscopy can be used to remove fibrinopurulent membrane from multiple loculations to make a single cavity[28,30].
However, if performed for this indication it should be done early (preferable before insertion of chest tube) to avoid adhesion becoming too fibrious and adherent to perform pleuroscopy.

Spontaneous Pneumothorax:
Pleuroscopy is being used as diagnostic and therapeutic modality in spontaneous Pneumothorax. In one study blebs and bullae were detected in 45% to 62% of cases. Through medical thorascopy, talc poudrage and electrocautery of belbs and bullae can be used simultaneously to treat the site of an air leak[14,31].

Diffuse Parenchymal Lung Diseases:
Pleuroscopy can be used in the diagnostic evaluation of diffused parenchymal lung diseases[8,9,13,32,33,34]. In a study of 419 patients of DPLD the overall sensitivity of medical thoracoscopy was 85% with different yields depending upon the underlying disease, 98% in sarcoidosis stage II and III, 88% in malignant diseases, 85% diffuse pulmonary fibrosis and 42% in histocytosis X[13].

Localize Diseases:

Medical thoracosocpy can be use for diagnostic evaluation of localized diseases of the chest wall, diaphargm and thoracic spine[9,13]. One study showed 83% diagnostic sensitivity of medical thoracoscopy for chest wall lesions[13].

CONTRAINDICATION:

Severe hypercarbia and obliteration of pleural space are absolute contraindications while relative contraindications are persistent cough, hypoxemia, coagulopathy, thrombocytopenia (Platelet 40,000-60,000/Cmm), cardiac abnormality. If hypercarbia is secondary massive pleural effusion or tension Pneumothorax then medical thoracoscopic would provide therapeutic benefit in addition to a possible diagnosis[9,13].

COMPLICATION:

Pleuroscopy is a safe intervention for diagnostic and therapeutic evaluation[8,9,35]. One review showed 0.09% mortality rate[8]. A study of 817 pleuroscopy procedures using conscious sedation and local anesthesia, the complications were air leak of more than 07 days duration in 2%, subcutaneous emphysema in 2% and post procedure fever in 16%[36]. Major uncontrollable bleeding requiring thoracotomy was not reported in any large series. During pleuroscopy there is very little risk of re-expansion of pulmonary oedema after the removal of a large amount of fluid because of immediate equilibration of pressure is provided by the entrance of air through the cannula into the pleural space[8].

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