

Diagnostic & Therapeutic Role of Pleuroscopy in Undiagnosed Exudative Pleural Effusion

Dr.Dewat Ram Nakipuria: Assistant Professor, Department of General Surger, North DMC Medical College & Hindu Rao Hospital, Delhi.

Dr.Dinesh Bhatnagar: Professor, Department of General Surger, North DMC Medical College & Hindu Rao Hospital, Delhi.

Corresponding Author: Dr.D.R.Nakipuria

Abstract

Background: Pleural effusion or collection of fluid in Pleural Space surrounding Lungs is common condition resulting from TB, Para Pneumonia, Trauma, Cancer, Congestive Heart failure, Pulmonary Embolism etc. Pleuroscopy providing direct visualization thus helping to take sample of fluid for cytology & biochemical estimation and biopsy to diagnose the Disease correctly beside offering drainage as therapeutic cure. The main objective of this study is to evaluate efficacy of Pleuroscopy in diagnosis & therapeutic modality of undiagnosed Pleural Effusion. Pleuroscopy is superior to blind aspiration (Thoracocentesis) and closed biopsy.

Material & Methods: This prospective observational study was conducted in 60 patients presented as undiagnosed pleural effusion in our tertiary care hospital either in form of simple or multi loculated collection or as Empyema. Pleuroscopy was performed under local anaesthesia by inserting Pleuroscope in 5th intercostals space in mid axillary line. All patients were in sitting position, breathing normally, requiring no sedation or positive pressure ventilation. Pleural fluid drained sent for cytological and biochemical estimation of Sugar, Protein, ADA level. Pleural Biospy confirmed diagnosis by histopathological examination. Pleuroscopy was done to drain effusion completely by putting a drain of 26fr for 02 to 07 days after diagnosing & treating the underlying disease.

Results. Out of 60 patients included in the study, 10 patients (07 male, 03 female) patients had simple pleural effusion, 35 patients (23 Male, 12 female) have multilocular collection, 15 patients (12 male, 03 female) had empyema. Rt sided effusion was present in 40 patients, left sided effusion in 17 patients had left sided effusion and 03 patients have bilateral effusion. Accurate Diagnosis was possible in 80% of patients by the above pleuroscopy procedure, By doing other diagnostic test like PCR by CB NET, culture sensitivity, biochemical tests as PH, amylase, triglyceride, LDH and Gram stain etc further diagnosis was possible in 18% of patients, no diagnosis was possible in 2% of patients. Therapeutic drainage cured 80% of patients and 15% of patients required thoracic surgeries and 10% cant be cured as suffering from primary or secondary malignancy.

Conclusions: This study confirms that pleuroscopy is superior to thoracocentesis to diagnose undiagnosed pleural effusions. Pleuroscopy can cure simple, multiloculated effusions and empyema if underlying disease is diagnosed & treated. Only thickened Pleura long standing empyema require thoracic surgeries as decortication or lobectomies..

Key Words: Pleural Effusion, Pleuroscopy, Empyema, TB, Decortication.

Date of Submission: 13-06-2023

Date of acceptance: 28-06-2023

I. INTRODUCTION:

Pleural effusion or collection of fluid in Pleural Space surrounding Lungs is common condition resulting from TB, ParaPneumonia, Trauma, Cancer, Congestive Heart failure, Pulmonary Embolism etc. It is mostly seen in patients with lung cancer [1,2]. As per data Pleural effusion is seen in 300 subjects per 100,000 people each year all across the globe [3]. Infections cause Exudative pleural effusions in children and adolescents, while malignant are more seen in the elderly [4,5]. It is difficult to make an accurate diagnosis of pleural effusion because, even after thoracocentesis by needle aspirations and /or closed pleural biopsy, 25-40% of pleural effusions are not detected by this procedure [6,7]. Pleuroscopy, also known as medical thoracoscopy, is a procedure that is commonly characterized as the assessment of the pleural cavity. Pleuroscopy was popularized in 1910 by a Swedish internist, Hans Christian Jacobaeus. It is a minimally invasive single-port endoscopic technique using rigid and semi rigid thoroscopes that offers direct visualization of pleural surfaces, as well as channels to perform diagnostic and therapeutic procedures [8,9]. Pleuroscopy is effectively utilized to treat

pleural illnesses under local anesthesia. The gadget is simple to use and has a larger endoscopic field of view. Thus, visualization of the lesion site and biopsy from a correct position becomes feasible, which is not achievable with blind aspiration or thoracentesis [10]. Pleuroscopy is regarded as a relatively safe technique with a high degree of diagnostic accuracy. Pleuroscopy in compare to chest tube insertion, is an easy procedure and is thus simpler to acquire than flexible bronchoscopy if competence in chest tube insertion has previously been acquired [11]. It has the benefit of Video Assisted Thoraoscopic Surgery (VATS) in that it does not need general anesthesia or single lung ventilation. Pleuroscopy is performed under local anaesthesia in mid axillary line in 5th or 6th intercostals space in sitting position without sedation and patient breathing normally without any positive pressure ventilation. Pleuroscopy will eventually replace traditional biopsy methods [12,13]. Major complications of Pleuroscopy are hemorrhage, bronchopleural fistula and / or persistent air leak, postoperative pneumothorax, and pneumonia) but occurs rarely in good hands. its minor complications are subcutaneous emphysema, minor hemorrhage, operative skin site infection, fever [14]. Pleural effusions which develop secondary to pneumonia or lung abscess are referred to as parapneumonic effusions (PPEs). PPEs are classified into three stages, The three stages include exudative stage, fibrinopurulent stage and organized stage. Drainage becomes progressively more difficult as more loculations and septa develop. Effective drainage prevents the fibrous organization and formation of a thickened pleura referred to as an organized stage, which often requires surgical intervention for complete cure [15]. Pleuroscopy helps breaking the loculations under direct vision, thereby facilitating complete clearance and curing the disease if underlying disease is diagnosed and treated properly [16].

II. MATERIAL & METHODS

This prospective observational study was carried out on patients of North DMC Medical College & HR Hospital, Delhi from January 2019 to December 2020. A total 60 patients (both male and females) of aged ≥ 18 , years were for in this study.

Study Design: Prospective open label observational study.

Study Location: This was a tertiary care teaching hospital based study done in outdoor & indoor patients of North DMC Medical College & HR Hospital, Delhi.

Study Duration: January 2019 to December 2020.

Sample Size: 60 Patients.

Sample Size Calculations: The sample size was estimated on the basis of a single proportion design. The target population from which we randomly selected our sample was considered 10,000. We assumed that the confidence interval of 10% and confidence level of 95%. The sample size actually obtained for this study was in 03 groups as per type of effusion present in patients, First group with simple collection was of 15 patients, 30 patients have multilocular effusion and 15 patients presented with empyema chest.

Subject & Selection Method; 60 patients of patients of North DMC Medical College & HR Hospital, Delhi from January 2019 to December 2020 who presented in outdoor or in ward for treatment of pleural effusion were included. By simple clinical examination, chest X-ray and if needed Ct scan of chest, what type of effusion present, patients were divided in 03 groups as simple effusion or loculated effusion or empyema.

Inclusion Criteria:

1. Patients having Respiratory Tract Infections leading Pleural Effusion.
2. Pulmonary Tuberculosis patients developing Pleural effusion.
3. Trauma over chest leading to pleural effusion.
4. Cancer patients (Primary Lung or Secondary Metastatic) developing pleural effusions
5. Patients of both sex, age > 18 yrs.

Exclusion criteria:

1. Pt developing Pleural effusion due to congestive heart failure.
2. patient developing pleural effusion due to pulmonary embolism.
3. Patients developing Pleural effusion due to Renal failure or hypoproteinemia.
4. Patients below age 18 yrs and more than 70 yrs of age.
5. Patients developing pleural effusion due to allergens & substance / drug toxicity

Procedure & Methodology: a written consent explaining the detail of Pleuroscopy examination was taken from from all 60 patients who has been suspected of pleural effusion after clinical examination or chest X-ray or by CT Scan of chest. Pleuroscopy was performed under local anaesthesia by inserting Pleuroscope in 5th intercostals space in mid axillary line. All patients were in sitting position, breathing normally, requiring no sedation or positive pressure ventilation. Pleural fluid drained sent for cytological and biochemical estimation of

Sugar, Protein, lactate dehydrogenase. Pleural Biopsy was also done in empyema and cancer patients to confirm the diagnosis by histopathological examination. Even in some patients where infecting agent could not be diagnosed by above tests then special tests as estimation of pH, Amylase, triglyceride, LDH level, PCR by CB NET, Culture sensitivity, Gram stain etc also done. Pleuroscopy was done to drain effusion completely by putting a 26fr drain for 02 to 07 days after diagnosing & treating the underlying disease. Drain is removed as Lung expands detected clinically or by chest x-ray.

Statistical Analysis: Data was analyzed using SPSS version 20 (SPSS Inc., Chicago, IL). Chi-square and Fisher exact tests were performed to test for differences in proportions of categorical variables between two or more groups. The level $P < 0.05$ was considered as the cut off value or significance.

III. RESULTS :

In this study of 60 Pleural effusion Patients, age wise distribution was seen as patients in Age Group 19-70 Yrs. 10 patients (16.6%) were of age below 25, 40 patients (66.6%) in age group 26-50 & 10 patients (16.6%) were of age group 51-70. Using statistical analysis, P value = 0.5 detected for age & sex distribution, indicating no association between age and sex with type of effusion detected in the study. Regarding presentation of disease, out of these 60 patients, 10 patients (07 male, 03 female) patients had simple pleural effusion, 35 patients (23 Male, 12 female) had multilocular collection, 15 patients (12 male, 03 female) had empyema. Rt sided effusion was present in 40 patients, left sided effusion, 17 patients had left sided effusion and 03 patients had bilateral effusion. pleuroscopy made accurate Diagnosis in 80% of patients by the above. By doing other diagnostic test like PCR by CB NET, culture & sensitivity, biochemical tests as PH, amylase, triglyceride, LDH and Gram stain etc on aspirated fluid, By these tests diagnosis was possible in more 18% of patients, 2% of patients remained undiagnosed. Regarding disease underlying the effusion, 27 patients (45%) were suffering from tuberculosis, 21 patients (35%) were of parapneumonic diseases, 06 patients (10%) were of post trauma and 06 patients (10%) were of malignant pleural effusions due to underlying primary lung cancer in 02 patients (3.33%), mesothelioma in 01 patients (1.66%), and secondary metastases in 03 patients (05%). Pleuroscopy guided therapeutic drainage cured 80% of patients (48) and 10% patients (06) required thoracic surgeries and 10% patients (06) cannot be cured as were suffering from primary or secondary malignancy. with the help of chi square and t inversion test, p value=0.005 detected for variables of treating different type of Pleural effusion by pleuroscope and different types of effusion seen in this study establishing a good correlation between them.

STATISTICAL ANALYSIS:

Tab 1: Age Correlation of Disease

Age Group	Cases	Percentage
18-25	10	16.6
26-50	40	66.6
51-70	10	16.6

Tab 2: Cause of Pleural Effusion

Disease	Cases	Percentage
Tuberculosis	27	45
Pneumonia	21	35
Trauma	06	10
Lung Cancer	02	3.3
Mesothelioma	01	1.6
Secondaries	03	05

Tab 3: Type of Effusion in Male female

Type	Cases	%	M	F
Simple	10	16.6	07	03
Multilocular	35	58.3	23	12
Empyema	15	25	12	03
Total	60	100	42	18

Tab 4: Cure Rate of Pleuroscopy

Type of Effusion	Pleuroscopy	Surgery
Simple	100 %	Nil
Multi locular	100%	Nil

Empyema Acute	100%	
Empyema Chronic	10-20%	80-100%
Cancer	Nil	Nil

IV. Discussion:

Pleural Effusion, a common sequelae of many underlying diseases of lung and pleura, is a common entity mostly seen in our clinical setup requiring an urgent Out of many diagnostic tool as clinical examination, chest X-ray, CT scan of chest etc cannot diagnose the cause of effusion until either a definite history of trauma or malignancy is evident. Most of the commonest cause in our country is tuberculosis followed by parapneumonic diseases. Until collected fluid is completely drained, expansion of compressed lung does not occur so diagnosis of effusion and underlying disease is most urgently required. We mostly opt for thoracentesis by a sterile needle puncture in pleural cavity, where we study the aspirated fluid for cytology and biochemical studies but such blind procedure may be dangerous to cause trauma to lung and some time to underlying liver on Rt side and spleen on Lt side. By such blind procedure, we often miss the diagnosis. Therefore aspiration by direct visualization of pleural cavity by pleuroscopy or called as Medical Thoracoscopy by rigid or semi rigid or flexible pleuroscope is most preferred method of aspirating the fluid for cytology and biochemical studies and to take multiple biopsy from parietal pleura and confirm the diagnosis by histopathological examination. Here by inserting a Pleuroscope in 5th or 6th intercostal space under local anaesthesia with patient sitting normally and breathing normal, examination of whole pleural cavity, underlying lung and pleura is done by a Pleuroscope. This procedure not only diagnose the underlying disease with high sensitivity but also help to cure the effusion by inserting a 26 Fr tube to drain the effusion over 2 to 7 days to expand the lungs with medicines to combat underlying disease which has resulted in such pleural effusion. In our studies we have found that in simple, multiclocular and acute empyema chest, pleuroscopy helps in diagnosing the lesion completely and help in cure of disease completely. In our studies of 60 patients, 80% of patients were completely cured by this procedure and remaining patients were either suffering from primary or secondary cancer or of long standing chronic empyema resulting in very thickened pleura adherent to lung and parietes needing decortications and lobectomies surgical procedure to heal. **In our study**, Rt sided effusion was present in 40 patients, left sided effusion was seen in 17 patients, and 03 patients had bilateral effusion. Accurate and definite Diagnosis was possible in 80% of patients by the above pleuroscopy procedure, By doing other diagnostic test on aspirated fluid like PCR by CB- NET, culture sensitivity, biochemical tests as PH, amylase, triglyceride, LDH and Gram stain etc further diagnosis was done in 18% of patients, no diagnosis was possible in 2% of patients. Pleuroscopy helped breaking the loculations under direct vision, thereby facilitating complete clearance and curing the disease completely by draining fluid from all pockets if underlying disease is diagnosed and treated properly with Pleuroscopy. Major complications of Pleuroscopy or Medical Thoracoscopy are hemorrhage, bronchopleural fistula and / or persistent air leak, postoperative pneumothorax, and pneumonia but occurs rarely in good hands but its minor complications are seen which are like subcutaneous emphysema, minor hemorrhage, operative skin site infection, fever etc and they were evident in our study too but were not cause of concern.

V. Conclusions:

Our prospective observational study have shown that 98% of cases of undiagnosed pleural effusion can be diagnosed by pleuroscopy and if under disease is controlled then drainage of collected fluid in pleural space by pleuroscopy further cure the patient by rapidly expanding the collapsed lung. So Pleuroscopy plays an important role in diagnosis and cure of undiagnosed pleural effusion but in long lasting chronic conditions, surgery remains only option to cure the disease..

References:

- [1]. L. Valdés, D. Alvarez, J. M. Valle, A. Pose, and E. San José, "The etiology of pleural effusions in an area with high incidence of tuberculosis," *Chest*, vol. 109, no. 1, pp. 158–162, 1996.
- [2]. K. V. Nance, R. W. Shermer, and F. B. Askin, "Diagnostic efficacy of pleural biopsy as compared with that of pleural fluid examination. *Modern pathology: an official journal of the United States and Canadian Academy of Pathology*," Inc, vol. 4, no. 3, pp. 320–324, 1991.
- [3]. D. Rand and I. Maskell, "Introduction and methods: British Thoracic Society pleural disease guideline 2010," *Thorax*, vol. 65, no. 2, pp. 1–3, 2010.
- [4]. N. Sinzobahamvya and H. P. Bhakta, "Pleural exudate in a tropical hospital," *Eur. Respir. J.*, vol. 2, no. 2, pp. 145–148, 1989.
- [5]. A. Emad and G. R. Rezaian, "Diagnostic value of closed percutaneous pleural biopsy vs pleuroscopy in suspected malignant pleural effusion or tuberculous pleurisy in a region with a high incidence of tuberculosis: a comparative, age-dependent study," *Respir. Med.*, vol. 92, no. 3, pp. 488–492, 1998.
- [6]. R. W. Light, "Clinical practice. Pleural effusion," *N. Engl. J. Med.*, vol. 346, no. 25, pp. 1971–1977, 2002.

- [7]. R. H. Poe, "Sensitivity, specificity, and predictive values of closed pleural Dr Mohammad Towfique Hasan et al JMSCR Volume 10 Issue 05 May 2022 Page 20 JMSCR Vol||10||Issue||05||Page 16-20||May 2022 biopsy," Arch. Intern. Med., vol. 144, no. 2, p. 325, 1984.
- [8]. D. Feller-Kopman, Pleural disease, an issue of clinics in chest medicine, E-book.Elsevier, 2021.
- [9]. V. G. Prabhu and R. Narasimhan, "The role of pleuroscopy in undiagnosed exudative pleural effusion," Lung India,vol. 29, no. 2, pp. 128–130, 2012.
- [10]. Y. Watanabe, S. Sasada, C. Chavez, Y. Matsumoto, T. Izumo, and T. Tsuchida, "Flex-rigid pleuroscopy under local anesthesia in patients with dry pleural dissemination on radiography," Jpn. J.Clin. Oncol., vol. 44, no. 8, pp. 749–755,2014.
- [11]. A. Shujaat, A. A. Bajwa, F. Usman, L.Jones, and J. D. Cury, "Safety and accuracy ofsemirigidpleuroscopy performed by pulmonary fellows at a major university hospital: our initialexperience: Our initial experience," J.Bronchology Interv. Pulmonol., vol. 20,no. 3, pp. 213–223, 2013.
- [12]. P. N. Mathur and R. Loddenkemper,"Biopsy techniques in the diagnosis of pleural diseases," European Respiratory Monograph, vol. 7, pp. 120–130, 2002.
- [13]. Lee P, Noppen M. Medical thoracoscopy / pleuroscopy: step by step. 2010;
- [14]. 3.Nour Moursi Ahmed S, Saka H, Mohammadien HA, Alkady O, Oki M,Tanikawa Y, et al. Safety and Complications of Medical Thoracoscopy. Adv Med. 2016;2016:1–6.
- [15]. Light RW. Parapneumonic effusions and empyema Proc Am Thorac Soc.2006;3:75–80
- [16]. Davies HE, Nicholson JE, Rahman NM, RJO, Lee YCG. Outcome of patients with pleuritis/□brosis on thorascopic pleural Cardiothoracic Surg. 2010; 38(4):472–7