e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2022; 12 (6); 1-6

Original Research Article

Percutaneous Closed Pleural Biopsy: A Vanishing Art in Current Era- is Still Alive?

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Received: 15-04-2022 / Revised: 18-05-2022 / Accepted: 01-06-2022

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Conflict of interest: Nil

Abstract

Study aim and objective: There is no doubt that thoracoscopy has an added advantage over closed pleural biopsy in evaluation of exudative pleural effusion. In many countries, Percutaneous closed pleural biopsy (PCPB) is still being used as an initial investigation of choice due to its easy availability and cost-effective alternative to thoracoscopy. The aim of this study is to observe whether the art of PCPB using Abram's needle is still alive in the evaluation of exudative pleural effusion in modern era.

Design: The medical records of 171 patients with exudative pleural effusion, who underwent PCPB using Abram's needle between 2012 and 2017, were reviewed.

Results: Pleural tissue was adequate in 158(92.3%) cases. The overall diagnostic yield of PCPB was 72.8% and for tuberculosis and malignancies it was 73% and 91.4% respectively. There were no major post procedure complications. The diagnostic yield and rate of complications with PCPB are comparable to thoracoscopy.

Conclusion: As PCPB is safe, cheap and easily available, it can be used as an initial diagnostic tool in the evaluation of exudative pleural effusion particularly in resource poor settings and there is a necessity to train the future pulmonologists.

Keywords: Exudative Pleural Effusion, Percutaneous Closed Pleural Biopsy, Thoracoscopy, Abrams Needle, Tuberculosis, Lung Cancer.

Introduction

Pleural effusions are not uncommon in clinical practice. Thoracocentesis and pleural fluid analysis are important in the diagnostic approach of pleural effusion. Literature review shows that pleural fluid analysis is diagnostic in 40% - 87% of malignancies[1,2] and zero to thirty percent of tuberculous pleuritis[3,4]. The high variability and low

diagnostic yield of pleural fluid analysis necessitate the requirement of pleural biopsy. Biopsy can be obtained by closed technique using the Abram's or Cope's needle, under vision using thoracoscopy or surgery with a mini thoracotomy.

CPB was originally described by De Francis et al in 1955 using the Vim-Silverman needle[5]. Over a period of time different needles were designed, among them Abram's and Cope's needles became popular. Abram's needle has a larger outer diameter and can yield larger biopsy samples than the Cope's needle[6-9]. The diagnostic yield of CPB by using these needles is 60%- 80% for tuberculosis and less than 60% for pleural malignancy[10]. With the advent of image guided closed pleural biopsy and thoracoscopy, the usefulness of blind closed biopsy technique has been reduced. Thoracoscopy has become more popular in the developed world, where pleural malignancies are more common than infectious causes of exudative effusion and there is less resource constraint. Closed pleural biopsy (CPB) is a safe procedure can easily be learnt and performed. It is still being used widely in many countries where especially tuberculosis is the predominant cause of pleural effusion and where thoracoscope availability is limited. Through this study we tried to know whether closed pleural biopsy is still useful as a cheaper alternative to thoracoscopy in the diagnostic evaluation of exudative pleural effusion.

Materials and Methods:

We retrospectively reviewed the medical records of all the adult patients aged more than 17years who underwent percutaneous CPB with Abram's needle for exudative pleural effusions (based on Light's criteria)[11] between 2012 and 2019 at Apollo Hospital, Chennai. All the patients gave informed consent for the procedure. Ethical committee of our institution gave the clearance for the study. All the procedures were performed by a single experienced pulmonologist. The obtained pleural biopsy specimens were sent for both microbiological and histopathological examination. Medical case records review was conducted for details like the number of pleural biopsies obtained, post biopsy complications, the adequacy of samples and for lab reports (histopathology and microbiology reports). Presence of pleural tissue in the specimen was considered as an adequacy of pleural biopsy specimen. The outcome of all the cases was noted. Those with nondiagnostic CPB were further investigated by thoracoscopy, open surgical biopsy and/or follow for 6months with empirical Anti Tuberculous Treatment (ATT) based on the clinicoradiological background. The final diagnosis was considered based on the reports obtained at the end of complete evaluation.

Diagnosis of Tuberculosis pleural effusion was considered based on the following criteria: 1. Histopathological evidence of granuloma with or without Acid fast bacilli (AFB) smear positivity (and/or) 2) AFB smear or culture positive from the pleural tissue or pleural fluid (and/or) 3) Patients who had favourable clinical and radiological response to empirical anti-tuberculosis treatment.

Malignant pleural effusion was diagnosed by the presence of malignant cells in the pleural tissue or in the pleural fluid. Other diagnoses were considered according to histopathological examination. Data entry was done in MS-Excel spread sheet. Data analysis and validation was carried out by SPSS version 21.0.

Results:

A total of 171 patients with exudative pleural effusion underwent blind CPB with Abram's needle over a period of 11years. There were 123(71.9%) men and 48(28%) women, with a mean age of 46 years (age ranged from 17 to 83years). Majority of patients 96(56.1%) had right sided pleural effusion, 70(40.9%)

patients had on the left side, and 5(2.9) had bilaterally. Mild to moderate effusion was more common. Fig-1 shows complete analysis of 171 patients with exudative pleural effusion. Lymphocytic predominance was observed in 108(63.1%) patients. In 28(59.6%) cases pleural fluid was positive for malignant cells and atypical cells were found in 6 cases. Pleural fluid culture for Mycobacterium tuberculosis (MTB) was positive only in 2 cases and in no case AFB smear was positive (Table No 1). Those with positive MTB culture also had necrotizing granuloma on histopathological examination.

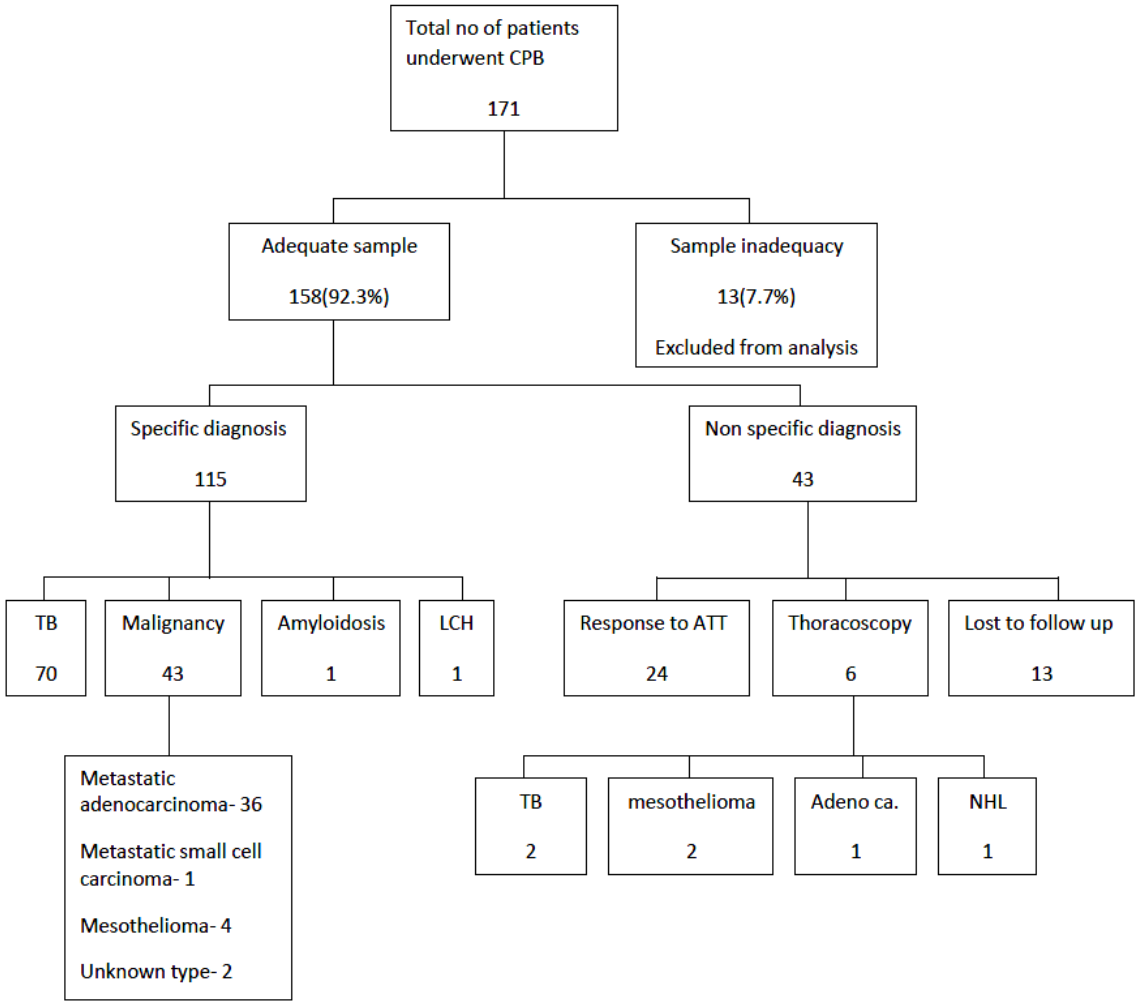

Figure 1: Algorithmic representation of complete analysis of 171 patients with exudative pleural effusion

Table 1: Pleural fluid cytology results

S. No	Cell type	N = 171 (100%)
1	Lymphocytosis	108 (63.2%)
2	Malignant cells	28 (16.4%)
3	Atypical cells	6 (3.5%)
4	Eosinophilic	1 (0.6%)
5	Neutrophilic	4 (2.3%)
6	Nonspecific	24 (14%)

In 158(92.3%) cases the biopsy specimen was adequate and in 13(7.7%) cases it was inadequate. The definitive diagnosis was obtained in 115 (72.8%) cases by blind CPB. Of these 115 cases, histopathological diagnosis of TB was in 70 cases, malignancy in 43 cases and other conditions like amyloidosis and Langerhan's cell histiocytosis each in one patient. In the remaining 43 cases with nonspecific diagnosis, 6 patients were further evaluated by thoracoscopy, 26cases were empirically treated with ATT based on clinico-radiological diagnosis and 13cases lost to follow up. 24 out of 26 cases responded to empirical ATT and were considered to have tuberculosis in the final diagnosis. Thoracoscopy confirmed TB in two patients out of the six with the other four being malignancy.

At the end of complete analysis, a total of 96 patients were diagnosed as TB pleural effusion, in which 70 cases were diagnosed by CPB with the diagnostic yield of 73%. 47 patients had malignant pleural effusion of which 43(91.4%) cases were diagnosed by CPB and 4(8.6%) cases by thoracoscopy. Adenocarcinoma was the predominant one (78.7%). Table no 2 show types of pleural malignancies obtained in 47 patients. Pleural fluid cytology was positive for malignant cells in 28 cases (59.6%) and CPB additionally diagnosed in 15 cases with the additional diagnostic yield of 31.9%. Out of 6 patients with atypical cells in pleural fluid analysis, 4 were confirmed as malignancy by CPB. No minor or major complication was reported in the post procedure period in any patient.

Discussion:

The availability of Pleuroscopy (Medical Thoracoscopy) has undoubtedly reduced the need for closed pleural biopsy to an extent where it has become almost extinct in the developed world. However, in resource poor settings, where tuberculosis is more common, closed pleural biopsy still remains an important and useful tool in the diagnosis of pleural effusions. Pleural biopsy not only gives the definitive diagnosis but is also quick, especially in the diagnosis of tuberculosis. There is still a need to impart the technique of closed pleural biopsy to younger physicians especially in developing countries.

Tuberculosis and malignancy are the two most common conditions of exudative pleural effusion with which patients present to hospital. Role of pleural fluid analysis is limited in these two conditions, and which necessitates pleural biopsy. Literature survey shows pleural fluid AFB smear is found positive in zero to 20% cases, MTB culture positivity in upto 30% cases[3,4] and in case of malignancies the diagnostic yield of pleural fluid cytology is in the order of 44-87%[1,2] which increased further on second aspiration[12]. In our study pleural fluid cytology for malignant cells was positive in 28(59.6%) patients. Pleural fluid culture for Mycobacterium tuberculosis (MTB) was positive only in 2 cases and in no case AFB smear was positive which implies the low sensitivity of these tests.

In our study, tuberculous pleural effusion was common (60.7%) and CPB was diagnostic in 73% of cases. The results are on par with that of many studies from TB endemic countries. Many Indian studies reported a diagnostic yield of 70% - 80% for tuberculous pleural effusion by CPB with Abram's needle[2,13,15]. In one of the largest reviews of over 2500 pleural biopsies reported by Tomlinson et al, the diagnostic yield of 75% by CPB for pleural tuberculosis[15]. Our results are coinciding with the previous studies in tuberculosis perspective and are clearly indicating that the pleural fluid analysis alone is useless and all the cases with exudative pleural effusion need pleural biopsy.

In case of malignant pleural effusion, various studies showed 7-27% better diagnostic yield

of CPB compared to pleural fluid cytology[1]. In an Indian study, Christopher et al reported a diagnostic yield of 71% in pleural malignancies with CPB[13,14]. Tomlinson et al in their study reported a diagnostic yield of 57% for pleural biopsy in cases of malignant pleural effusion[16]. Mungall et al reported diagnostic sensitivity of 72% in malignant effusions[17]. In our study, malignancy was confirmed in 47 cases, of which 43 (91.4%) were diagnosed by CPB and in 4(8.6%) patients thoracoscopy added the diagnosis. Our results are higher when compared to previous studies. It can be explained by the predominance of adenocarcinoma with extensive involvement at the time of presentation and the experience of the pulmonologist.

In the total number of malignant cases, adenocarcinoma was predominant, in 37 cases (78.7%), 36 were diagnosed by CPB. 4 (66.7%) out of 6 Mesothelioma cases were diagnosed by Abram's technique. These results are as good as the results reported by Beauchamp et al.[18] Metastatic carcinoma was observed in 4 cases, one of which was secondary to ipsilateral small cell lung carcinoma and the other two were with unknown primary. One case of Non Hodgkins lymphoma was found.

In one case Amyloidosis was diagnosed by CPB and that patient had coexistent multiple myeloma which was confirmed by bone marrow biopsy. Langerhans cell histiocytosis involving pleura was found in one case which was confirmed by immunohistochemistry. In one case both adenocarcinoma and tuberculous pleuritis were noted.

Diagnostic yield of thoracoscopy guided pleural biopsy in malignant and TB pleural effusion ranges from 91% to 94% and 93% to 100%, respectively[1]. In our study the diagnostic yield of CPB in malignancy and TB are 91.4% and 73% respectively. Our results are comparable to that of thoracoscopy in malignant pleural effusions.

In 13 out of 171 cases the biopsy sample was inadequate and in 158 cases (92.4%) adequate specimens were obtained. On an average 5.87 specimens were obtained from each person in cases with adequate biopsy specimen and 5.7 specimens in cases with inadequate specimen. Average number of specimens obtained was almost same in both the situations. Cowie et al in a large study of 750 needle biopsies, reported a success rate of 90% in obtaining pleural tissue[19]. Walshe et al reported 71% samples had pleural tissue and also suggested six biopsy samples should be obtained to get the maximum diagnostic yield[20]. Our results are comparable with literature survey.

All the procedures were performed by a single experienced pulmonologist. There were no major complications and mortality noted during and after the Abram's CPB procedure.

Conclusion:

Thoracoscopy may be the choice of investigation in patients with only pleural fluid appearance on CT without any pleural abnormality. Recent evidence suggesting that PCPB has a role when it's done under image guidance rather than blind and in very specific conditions such as a pleural thickening of >10 mm, diaphragmatic pleural thickening of >7 mm, pleural nodules and masses of >20 cm, and in solid pleural tumors.[21]

Recent publications have highlighted that image guidance may be used before taking pleural biopsy as it significantly increases the yield and reduces the complications of blind CPB, with both ultrasound and CT guidance having been utilized for this purpose.[22] In addition, this procedure is simple and can be done as a day care procedure without much equipment. Yield and complication rates are comparable to thoracoscopy. There is, therefore, a case for continuing this simple and useful procedure in evaluation of pleural effusion and there is a need for training the future pulmonologists in it.

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