Diagnostic Value of Flexible Thoracoscopy in Undiagnosed Cases of Exudative Pleural Effusion

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ABSTRACT

BACKGROUND

The diagnostic yield of thoracoscopy is 95 %, of pleural fluid cytology it is 62 % and of closed pleural biopsy is 44 %, in malignant effusion. We wanted to study the diagnostic utility of flexible thoracoscopy in undiagnosed exudative pleural effusion and compare the thoracoscopy findings with the histopathology results.

METHODS

The study was conducted in the Department of Respiratory Medicine, Government Stanley Medical College, Chennai, from January 2019 to January 2020. 40 patients were enrolled in this longitudinal observational study with moderate to massive effusion and were evaluated with pleural fluid aspiration and sent for cytology, protein sugar analysis, total count, and ADA. Those cases which are exudative pleural effusions, with ADA value of less than 40 IU / L were subjected to thoracoscopy after being evaluated for fitness for thoracoscopy with complete blood count, bleeding time, clotting time, sputum for AFB, ECG, pulse oximetry, cardiac evaluation and CT chest.

RESULTS

Thoracoscopy was done in 40 enrolled patients. In this study, biopsy was taken from the parietal pleura in all the cases. Of these 40 cases, 30 were male and 10 were female, that is 75 % males and 25 % females. The mean age of the study population was 43 ± 14.9. Patient with the lowest age in this study group was 18 years and highest was 71 years. 16 cases (40 %) presented with left sided pleural effusion. 24 cases (60 %) presented with right sided pleural effusion. 30 cases presented with massive effusion, and 10 cases with moderate effusion. Of the 40 cases, 27 cases presented with straw coloured pleural effusion. 13 cases were haemorrhagic effusion. Histopathologic examination showed 11 cases as malignant and 29 cases as non-malignant out of which 18 cases were of tuberculosis aetiology. Thoracoscopy revealed adhesions in 13 cases and mass lesion in 4 cases. Of the 4 mass lesions 3 came as malignant, normal pleura in 11 cases, 10 were non-malignant and 1 was malignant. Nodules were seen in 12 cases of which 7 came as malignant. Straw coloured effusion was seen in 27 cases, of which 2 were malignant.

CONCLUSIONS

The most important indication for thoracoscopy is exudative undiagnosed pleural effusion. The overall diagnostic yield in pleural fluid cytology is 62 % and blind pleural biopsy is 44 %. The diagnostic yield of thoracoscopy varies from 60 % to 97 % in various studies, whereas, in our study, it is 72.5 %. Visualization of the visceral and parietal pleura is another advantage, so that we can take biopsy from the abnormal areas.

KEYWORDS

Flexible Thoracoscopy, Undiagnosed Exudative Pleural Effusion

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BACKGROUND

Pleural effusion is the accumulation of excess fluid in the pleural cavity and exudative pleural effusion is a common clinical entity in routine pulmonologist's practice.[1] Malignancy is the most common condition presenting as undiagnosed exudative pleural effusion[2] and are missed in the initial stage. Most of the time, it will be misdiagnosed as tuberculosis and empirical antituberculosis therapy are started.[3] The main value of thoracoscopy in pleural effusions of undetermined origin lies in the consider accuracy, allowing the exclusion of malignant or tuberculous disease.[4] By means of thoracoscopy the proportion of idiopathic pleural effusions falls below 10 %.[5] The diagnostic yield of thoracoscopy is 95 % in malignant effusion whereas pleural fluid cytology is 62 % and closed pleural biopsy is 44 %.[6] The procedure can be done in conscious sedation. With rigid thoracoscopy the pain will be more compared to flexible thoracoscopy. So flexible thoracoscopy was taken for study because most of the patients are old age, poorly built and nourished and will be associated with multiple comorbidities.

METHODS

The study was conducted in the Department of Respiratory Medicine, Government Stanley Medical College, Chennai. During the years between January 2019 to January 2020. 40 patients were enrolled in this diagnostic observational study. Patients with moderate to massive effusion by radiology were evaluated with pleural fluid aspiration and sent for cytology, protein sugar analysis, total count and ADA (Adenosine Deaminase Test). Those cases which had exudative pleural effusion and ADA value less than 40 IU / L were subjected for thoracoscopy. Patients were evaluated for fitness for thoracoscopy with complete blood count, bleeding time, clotting time, sputum for AFB (Acid-Fast Bacillus), ECG (Electro-Cardio-Graphy), pulse oximetry, cardiac evaluation and CT (Computed Tomography) chest.

Thoracoscopy was done under conscious sedation. Chest wall was draped with sterile cloth after cleaning the skin with 7.5 % povidone iodine. Patient is placed in lateral decubitus position with the hemi thorax to be studied facing upwards. After cleaning and draping, the skin, subcutaneous tissue, the intercostal muscles and the pleura is anesthetised by local anaesthetic agent lignocaine 2 %, 5 - 7 ml. After that needle aspiration of the pleural fluid is done in order to confirm the position. Midazolam 0.5 mg / kg IV is given for sedation. Heart rate, blood pressure, continuous electrocardiographic monitoring and pulse oximetric saturation measurement were observed throughout the procedure and in the post-procedure period for 2 hours.

Incision (1 – 2 cm) is done in the 4^{th} – 7^{th} intercostal space in the mid or anterior axillary line. By blunt dissection with curved artery forceps, the subcutaneous tissue and muscles are separated. After palpating the pleura, with the help of trocar and cannula parietal pleura is punctured. Trocar was taken out and through the cannula flexible thoracoscope was inserted. The thoracoscope that used was Olympus semi rigid thoracoscope LTF-160.

Pleural fluid will be aspirated in an intermittent manner, so as to prevent the development of re-expansion pulmonary oedema and to keep the lung collapsed. The pleural cavity was then inspected and the site for biopsy was fixed. Biopsy forceps was introduced through the biopsy port of the thoracoscope. By shearing movement. 5 - 7 biopsy bits were taken from the parietal pleura and any adhesions present was lysed with the help of thoracoscope.

Following thoracoscopy, cannula was removed and chest tube of size between 28 - 34 Fr was introduced and connected to under water seal. When the pleural fluid drainage is less than 50 ml / day, intercostal drainage tube was removed.

Inclusion Criteria

Patient with moderate to massive pleural effusion confirmed by radiology, i.e., pleural effusion present at least up to the 4th intercostal space, exudative pleural effusion based on Light's criteria[7] and pleural fluid ADA < 40 U / L.

Exclusion Criteria

Patients who are not willing to participate in the study or not fit for thoracoscopy, new smear positive for TB (Tuberculosis), smear positive for retreatment tuberculosis, respiratory failure, coagulation disorder or on anticoagulants, empyema, recent MI and history of arrhythmia, low platelet count < 60000 and who cannot lie down in the lateral decubitus position.

Statistical Analysis

The study participants were randomized by SPSS generated random number. Data entry was made in the Microsoft Excel software in codes and analysis was done with an SPSS-20 computer package. Association between the categorical variable was found by Fishers exact test and the p-value < 0.05 was considered as statistically significant.

RESULTS

Thoracoscopy was done in 40 patients during 1-year period for all those patients who were inconclusive for initial pleural fluid analysis and were undiagnosed for exudative pleural effusion. Biopsy was taken from the parietal pleura in all the cases. The mean age of the study population was 43 ± 14.9. Patient with the lowest age in this study group was 18 and highest was 71 years. Of these 40 cases, 30 were male and 10 were females, that is 75 % males and 25 % females. 16 cases (40 %) presented with left sided pleural effusion; 24 cases (60 %) presented with right sided pleural effusion. There was no bilateral effusion in our study group. 30 cases presented with massive effusion,

10 cases with moderate effusion. Of the 40 cases, 27 cases presented with straw colored pleural effusion. 13 cases were haemorrhagic effusion of these 40 cases, 28 cases we suspected tuberculosis based on the history, clinical features and radiology. 12 cases we suspected malignancy. Histopathologic examination showed 11 cases as malignant and 29 cases as nonmalignant. 1 case of suspected malignancy came as no evidence of malignancy. Out of the 29 nonmalignant cases 18 came as tuberculosis. Thoracoscopy showed 13 cases had adhesions and mass lesion in 4 cases. Of the 4 mass lesions, 3 came as malignant. Normal pleura in 11 cases, of which 10 came out as nonmalignant and 1 as malignant. Nodules in 12 cases of which 7 came as malignant and 5 as nonmalignant. Straw colored effusion in 27 cases, of which 25 came as nonmalignant and 2 as malignant. Haemorrhagic effusion in 13 cases. 9 came out as malignant and 4 as nonmalignant.

Gender	No.
Male	30
Female	10
Total	**40**

Table 1. Gender Distribution

Histopathology Findings	No.
Malignant	11
Non Malignant	29 (18 cases were Tuberculosis)

Table 2. Histopathology Findings

Thoracoscopic Findings	Malignant	Non Malignant	Total No.
Normal pleura	1	10	11
Adhesion	0	13	13
Nodules	7	5	12
Mass lesion	3	1	4
Total	**11**	**29**	**40**

Table 3. Distribution of HPE in Relation to Thoracoscopic Findings

p value < 0.001

Colour	Malignant	Non Malignant
Straw	2	25
Haemorrhagic	9	4
Total	**11**	**29**

Table 4. Histopathology Results with Colour of Pleural Fluid

p value < 0.001

Comparison	Malignant	Non-Malignant
Histopathology (Gold Standard)	11	29
Flexible thoracoscopy	12	28

Table 5. The Diagnostic Parameters

Diagnostic Parameters	Value
Sensitivity	92 %
Specificity	97 %
Positive predictive value	92 %
Negative predictive value	97 %

Table 6. Diagnostic Yield

DISCUSSION

In this study 40 patients underwent thoracoscopy whose initial pleural fluid results were inconclusive. Flexible thoracoscopic biopsy of the pleura yielded 72.5 % in this study. This is comparable to the 74.3 % by Mootha et al.[8] Lokanathan et al[9] got a yield of 66.7 %. Dhooria et al[10] got 73.3 % and Laila et al[4] got 95 %.

All cases of suspected malignancy came as malignant on pleural biopsy except one, which came as no evidence of malignancy. So, the diagnostic yield of thoracoscopy among the suspected cases of malignancy is 91.6 %.

Of the malignant cases majority were adenocarcinoma. There were 4 adenocarcinoma, 2 metastatic renal cell carcinoma, 1 metastatic carcinoma with primary bone, 1 metastatic deposit primary GI (Gastro-Intestinal) tract, 1 pleural lymphoma, 1 poorly differentiated carcinoma lung and 1 small cell carcinoma.

In our study the most common causes of pleural metastasis and subsequent effusion was from the lung. Among that the most common type was adenocarcinoma. This finding is comparable to the finding of Mootha et al.[8] In his study also most common type was adenocarcinoma. The second commonest cause was metastatic renal cell carcinoma. There was one case from metastatic bone carcinoma and one from GI tract. There was no case of squamous cell carcinoma or mesothelioma in our study group.

Out of the 29 nonmalignant cases 18 were diagnosed as tuberculosis. This high number of tuberculosis is may be because ours is a tertiary care referral centre for tuberculosis and it is highly endemic in our community. Rest of the cases were diagnosed as chronic pleural fibrosis, acute inflammatory process and chronic nonspecific inflammation.

During thoracoscopy adhesions are found in 13 cases, nodules were found in 12 cases, normal pleura in 11 cases and mass lesion in 4 cases. All cases with adhesions came as nonmalignant. 58.3 % of the nodules came as malignancy. 90.9 % of the normal pleura findings are seen in nonmalignant cases. 75 % of the mass lesion came as malignancy. All these finding was significant with a p value of 0.001.

Some of these findings were comparable to findings of Prabhu et al[11] and Laila et al.[12] Prabhu et al[11] got the finding as more than 70 % of patients with nodules were malignant lesion, more than 96 % of patients with adhesion were chronic or sub-acute inflammation (non-malignant lesion) and 100 % of sago grain nodules were tuberculosis. Laila et al[12] got 100 % of patients with adhesions were non-malignant

76.9 % of all haemorrhagic effusion came as malignant, that is out of 13 haemorrhagic effusion 10 came out as malignancy. Of the 27 straw-colored effusion only 2 came as malignancy with a p value of 0.001. About 59.2 % of the straw-colored pleural effusion came as tuberculosis. The sensitivity, specificity, positive predictive value and negative predictive value of thoracoscopy in diagnosing different kind of pathologies as compared to histopathology (gold standard test)[2] were 92 %, 97 %, 92 % and 97 % accordingly.

Regarding the complication, thoracoscopy is a safe procedure with mortality rates are very rare.[6] Most common minor complications encountered are subcutaneous emphysema, prolonged air leak and

empyema.[13] In our study none of them developed any of the previously mentioned complication.

CONCLUSIONS

Thoracoscopy is a semi-invasive safe procedure which can be done in conscious sedation. Visualization of the visceral and parietal pleura is another advantage, so that biopsy can be taken from the abnormal areas. So, if there is facility for thoracoscopy, it should be preferred in undiagnosed exudative pleural effusion because of its high diagnostic yield in tuberculosis and malignancy. The diagnostic yield of thoracoscopy in our study was 72.5 % compared to 60 % - 97 % in various studies and for blind pleural biopsy it was 44 %.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
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