COMPARISON BETWEEN MEDICAL THORACOSCOPIC PLEURAL BIOPSY AND PLEURAL BRUSH CYTOLOGY IN UNDIAGNOSED EXUDATIVE PLEURAL EFFUSIONS – A PROSPECTIVE STUDY.

Dissertation submitted to

The Tamil Nadu Dr. M. G. R. Medical University

in partial fulfilment of the requirements for the degree of

DOCTOR OF MEDICINE (M. D.) in

TUBERCULOSIS AND RESPIRATORY DISEASES

BRANCH- XVII

2017-2020

DEPARTMENT OF TUBERCULOSIS AND RESPIRATORY DISEASES

Govt. Stanley Medical College and Hospital Chennai- 600001

THE TAMILNADU DR. M.G.R MEDICAL UNIVERSITY

CHENNAI-600032. MAY 2020

BONAFIDE CERTIFICATE

This is to certify that the dissertation titled **"COMPARISON BETWEEN MEDICAL THORACOSCOPIC PLEURAL BIOPSY AND PLEURAL BRUSH CYTOLOGY IN UNDIAGNOSED EXUDATIVE PLEURAL EFFUSIONS - A PROSPECTIVE STUDY."** - is a bonafide research work done by **Dr.MATHIYALAGAN M**,

during his academic years 2017- 2020, in Government Stanley Medical College, Chennai, in partial fulfilment of the M. D. (Tuberculosis & Respiratory Medicine) examination of The Tamilnadu Dr. M. G. R. Medical University to be held in May 2020. This work has not previously formed the basis for the award of any degree.

Dr. R. SRIDHAR, MD., DTRD.	**Dr. R.SHANTHI MALAR , M.D.,DA.**
Professor & head of department	Dean
Department of Tuberculosis & Respiratory diseases	Govt.Stanley medical college & Hospital
Govt.Stanley medical college & Hospital, Chennai – 600001	Chennai - 600001

DECLARATION BY THE GUIDE

This is to certify that the dissertation titled **"COMPARISON BETWEEN MEDICAL THORACOSCOPIC PLEURAL BIOPSY AND PLEURAL BRUSH CYTOLOGY IN UNDIAGNOSED EXUDATIVE PLEURAL EFFUSIONS - A PROSPECTIVE STUDY"** is a bonafide research work done by **Dr. MATHIYALAGAN M**,during

his academic years 2017-2020, in Govt. Stanley Medical College & Hospital under my guidance. This work is submitted in partial fulfilment of the M. D. (Tuberculosis & Respiratory Medicine) examination of The Tamilnadu Dr. M. G. R. Medical University to be held in May 2020.

Place : **Signature of the guide**

Date : **Name & designation of the guide**

Dr. R. SRIDHAR, MD., DTRD
Professor & head of department
Department of Tuberculosis &
Respiratory diseases
Govt.Stanley medical college
& Hospital, Chennai – 600001

DECLARATION BY STUDENT

I hereby declare that this dissertation titled **"COMPARISON BETWEEN MEDICAL THORACOSCOPIC PLEURAL BIOPSY AND PLEURAL BRUSH CYTOLOGY IN UNDIAGNOSED EXUDATIVE PLEURAL EFFUSIONS - A PROSPECTIVE STUDY"** submitted for the degree of

Doctor

of Medicine (M.D.) in Tuberculosis and Respiratory Diseases, Branch XVII

is my original work and has not formed the basis for the award of any degree, diploma, associate ship, fellowship or other similarities

Place : **Signature of the student**

(Dr.MATHIYALAGAN M)

Date :

ACKNOWLEDGEMENT

I would like to begin my acknowledgement by thanking **Dr.Shanthi malar M.D.,D.A.** Dean ,Stanley medical college and hospital for permitting me to conduct this study

I am deeply grateful to my mentor, my chief and Professor **Dr.R.Sridhar M.D.,D.T.R.D.** Head of department – Pulmonary medicine, Stanley medical college and hospital & Superintendent – Govt.Hopstial of thoracic medicine, tambaram sanatorium for his valuable guidance. It has been my greatest privilege to work under his expertise.

I would like to express my gratitude towards my teacher,**Prof. Dr.VINOD KUMAR M.D., D.N.B.** Professor, Stanley medical college and hospital for his constant encouragement and support throughout my course. It has been an honour to learn from him

I sincerely thank my guide Professor **Dr.R.Sridhar M.D.,D.T.R.D.** Head of department – Pulmonary medicine, for his valuable inputs and guidance through the course of my study.

A special mention to all assistant professors in my institution who have been a great source of help and support.

I will forever be grateful to my colleagues **Dr.DEVANATHAN, Dr.ANUGRAHA, Dr.SIVA SHANMUGAM, Dr.MOHAN** and **Dr.RAMASAMY** for their support and motivation throughout my time at this institution and would go out of their way to help me without expectations. I feel blessed to have had the opportunity to gain their friendship and to have been a part of this team. A special mention to my juniors **Dr. PRAKASAM , Dr,KARNIHA, Dr.PRATHEEB KUMAR** and **Dr.REETHU SINGH** for their help and support.

I fall short of words to express my deep sense to gratitude towards my parents who have always stood by me. I have had the support and encouragement of my wife **ABINAYA.K.** who was understanding and accommodative of my ambitions.

A very special mention to the nursing staff of our institution who were kind enough to lend a helping hand for this study.

I will forever be indebted to the patients that have been kind enough to agree to be a part of my study, without whom this would this presentation would have been impossible.

CONTENTS

ABSTRACT:

COMPARISON BETWEEN MEDICAL THORACOSCOPIC PLEURAL BIOPSY AND PLEURAL BRUSH CYTOLOGY IN UNDIAGNOSED EXUDATIVE PLEURAL EFFUSIONS -PROSPECTIVE STUDY

INTRODUCTION:

The accurate diagnosis of pleural effusion remains a challenging clinical problem. Medical thoracoscopy has an established role in diagnosis of the undiagnosed exudative pleural effusion. Medical thoracoscopy, when combined with pleural brush cytology, may reduce time to diagnose the undiagnosed pleural effusion and is less complicate when compared to Pleural Biopsy.

AIM :

(a)To compare the yield of Medical Thoracoscopic Pleural biopsy and Thoracoscopic Pleural brush cytology in undiagnosed exudative pleural effusions. (b)To minimize the Thoracoscopy Pleural biopsy complication by doing pleural brush cytology for undiagnosed exudative pleural effusion.

STUDY DESIGN: Prospective study.

PATIENTS AND METHODS:

The study was done between December 2018 and June 2019 in all the patients of undiagnosed exudative pleural effusions who were taken for thoracoscopy. Both medical thoracoscopic pleural biopsy and pleural brush cytology were obtained for all the patients..

RESULTS:

sample size 40. the mean age was 54 years. . thoracoscopy morphology nodule was the most common finding on thoracoscopic examination. thoracoscopic pleural biopsy was found to be positive in 34 patients out of 40.whereas thoracoscopic pleural brush cytology was found to be positive in 32 patients out of 40.in thoracoscopic pleural biopsy out of 34 positive cases ,20 were observed having malignancy whereas in case of thoracoscopic pleural brush cytology out of 32 positive cases 19 were diagnosed having malignancy.among the 40 cases 22 cases had minor complication during thoracoscopy procedure.

CONCLUSION:

Thoracoscopic pleural brushing could be done easily and safely and allows obtaining pleural cellular material in areas dangerous to take biopsy specimens. It could augment the diagnostic yield of a medical thoracoscopy in undiagnosed exudative pleural effusion cases.

INTRODUCTION

THORACOSCOPY OR MEDICAL PLEUROSCOPY:

- The technique of medical thoracoscopy (or pleuroscopy) involves passing an endoscope through the thoracic cage and allows direct visualization and biopsies from the pleura. It is both a diagnostic and therapeutic procedure.

- Pleural fluid analysis, blind pleural biopsy, transthoracic needle aspiration are not always able to achieve a diagnosis in all cases. It is in this context that medical pleuroscopy or thoracoscopy is useful since the pleurae can be visualized and adequate sampling can be done.

- Exudative pleural effusion is most commonly seen in three conditions namely cancer, tuberculosis (TB) and parapneumonic effusion.

- The accurate diagnosis of pleural effusion remains a challenging clinical problem because even after thoracentesis and closed pleural biopsy 15–20% of pleural effusion still remains undiagnosed

- In order to get a pleural biopsy for the diagnosis of undiagnosed pleural effusion, several techniques are used such as percutaneous needle pleural biopsy, CT guided pleural biopsy, medical thoracoscopy, video assisted thoracoscopy and open thoracotomy.

- Forceps biopsy is the commonest used instrument to obtain thoracoscopic specimens from suspected pleural lesions; however its procedures may be associated with bleeding that hinders further biopsy, additionally the decision to take biopsy could be difficult especially when the targeted lesions are on the visceral pleura or near the vascular structure.

- On the other hand pleural brush could be used to obtain pleural specimens through medical thoracoscopy from suspected areas either in parietal, visceral pleura or near the vascular structure safely.

THE GOVERNMENT HOSPITAL OF THORACIC MEDICINE, TAMBARAM SANATORIUM, CHENNAI:

The Government Hospital of Thoracic Medicine at Tambaram sanatorium is a tertiary care referral centre located in Chennai, Tamilnadu. It is an apex centre for the diagnosis and treatment of respiratory diseases including tuberculosis. It is attached to Stanley medical college, Chennai and is a postgraduate teaching centre.

This hospital has around 776 beds. There are thirty one in-patient wards. The outpatient department receives around one thousand patients [main OPD and HIV OPD] daily. It is one of the biggest AIDS care centre in the country with around three hundred HIV patients visiting the separate HIV OP department daily. Another three hundred patients take in-patient treatment in eight exclusive HIV wards.

This hospital provides good care and support to all types of chest diseases.

Medical thoracoscopy is being done in government

hospital of thoracic medicine for past 4 years. It is done in the fully

functional operation theatre as per guidelines.

Patients with pleural effusions are a common

occurrence in this hospital. Diagnosing the underlying causes of pleural

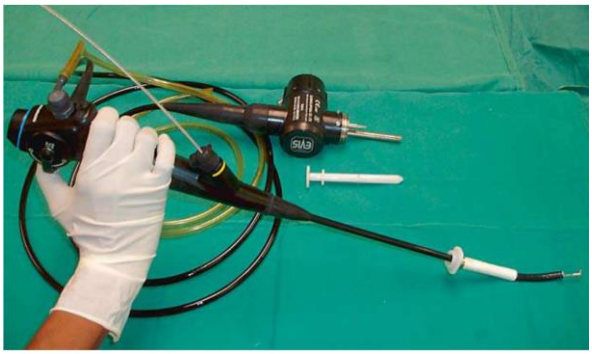
effusions is mandatory for appropriate treatment. Though tubercular

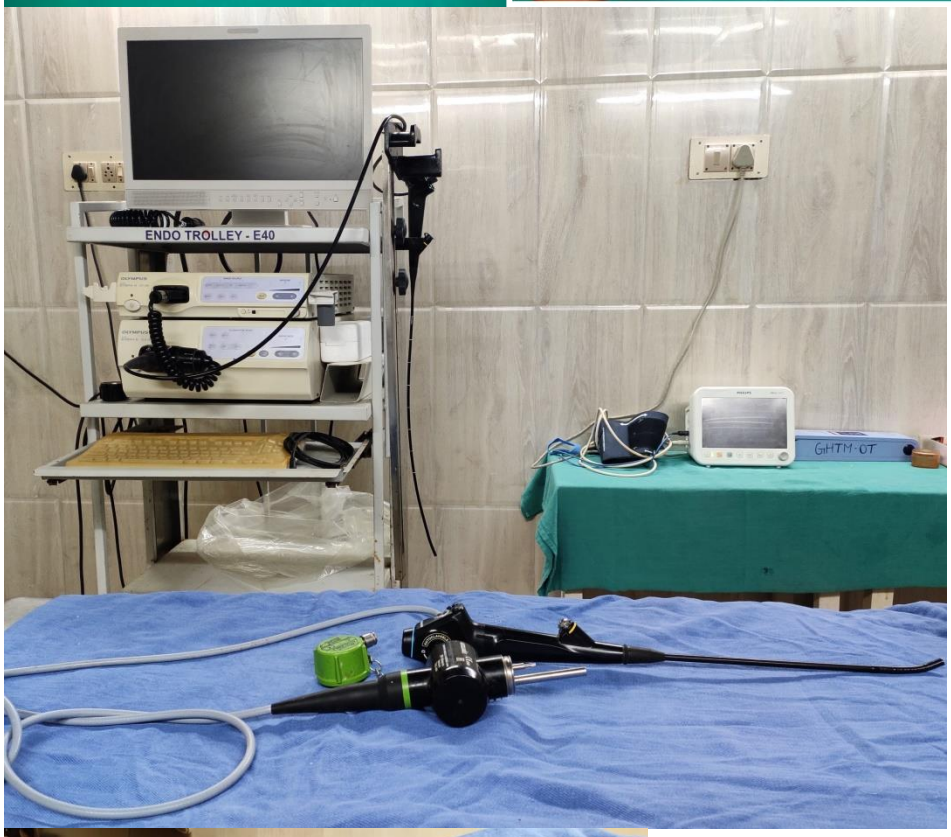
effusions are the most common cause in our set up, other causes of

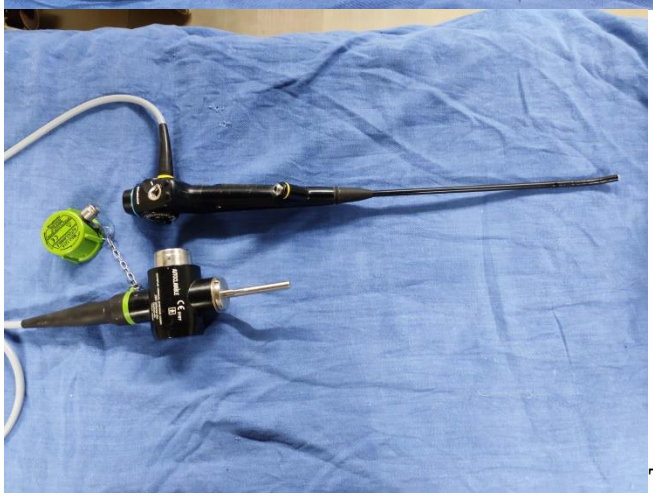
effusions have to be ruled out before initiating anti-tubercular treatment.

Govt. hospital of thoracic medicine – entrance view.

Govt. Hospital of Thoracic Medicine - a ward





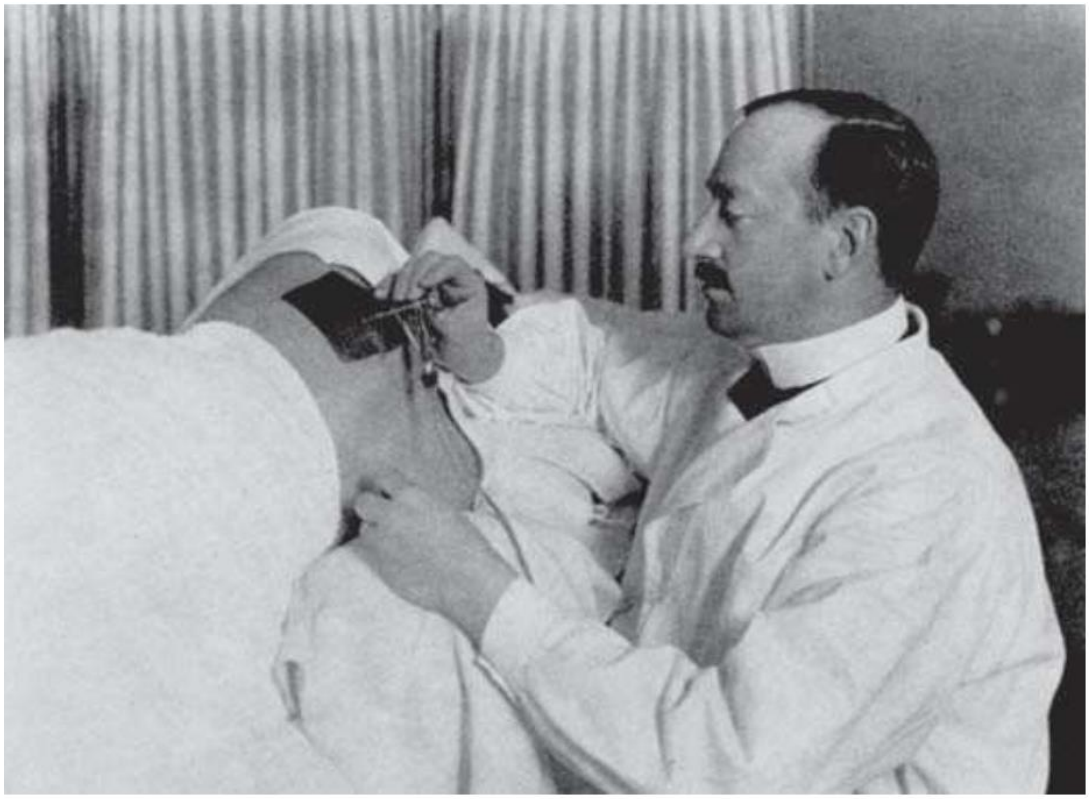


THORACOSCOPY UNIT

LITERATURE REVIEW

HISTORY: Thoracoscopy was presented more than 100 years prior by Hans-Christian Jacobaeus from Sweden and has moved toward becoming today the second most significant endoscopic strategy in respiratory prescription after bronchoscopy(1) . Jacobaeus created thoracoscopy principally as a symptomatic strategy and portrayed the system, together with laparoscopy, in a paper entitled " On the possibility to use cystoscopy in the examination of serous cavities''(2)

JOCOBES



Jacobaeus demonstrating the thoracoscopic approach (c. 1920).

• 1910

• H.C. Jacobeus, the Swedish internist,

was the first to perform thoracoscopy,

as a diagnostic procedure for exudative

pleuritis .(1)

• 1921

• H.C. Jacobeus published the first series

of thoracoscopy cases, describing the

value of thoracoscopy in the diagnosis

of tuberculous and malignant effusions

1972 • Swierenga et al. , Brandt and Boutin et al. confirmed its value in publications.

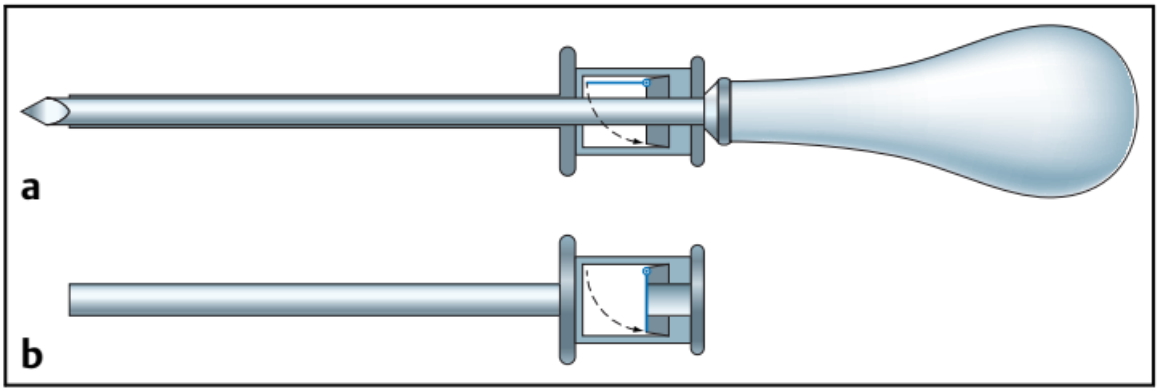
History of semi-rigid Thoracoscope:

• In 1978 takeno(a surgeon) in japan developed a special Semi flexible instrument for treatment f pneumothorax.(3)

• In 1998, olympus developed a semi-flexible thoracofibrescope with working channel of 2 mm, used by MacLean and coworkers in pleural effusions .(4)

• The next generation was again developed by Olympus Corporation in 2002 , with a working channel of 2.8 mm and incorporated video imaging. (5)

Original trocar (a) and automatically closing valve (b) fromJacobaeus (1910).



Aus dem westlichen Krankenhause der Allgemeinen Fürsorge-anstalt in Stockholm (Oberarzt: Dr. G. Wilkens).

Ueber die Möglichkeit die Zystoskopie bei Untersuchung seröser Höhlungen anzuwenden.

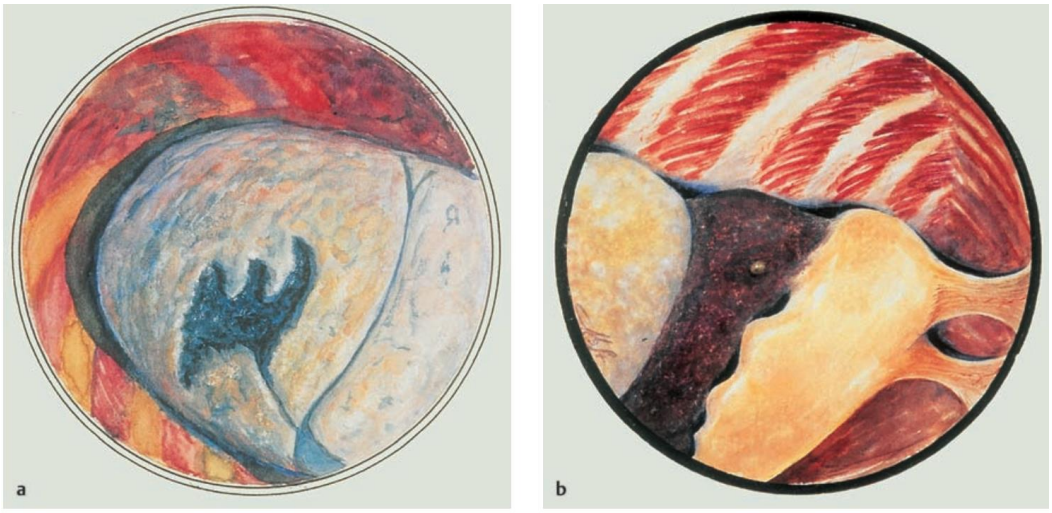
Vorläufige Mitteilung.

Von H. C. Jacobaeus, Privatdozent in Stockholm.

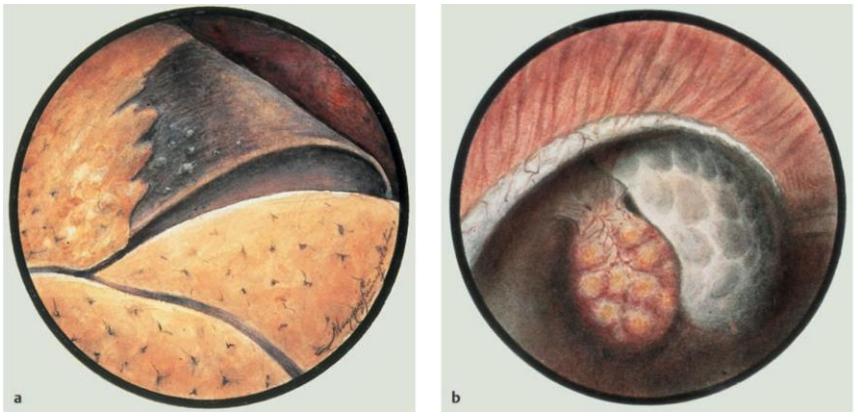
Die mit der äusseren Körperfläche durch natürliche Oeffnungen in Verbindung stehenden Hohlräume des Organismus, war man seit langem instand gesetzt, mit verschiedenen Licht- und Spiegelanordnungen zu beleuchten und infolgedessen auch mit dem Auge zu untersuchen.

Muenchener Medizinische Wochenschrift

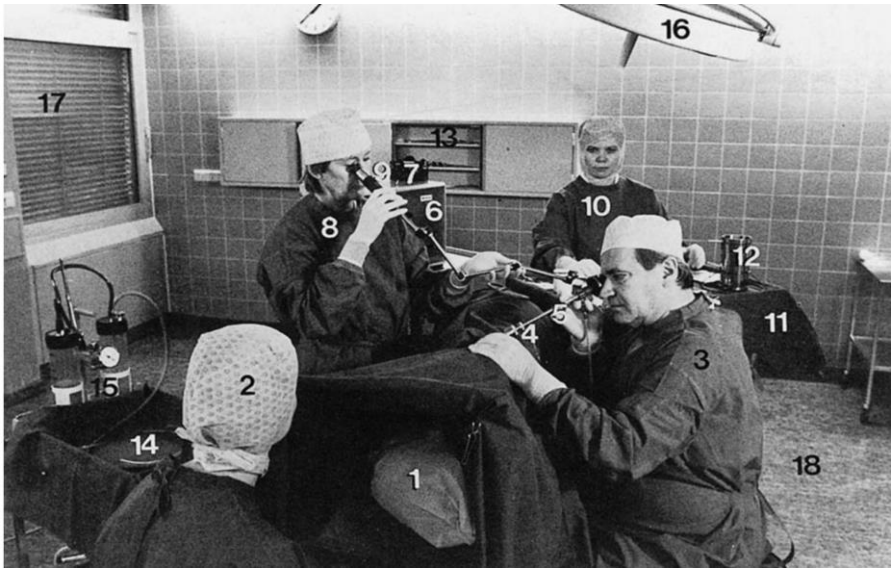
57: 2090 – 2092 (1910)



Original drawings of thoracoscopic situations by Jacobaeus. (Courtesy of Gunnar Hillerdal.)



Original drawings from Cova's Atlas Thoracoscopicon (1928).



Historical photograph of Hans-Jürgen Brandt performing diagnostic thoracoscopy, assisted by Jutta Mai, who observes the procedure through a teaching optic. The figure also demonstrates the set-up for performing thoracoscopy. Sterile draped patient (1) in lateral decubitus position monitored by a nurse (2). Thoracoscopist in sterile outfit (3), holding the trocar shaft in his left hand (4), guiding the thoracoscope with his right hand (5). Combination light unit with cold light source and flash generator (6). Camera (7). Assistant (8) with teaching optics (9), to which a color TV camera can be attached. Nurse for sterile instruments (10) with instrument table (11) and hot water container (12) to warm and clean the optic. Formalin-tight sterile instrument cupboard (13) (for this photograph the door is open). Sterile suction drainage equipment (15), surgical light (16), blinds (17), conductive, washable floor (18). (From Brandt et al. 1985.)

UNDIAGNOSED PLEURAL EFFUSION:

‘’Pleural effusions with adenosine deaminase levels less than 70IU/L and negative pleural fluid cytology for malignancy on three occasions was evaluated’’ .(8)

Mechanism Of Pleural Effusion:

Mechanism of pleural fluids turnover:

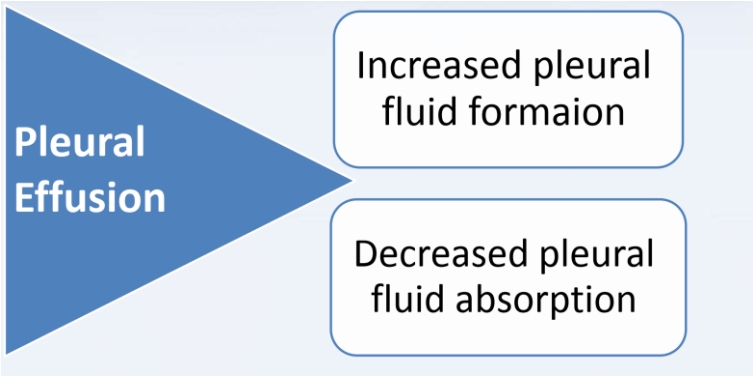
- The passage of protein-free liquid across the pleural membranes was Reliant on the hydrostatic and oncotic pressures across them.
- When the capillaries in to the parietal pleura were thought of it, it could be seen that the net hydrostatic pressure supports the movement of fluid from these capillaries to the pleural space was the systemic capillary pressure (30cm H2O) minus the negative pleural pressure (-5cm H2O) or on the other hand 35cm H2O.(9)
- Opposing this was the oncotic pressure in the blood (34cm H2O) minus the oncotic pressure in the pleural fluid (5 cm H2O), or 29cm H2O. The resulting net pressure differences of 6 cm H2O (35-29) favors movement of fluid from the parietal pleura into the pleural space.(9)

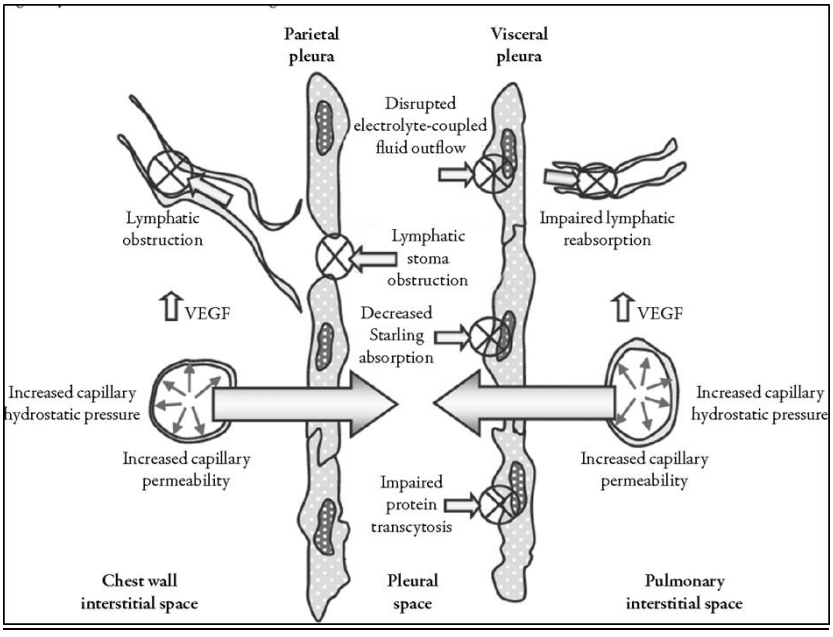
Mechanism of pleural fluids turnover:

- The net rate of pleural fluid formation in animals with thick pleura is approximately 0.01 ml/kg/hr or 15 ml per 24 hr.(9)

- Usually , the pleural space was maintained nearly fluid free because the filtered fluid was removed from the pleural space by the pleural lymphatic's, which could remove over 0.20 ml/kg/hr. .

Pathophysiology of p pleural effusion(9)





General Causes of Pleural Effusions

Increased pleural fluid formation	Decreased pleural fluid absorption
• Increased interstitial fluid in to the lung • Increased intravascular pressure in To pleura. • Increased permeability of the capillaries in the pleura. • Increased pleural fluid protein level. • Decreased pleural pressure. • Increased fluid in peritoneal cavity. • Disruption of the thoracic duct. • Disruption of blood vessels in the thorax.	• Obstruction of the lymphatic's draining the parietal pleura. • Elevation of systemic vascular pressures

Increased Pleural Fluid Formation:

Increased Interstitial Fluid:

• It was the most frequent cause of increased pleural fluid formation.

• whenever the amount of enema in lung exceeds 5 g/gram of dry lung weight, pleural fluid gathering.(9)

• This was the most predominant mechanism of pleural effusions in patients with congestive heart failure, Para pneumonic effusions, acute respiratory distress syndrome, after lung transplantation.

Increased Capillary Permeability:

• increased permeability of the pleura can lead to increased pleural fluid formation.

• Increased levels of vascular endothelial growth factor (VEGF) increase the permeability of the capillaries

• VEGF receptors have been demonstrated on mesothelium cells , and the levels of VEGF are higher in exudative effusions thanintransudative pleural effusions .

• If the pleural surfaces become inflamed, the permeability of the capillaries may be increased.(10)

Increased Hydrostatic Pressure Gradient

Increased intravascular pressure	a decrease in the pleural pressure
• can occur with right ventricular failure, left ventricular failure, pericardial effusions, or superior vena cava syndrome.	• The most common cause is bronchial obstruction leading to atelectasis of the lower lobe or complete lung. • A decrease in the pleural pressure also occurs when the visceral pleura becomes coated with a collagenous peel and the lung becomes trapped

Decreased Oncotic Pressure Gradient:

• A decrease in the oncotic pressure gradient can also lead to increased pleural fluid formation.

• Increased pleural fluid protein levels occur with

-- Increased-permeability pulmonary enema,

-- Hemothorax,

-- And with conditions in which the permeability of the pleural

capillaries is increased.(11)

N.B.This mechanism, however, is probably not too important because when a pleural effusion is induced in sheep with a protein level of 9.0 g/dL, the rate of fluid entry into the pleural space is only 0.22 mL/kg/hour . This rate of fluid formation is approximately equal to the capacity of the lymphatic's to remove pleural fluid. Moreover, hypoproteinemia is thought to be a very uncommon cause of pleural effusion .(12)

Presence of Free Peritoneal Fluid:

If there is free fluid in the peritoneal cavity, it will lead to pleural fluid

accumulation through defects in the diaphragm,(12)

e.g. in - hepatic hydrothorax,

- peritoneal dialysis,

- meig's syndrome

(Benign ovarian tumour with ascites and pleural effusion

usually resolve after resection of the tumour)

Disruption of the Thoracic Duct

• Thoracic duct disruption leading to formation of chylothorax.(9)

<u>Disruption of blood vessels in the thorax</u>

• Blood will accumulate in the pleural space if there is

a disruption of a blood vessel in the thorax.(Hemothorax)

- **Decreased Pleural Fluid Absorption**

  - **Obstruction of Lymphatics:** The most common cause of a decrease in pleural fluid absorption is obstruction of the lymphatic's draining the parietal pleura.(13)

    Normally, the lymphatic flow from the pleural space is approximately 0.01 mL/kg/hour or 15 mL/day because this is the amount of pleural fluid

    formed. However, the capacity of the lymphatic's is approximately 0.20 mL/kg/hour or 300 mL/day.(13)

    Lymphatic blockade is an important factor that contributes to the development of a malignant pleural effusion.

Elevation of systemic vascular pressures

• Superior vena caval syndrome or right ventricular failure.

• pleural effusions developed because of

(a) lymph leakage out of the lymphatic's that pass through the chest

(these include the thoracic duct and the diaphragmatic and

pulmonary lymphatic's); or

(b) obstruction of lung or chest wall lymphatic's with subsequent

leakage of interstitial fluid into the pleural space .(13)

Pleural effusion epidemiology in India:

Pleural effusion Pleural effusion is the more common pleural disease affecting a significant majority of population in India. is the most common pleural disease affecting a significant bulk of populace in India. It can be the result out of pleural, lung parenchymal, as well as systemic disease. The pleural effusion may be benign or even malignant.(8)

he pleural cavity is actually a potential space normally that contain about 0.1ל.3 ml/kg of pleural fluid which is being exchanged constantly. Their pleural fluid is released by just each parietal pleural vasculature as well as gets absorbed by the lymphatic's in the mediastina and diaphragmatic parietal pleura. In case the pleural effusion is due towards changed hydrostatic and oncotic pressures, the resultant is transudates, and if the effusion is due to increased mesothelium and capillary permeability, the resultant is exudates.

The pleural fluid is characterized into transudate and exudate based on the modified Light's criteria.

The sufferers concerning pleural effusion may be symptomless or even might present with exertional dyspnoea. The most frequent demonstrations are cough, chest pain, and temperature. Active inflammation may also render the picture of pleurisy. The clinical assessment will be positive for the fullness out of intercostal spaces and dullness upon percussion on the involved half. The detailed history with respect to the involvement of pulmonary or systemic disease is important in the diagnosis of pleural effusion.

Chest radiographs are convenient in the confirmation concerning pleural effusion. As part of a standing PA view radiograph, that it requires 200 ml to hidden the cost phrenic angle demonstrating the meniscus sign, while on top of a lateral radiograph, 50 ml fluid can be appreciated(8). Solography of the chest is more sensitive in the diagnosis of pleural effusion and also helps in the guidance of thoracentesis.

Pleural fluid cytology is actually additionally significant. It offers sixty per cent sensitivity at the recognition of malignant cells using enhance in yield through three endeavours at different days to almost 95%. Pleural fluid could in addition be used for ADA levels (specific for the tuberculosis), amylase levels (in oesophageal breach), NT-pro-BNP level (heart failure), and triglyceride amounts (>110 mg/dl in chylothorax).(14)

Once the medical diagnosis is has made, the principal aim of the treatment strategy is to treat the underlying cause. In Republic of India, the tuberculosis is actually treated as per the guidelines issued via the revised national tuberculosis program and also WHO guidelines which tend to be modified from time to time.

In one study by Mohan and also Ravindran, they discovered tuberculosis as the most common cause of exudative pleural effusion used by malignancy.

The present research revealed that malignancy as a cause of pleural effusion has taken the second seat following tuberculosis. The pleural fluid analysis, pleural biopsy, and also radiographic and sonographic evaluation had been utilized in the precise diagnosis of these cases.

Their results were also in accord with the study done by Raghavan et al., who concluded that tuberculosis and malignancy form the bulk of the patients with pleural effusion.

Malignant pleural effusion indicates an advanced malignancy as characterized by Dixit et al.[15] The alike results had been acquired in the present research where almost 65% of patients using malignant effusion had advanced/unresectable malignancy.

Dhital et al., as part of their research, determined that tuberculosis is the most prevalent reason of unilateral effusions followed by synpneumonic effusions in india.[15] The present study disclosed that tuberculosis as the most common cause of pleural effusion (unilateral as very well as bilateral), but in contradiction in terms, the second most common cause had been discover to be malignancy.

PLEURAL FLUID ASPIRATION:

A diagnostic pleural fluid sample should be aspirated with use of a fine-bore (21G) needle and a 50 ml syringe. Bedside pulmosonogram guidance was recommended for reduce iatrogenic complication. Pleural fluid should always be sent for biochemistry values like protein, lactate dehydrogenase, Gram stain,

cytology ,cell block and microbiological culture. These preliminary tests were used to guide further investigation. A lateral side of the patient more suitable for aspiration , provided that adequate fluid is demonstrated here on pulmosonogram. The risk of intercostal vessel injury increases with more posterior or medial punctures. If we suspect pleural infection and a pleural fluid pH is to be calculate, immediate preserve with heparinized syringe send within one hour to laboratory. We should avoid air contact after pleural fluid aspiration because of spurious report.

The remaining pleural fluid sent for biochemistry analysis (5ml),microbiological (5ml) ,cytological and cell block remaining pleural fluid (20-40).

All pleural fluid sample for microscopic examination for gram stain sediment is necessary .if we suspect infection pleural area blood culture should sent it increases diagnostic accuracy particularly for anaerobic organism.

There is confusing for hoe much pleural fluid aspirate foe suspected malignant pleural effusion for diagnostic approach; sensitivity depends on the cellularity of the

sample and processing technique as well as volume submitted. 8 It is sensible to send as large a volume as possible from the 50-60 ml sample obtained following diagnostic aspiration as other tests only require small volumes. At room temperature the sample for cytology should be sent to the laboratory as quickly as possible but, if a delay is anticipated, the specimen can be refrigerated at 4-8 0C for up to 14 days with no deterioration in the diagnostic yield for malignancy 4-8 0C for up to 14 days with no deterioration in the diagnostic yield for malignancy.

A pleural fluid appearance:

the advent of the pleural fluid and any odour ought to be recorded. a pleural fluid haematocrit is helpful in the prognosis of hemothorax. fluid may additionally appear serous, blood-tinged, frankly bloody or purulent.

centrifuging turbid or milky pleural fluid will distinguish among empyema and lipid effusions(19). if the supernatant is obvious, the turbid fluid turned into due to mobile particles and empyema is likely while, if it's miles nonetheless turbid, chylothorax or pseudochylothorax are likely26. the unpleasant scent of anaerobic infection may additionally manual antibiotic picks and the odour of ammonia shows urinothorax. grossly bloody pleural fluid is commonly because of malignancy, pulmonary embolus with infarction, tuberculosis, trauma, benign asbestos pleural effusions or post cardiac injury syndrome.

Differentiating between a pleural fluid exudate and transudate: differentiating among a pleural fluid exudate and transudate:

Light's criteria :

This criteria should be used to differentiate between a pleural fluid is exudate or transudate the total protein and lactate dehydrogenase (LDH) should be measured in both blood and pleural fluid. Its important tep to Categorize the pleural fluid for further management of pleural effusions narrowing the differential diagnosis and directing proper investigations and management. Usually , pleural fluid protein >30 g/l has denoted an exudate and <30 g/l a transudate. This classification is not accurate when serum protein is abnormal or when the pleural fluid protein is close to 30g/l and, as this is very common, the application of Light's criteria is always recommended (20)

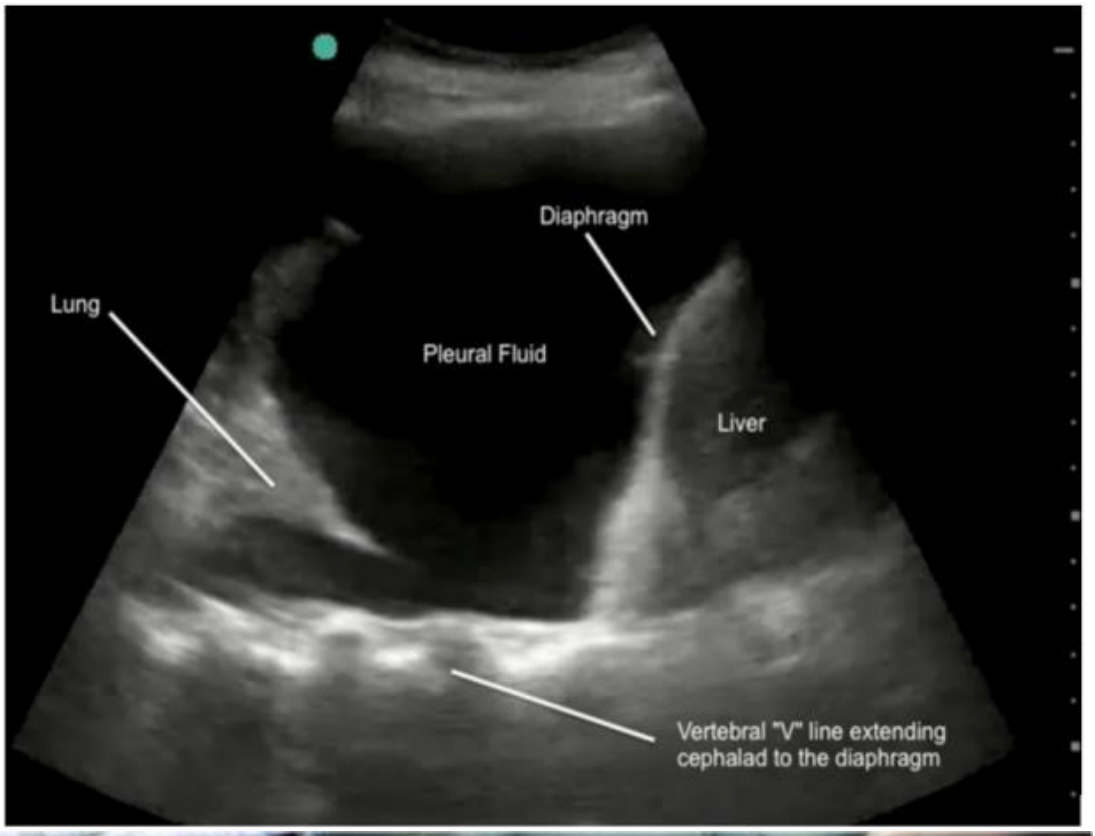
SAMPLE COLLECTION GUIDANCE :

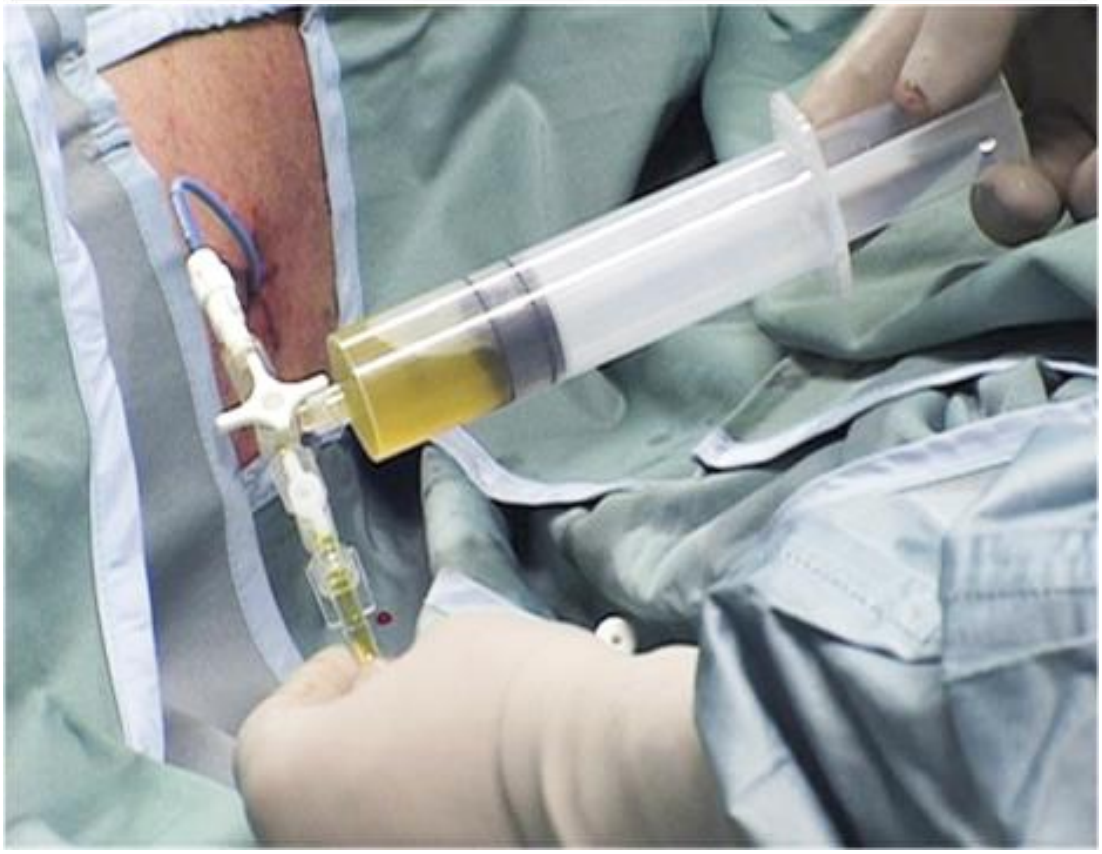
Biochemistry:

LDH and protein 25ml in plain container or serum blood collection tube depending on local policy. Blood should be sent simultaneously to biochemistry for total protein and LDH so that Light's criteria can be applied

Microscopy and culture (MC and S): 5 ml in plain container. If pleural infection is particularly suspected, a further 5 ml in both anaerobic and aerobic blood culture bottles should be sent Cytological examination and 36

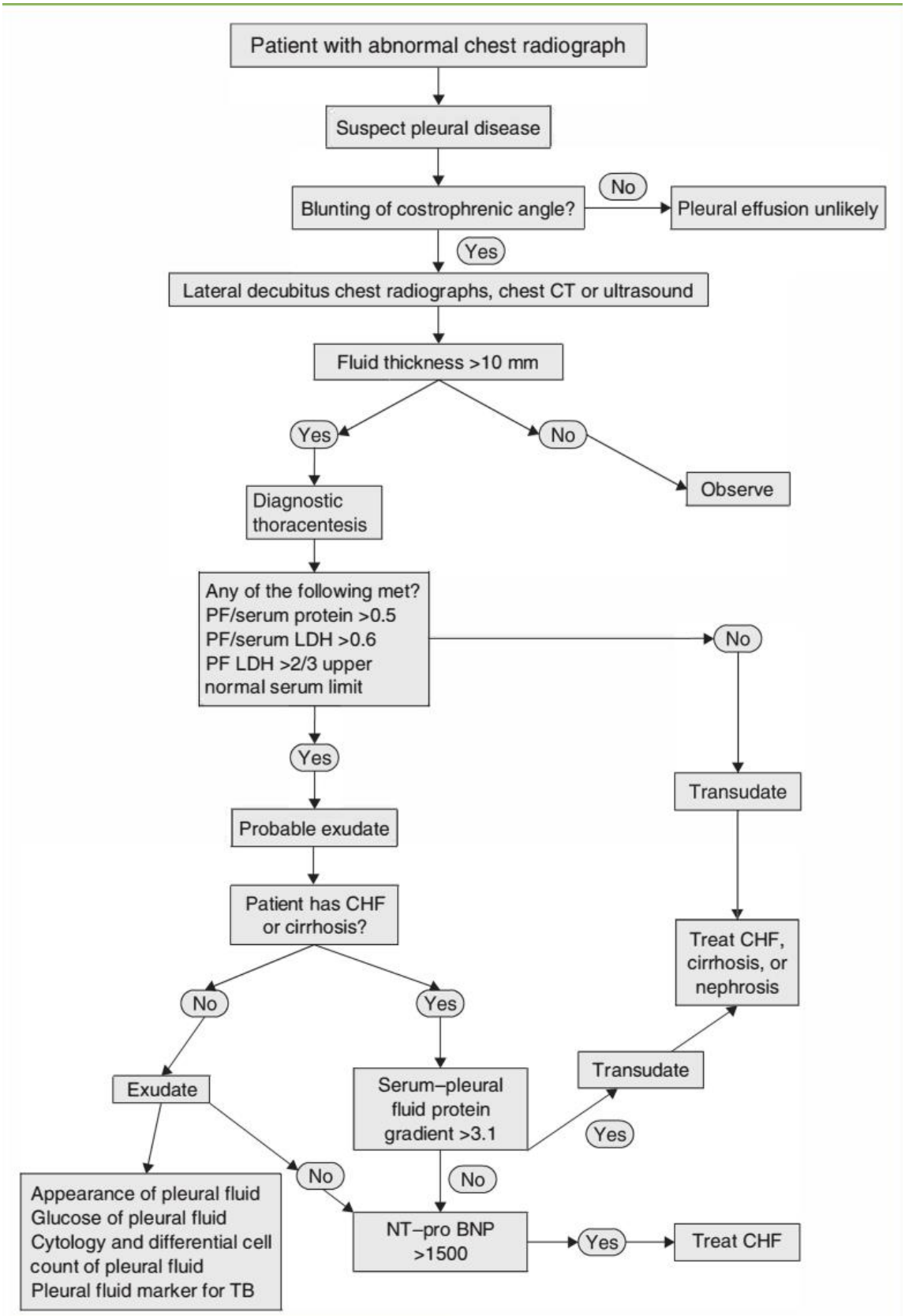
.differential cell count. Maximum volume from remaining available sample in a plain universal container. Refrigerate if delay in processing anticipated (eg, out of hours)





ULTRASOUND -GUIDED THOROCOCENTESIS

Equation 1 algorithm of distinguish transudate from exudative



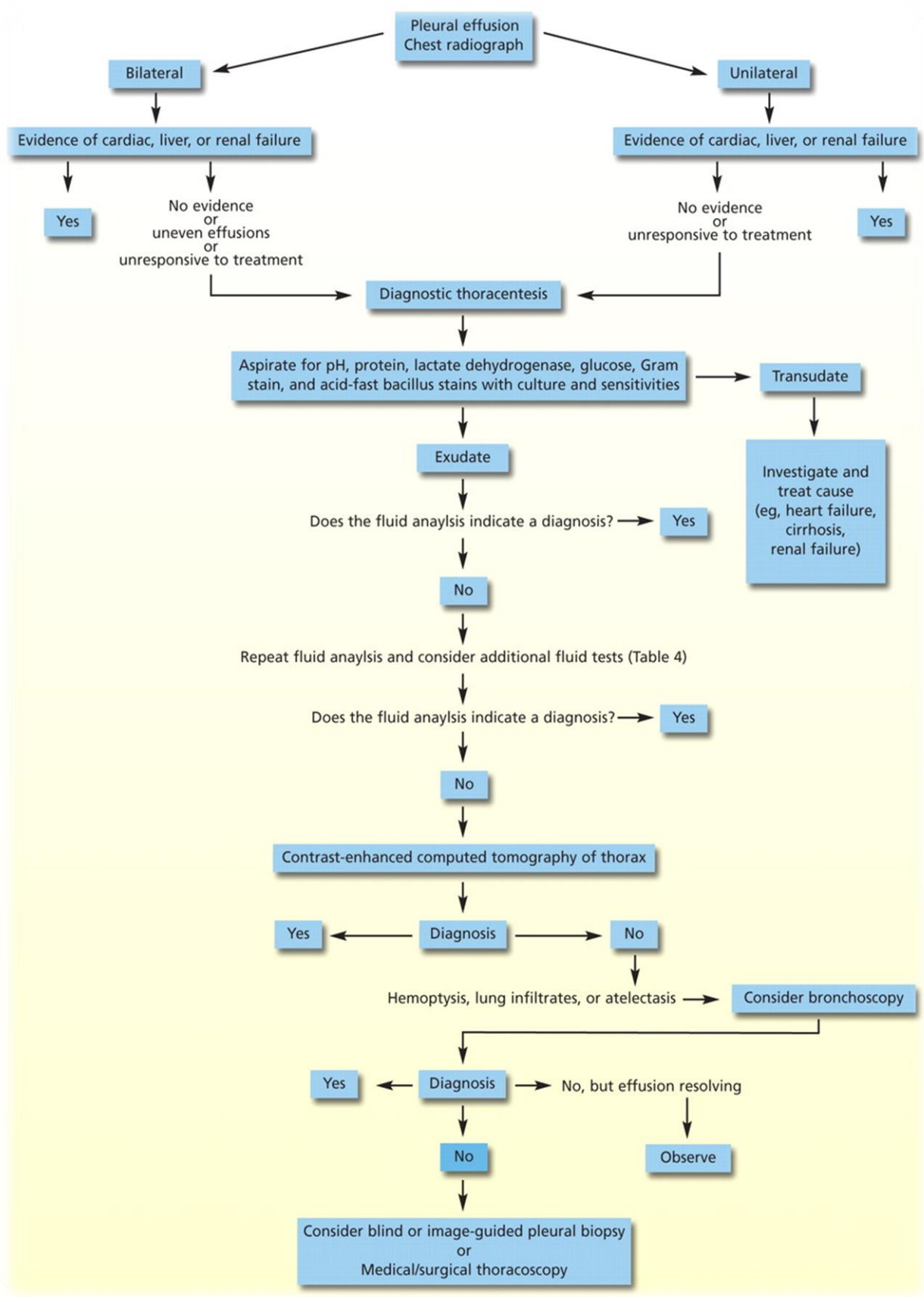


Figure21RECOMMENDED ALGORITHM OF PLEURAL EFFUSION

Light's criteria for distinguishing between pleural exudates

Fluid is an exudate if 1 or more of the following criteria met
• Ratio of pleural fluid level of lactate dehydrogenase LDH to serum level of LDH is greater than 0.6 • Pleural fluid level of LDH is more than two thirds the upper limit of the reference range for the serum level of LDH • Ratio of pleural fluid level of protein to serum level of protein is greater than 0.5
Modified lights criteria :
• Pleural fluid cholesterol level > 60 mg/dl • Serum albumin minus pleural fluid albumin level <1.2g/dl

PLEURAL FLUID COLLECTION GUIDANCE :

Pleural effusion in india:

in study by Rahul gupta et al in Department of Chest Diseases and Tuberculosis, Government Medical College, Jammu, Jammu and Kashmir, India about 1000 people participants research unveiled that pleural effusion had been a lot more frequent in adult males following the earlier explained trends in the literature. (21)This unveiled which majority of people had been between 31 and 40 years of age, generally there

had been a strong association alongside smoking, as well as 68% patients of pleural effusion had been smokers. The significant presenting signs or symptoms included fever and dyspnoea on exertion, using nearly 56% having moderate effusion. Most of the patients have right-sided effusion. Two most common causes of pleural effusion included tuberculosis and malignancy.

In patients with tuberculosis, just ten have trans dative effusion while 685 patients had exudative effusion's with tuberculosis, just ten have trans dative effusion while 685 sufferers experienced exudative effusion. At malignant cases, just a couple of patients had transudative effusion while 158 had exudative effusion(21). At cases suffering from systemic diseases such as the liver cirrhosis, congestive cardiac failure, and renal dysfunction, most of them all had transudative effusion (>90%) while those cases suffering from pleural effusion related with pancreatitis had exudative effusion (approximately seventy per cent). When analysed with respect to smoking, it was seen that most of the smokers had exudative effusion. Of the 70 patients with bilateral effusion, 56 had tuberculosis as the etiology.Out of the 70 sufferers with bilateral effusion, fifty six experienced tuberculosis as the aetiology.

In patients diagnosed as having malignancy on thoracoscopic biopsy, eight patients had adenocarcinoma, five had squamous cellular carcinoma, and four had cellular carcinoma that is little. In pleural fluid analysis, about 70% had raised ADA levels with majority of them tuberculosis that is having. The ADA amounts had been increased predominantly in exudative effusion (94.3%) and nearly 99% of the clients had tuberculosis.

transudates	exudates
• at failure • Cirrhosis with ascites • Nephrotic syndrome • Peritoneal dialysis • Myxoedema • Atelectasis(acute) • Constrictive pericarditis • Superior vena cava obstruction • Pulmonary embolism	• Pneumonia(Para pneumonic effusion) • Cancer • Pulmonary embolism • Bacterial infection • Tuberculosis • Connective tissue disease • Viral infection • Fungal infection • Rickettsial infection • Parasitic infection • Asbestos • Meigs syndrome • Pancreas disease • Uraemia • Chronic atelectasis • Trapped lung • Chylothorax • Sarcoidosis • Drug reaction • Post-myocardial syndrome

IMAGING, ECHOCARDIOGRAPHY, AND CANCER TUMORS MARKERS:

The outcomes of CECT thorax, echocardiography, pleural fluid cytology, and cancer marker studies receive in . It may be seen that lung consolidation had been most often seen in pneumonia followed by lymphadenopathy and malignancy in tuberculosis and malignancy. Some situations of effusion of undetermined aetiology had been characterized by both lymphadenopathy and consolidation(.9)

Kept ejection that is ventricular (normal >50percent) ended up being weakened in CCF (20-40%- 6/9 situations) and tuberculosis (25-35% - 2/7 situations) - suggestive of cardiac aetiology of pleural effusion. Therefore, two situations of tuberculosis effusion had been additionally complicated with CCF-an example of combined CCF and tuberculosis.

Pleural fluid cytology was good for cancerous cells in six (50%) instances of cancerous effusion. Quantities of cancer tumours markers had been elevated in two patients: Cancer antigen (CA 125) - 1 and antigen that is carcino-embryonicCEA) marker - 1.(22)

FIBROTIC BRONCHOSCOPY:

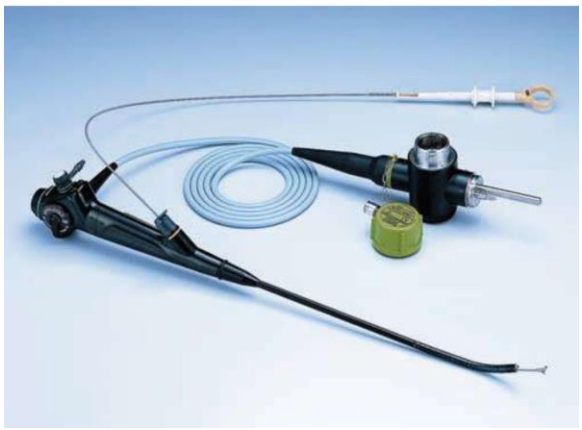
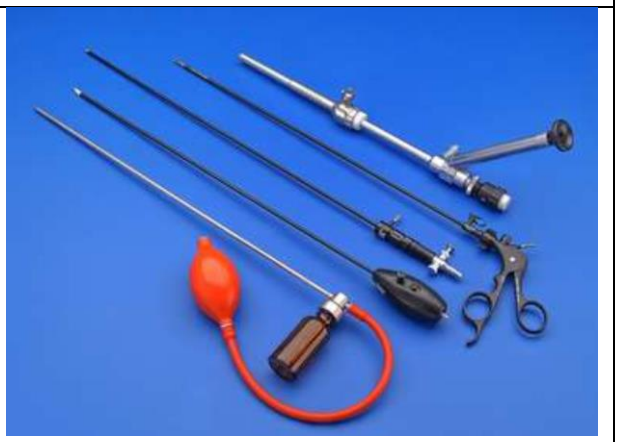
Bronchoscopy is beneficial when you look at the diagnosis of pleural effusion as long as more than one regarding the following four conditions can be found: (a) A pulmonary infiltrate is present from the chest radiograph or perhaps the chest CT scan; in this example, particular attention should always be paid into the area which contains the infiltrate.(9) (b) Haemoptysis is present; haemoptysis when you look at the presence of a pleural effusion is suggestive of an endobronchial lesion (or pulmonary embolism). (c) The pleural effusion is massive, this is certainly, it occupies significantly more than three fourths regarding the hemi thorax.(9) (d) The mediastinum is shifted toward the medial side regarding the effusion; in this example, an endobronchial lesion is probable. In patients with pleural effusions with positive cytology but no haemoptysis or parenchymal infiltrates, bronchoscopy will likely not identify the principal tumour .

Thoracoscopic evaluation having undiagnosed exudative pleural effusions

In every the patients with pleural effusion, cytobiochemical analysis of pleural fluid is necessary to establish the aetiology; however, it really is ideal for diagnosis only in as much as 60% of cases, [23] in around 20% regarding the cases, aetiology often remains unclear even with extensive diagnostic workup. [23] so it's in this context that the thoracoscopy becomes an essential investigation modality, where pleural cavity may be grossly visualized and appropriate representative sample can easily be picked up.

MEDICAL THORACOSCOPY DEFINITION:

• Pleuroscopy/Medical thoracoscopy or Local Anaesthetic Pleuroscopy is a minimally invasive procedure that allows complete visualization of the pleural space using a combination of viewing and working instruments enabling the diagnostic and the therapeutic procedures, like pleural biopsy and talc insufflation for pleurodesis to be performed safely.(24)

SEMI-RIGID THORACOSCOPE	RIGID THORACOSCOPE
	
Olympus LTF-160 autoclavable thoracoscope (Olympus Tokyo, Japan	Rigid thoracoscopy

SEMI-RIGID THORACOSCOPE	RIGID THORACOSCOPE
• More flexibility. • Ability to retroflex the pleuroscope to biopsy the parietal pleura adjacent to the insertion site(25) • Ability to be connected to the existing endoscopic processors and light sources with better image quality • Small working channel with flexible biopsy forceps (2.4 mm) ,small biopsy specimens • Diagnostic/Therapeutic	• Limited flexibility • Inability to retroflex • Needs a separate cold light source with a camera attached to the eyepiece of the telescopex • Rigid biopsy forceps (5 mm) often facilitate bigger and deeper biopsies and are more efficient in breaking down adhesions • Diagnostic/therapeutic(25)

INDICATIONS OF MEDICAL THORACOSCOPY
Diagnostic • Pleural Effusion of Unknown Etiology • Staging of lung cancer with pleural effusion and of mesothelioma • Pneumothorax • Diffuse lung diseases(26)
Therapeutic • Talc poudrage in malignant and chronic, recurrent non-malignant pleural effusions • Talc poudrage in pneumothorax • Parapneumonic effusions and empyema (opening of loculations)(26)

Clinical Application of Pleuroscopy:

• Pleural effusion of unknown etiology

• Malignant Pleural Effusion

• Malignant Mesothelioma

• Tuberculous Pleural Effusion

• Recurrent Pleural Effusions of Benign Etiology

• Empyema and Complicated Para pneumonic Effusions

• Pneumothorax

• Lung biopsy

CONDTRAINDICATION OF MEDICAL THORACOSCOPY:

Absolute Contraindications	Relative Contraindications
Lack of pleural space due to: • Advanced empyema • Pleural thickening • Previous pleurodesis • Suspected mesothelioma with fused visceral and parietal surface(26)	• Intolerable hypoxemia requiring mechanical ventilation • Unstable cardiovascular or hemodynamic status • Bleeding diathesis • Drug hypersensitivity • Inability to tolerate lateral decubitus position • Pulmonary arterial hypertension • Severe obesity

PROCEDURE:

Medical thoracoscopy is often performed by

respiratory physicians in the setting of undiagnosed pleural effusion or malignant pleural disease.

Generally speaking, medical thoracoscopy,

mostly done for diagnostic purposes, can be performed under local anaesthesia in the endoscopy suite(27). In contrast, video-assisted thoracoscopic surgery (VATS) which is commonly done for therapeutic purposes is often performed in the operating room, requiring general anaesthesia with one-lung ventilation (Buchanan and Neville 2004; Horswell 1993).

Physiology of Thoracoscopy

and the Lateral Decubitus

Position:

gravity will cause a vertical gradient in blood flow, preferentially to the dependent lung, as well as higher pleural pressures and an

increased curvature of the dependent hemi diaphragm(27). This will result in the lower, dependent lung being better ventilated and receiving better

perfusion than the upper, nondependent lung.

When the nondependent hemi thorax is opened

during thoracoscopy, the negative pleural pressure causes air to enter the pleural cavity, creating

a pneumothorax

Preoperative Assessment:

A detailed medical and drug history as well as physical examination are essential before the procedure. Imaging, such as chest radiographs(poster anterior, lateral and

decubitus views),pleural ultrasonography or chest computed tomography (CT), I essential in choosing the appropriate insertion sites for the instruments.(27)

Additional preoperative evaluation for the

patient undergoing thoracoscopy includes pulmonary function testing, electrocardiogram (ECG), blood gas analysis and routine blood chemistry analysis, including coagulation studies, complete blood count and studies of renal and liver function The only absolute contraindication to perform thoracoscopy under local anaesthesia is lack of a pleural space due to pleural adhesions.

Preoperative Preparation:

The patient's respiratory and cardiovascular status should be optimised before the procedure. This may include chest physiotherapy, bronchodilators, antibiotics and corticosteroids for patients with chronic obstructive pulmonary disease. Current medications are usually continued except for anticoagulant medications.(27)

Benzodiazepines, such as midazolam or lorazepam, are commonly

used to produce anxiolytics and sedation before

the procedure is started.

Monitoring:

Currently, there are no specific guidelines for monitoring requirements during thoracoscopy. Thoracoscopy, especially when done under local anaesthesia, is a short procedure and does not warrant invasive intraoperative monitoring. An

intravenous peripheral line should be inserted to administer fluids and medication during the procedure. Oxygen is given via nasal cannula or face mask. Basic mandatory monitoring, when sedation and analgesia is administered, should include continuous electrocardiographic monitoring, digital pulse oximetry and regular non-invasive blood pressure measurements (at least every5 min). General anaesthesia should be undertaken in the presence of trained personnel, and additional monitoring is required including capnography or capnometry, blood pressure monitoring and continuous or regular temperature

Thoracoscopy Under Local Anaesthesia:

Many authors have confirmed that thoracoscopy

for the diagnosis of pleural disease can be performed safely under local anaesthesia.

The procedure can be performed using local anaesthesia with “conscious sedation” (Loddenkemper 1998; Boutin et al. 1991; Menzies and

Charbonneau 1991)(28). This widely used term, also known as diaz-analgesia, refers to a patient who remains awake or arousable and spontaneously breathing while having been administered small doses of anxiolytics and analgesics.

The most commonly used drugs for sedation are midazolam and propofol. Benzodiazepines, such as midazolam or diazepam, are more widely

used because they cause less hemodynamic instability and respiratory depression than propofol

Equipment:

Since the first detailed description by Jacobaeus in 1910 [1], rigid endoscopic

instruments such as stainless-steel trocars and telescopes

have been pivotal in the performance of thoracoscopy (fig. 2). With the introduction of the semi-rigid (semi-flexible) pleuroscope

(Olympus Corporation, Tokyo, Japan), similar in design and handling to the flexible bronchoscope, pleuroscopy is now frequently performed with this technique, analogous to flexible bronchoscopy (fig. 3). Equipment requirements include trocar, thoracoscope/pleuroscope, biopsy sy forceps, unipolar coagulation forceps, light sources, video system, aspiration system, talc, chest tubes and drainage systems. The usual diameter of the rigid thoracoscope is 9 mm, that (Placeholder1)of the semi-rigid pleuroscope 7 mm.

Performance of medical thoracoscopy/pleuroscopy:

The physician and assistant nurse clean their hands with a standard surgical scrub technique and then put on a sterile gown and gloves. The patient's skin is prepared by shaving and disinfecting a large area to include from the sternum to the clavicle and across the axilla past the scapula to the spinous processes, and down to the base of the thorax. Then the patient is covered with sterile sheets. Usually, the thoracoscopist faces the patient during the procedure (but may change position if needed), while the assistant is across the table(29).

Then the following steps are taken: at the selected point of entry (usually near the midaxillary line), a vertical incision is made with the scalpel through the skin and subcutaneous tissue, correct to the size of the trocar should be used, usually of approximately 10 mm, parallel with and in the middle of the selected intercostal space(29). Then the trocar is inserted in a corkscrew motion until the sudden release

of resistance (after passing the costal pleura) is felt, while holding the handle of the trocar firmly in the palm of the hand, as the extended index finger, for safety's sake, limits the depth of insertion needed to reach the pleural space, previously established with the local anaesthetic needle. While the trocar is in the pleural cavity, the trocar is removed and the cannula should lie 1–3 cm within the pleural cavity and be held in position by the assistant.

\Then the pleuroscope was placed in the cannula and advanced into the pleural cavity under direct vision through the trocar. If we want , the pleural fluid is removed with a suction catheter or directly through the working channel of the semi-rigid pleuroscope. In cases of a large pleural effusion, the fluid should be aspirated completely and not too hastily. This is without risk of development of immediate re-expansion oedema, as long as air is allowed to enter the pleural space through the cannula to replace the aspirated volume, thus maintaining normal intrapleural pressure.

The pleural space can be checked through the thoracoscope/pleuroscope, either directly or indirectly by video. The endoscope was advanced towards the back and directed towards the diaphragm in the costophrenic angle. After completely removing the pleural fluid, systematic exploration of the chest cavity is performed by manoeuvring the thoracoscope/pleuroscope.. preferred orientation is simple, sometimes fine adhesions resembling spider webs may interfere with complete examination of the pleural cavity. These could be mechanically separated by the help of bronchoscopic brush forceps. Fibrous bands or vascular adhesions should be avoided to take biopsy but preferred for pleural brushing . Suspicious areas are biopsied through the working channel of the thoracoscope/pleuroscope and pleural

bruising technique to and fro motion . Often, multiple biopsies are necessary at least 4-6 biopsy bits nessceasry to histopathology. But pleural brushing can brusing various areas reduce the risk of air leak.

. If lesions are present on the parietal pleura, rather than visceral pleural lesions, these should be biopsied, thus avoiding the risk of prolonged air leak by the help of pleural brushing.. Sufficient quantities of tissue should be obtained and various areas pleural brushing, especially if immunohistochemistry studies are required for tumours such as carcinoma of the breast. In the presence of undiagnosed exudative pleural effusions, biopsies and pleural brushing should be taken at a minimum from microscopically suspicious lesions at the anterior and posterior chest wall and the diaphragm for histological evaluation, and, if suspicious for tuberculosis, also for mycobacterial culture. Then doing pleural brush by the help of bronchoscopy brush forceps in costal pleura , diaphragmatic pleura if any lesions present in visceral pleura doing pleural brush more safety than pleural biopsy . Pleurodesis was avoided in patients with an inconclusive macroscopic appearance or with signs of lung entrapment

POST-THORACOSCOPIC CHEST-TUBE INSERTION

At the ending of the procedure, a chest tube was inserted to drain residual air and fluid from the pleural cavity, allowing the lung to re-expand. The indications for removal of chest tubes placed for various pathological processes are as varied as the indications for tube placement. In general, absence of air leakage and cessation of fluid flow (<100–150 mL daily) are reasonable guidelines

PLEURODESIS:

Medical thoracoscopic talc pleurodesis is a palliative and effective treatment for malignant pleural effusion. In addition, postoperative simple negative pressure chest tube drainage significantly shortens the drainage time. However, thoracoscopic pleurodesis is less effective for the treatment of effusion caused by lung cancer and pleural mesothelioma compared with that caused by other types of cancers.(30)

. In study by sk Jindal et al (8)‘’Medical Thoracoscopy for Undiagnosed Pleural Effusions’’ published in Indian Journal of Chest Diseases and Allied Sciences. 2011;53(1):21 .Experience from a Tertiary Care Hospital in North India35 patients were studied .the diagnostic yield of thoracoscopic pleural biopsy was 74.3% in patients with undiagnosed pleural effusions. Pleural malignancy was diagnosed in 48.6% of patients. Tuberculosis was diagnosed with pleural biopsy in 22.8% of patient.

Khaled H. Mohamed et al (31)studied under the heading of ‘’Usefulness of fiberoptic pleuroscopy and brushing in patients with unknown pleural effusion’’ published in Egyptian Journal of Chest Diseases and Tuberculosis. 2013 Jan 1;62(1):111-4.comparing thoracoscopy pleural biopsy and pleural brush cytology in twenty case cases .sixteen cases were finally documented to have malignancy, pleuroscopic biopsy provided diagnosis in 12 (75%) of 16 cases. Pleural brushing was diagnostic in 10 (62.5%) of 16 cases. . When all procedures were used in combination,

the yield increased to 87.5%. When pleural brushing (PBR) was used in addition to pleural biopsy by fiberoptic bronchoscopy, the yield of the diagnosis increased more than 10%. Reduce the complication of biopsy procedure by doing pleural brush in complicated areas.

In another article titled “Efficacy of Pleural Brush Cytology in the Diagnosis of Pleural Diseases ” by Rakhee Sodhi Khanduri and colleagues (32)from Departments of Pulmonary Medicine and Pathology, Himalayan Institute of Medical Sciences, Dehradun, Department of Pulmonary Medicine, All India Institute of Medical Science, , December 2015 and June 2017 ,published in Indian Journal of Respiratory Care. 2019 Jul 1;8(2):76

the following observations were made: This is a prospective study .totally present the data of 45 patients. The study participants comprised of consecutive patients in whom the etiology of pleural effusion remained undiagnosed despite routine investigations of pleural fluid such as cell count, adenosine deaminase, lactate dehydrogenase, sugar, protein, cytology, and polymerase chain reaction. Results were Pleural brush cytology was positive in 26 patients with malignancy, 13 for infection and 6 were inadequate . However, forceps biopsy was positive in 42 cases out of 45 (93.3%) in detecting malignancy and infectious diseases. While observing the results from the brush cytology, they found positivity in 39 cases (86.67%). On comparing brush cytology report with that of pleural biopsy, 80% concordance (36 patients out of 45) was observed, which was highly significant. In this study, the procedure of

medical thoracoscopy was generally well tolerated by our patients, with no major complications recorded. Minimal complications were recorded with pleural brush procedure. However, forceps thoracoscopic biopsy is more painful than brushing.

shajahal dhooria et al(33) ‘’ A Randomized Trial Comparing the Diagnostic Yield of Rigid and Semi rigid Thoracoscopy in Undiagnosed Pleural Effusions ‘’ published in . Respiratory care. 2014 May 1;59(5):756-64. They 145 screened subjects with exudative pleural effusions, 90 were randomized to undergo thoracoscopy with the 2 thoracoscopes (n = 45 each). The diagnostic yield of rigid thoracoscopy was superior to semirigid thoracoscopy (97.8% vs 73.3%, P = .002) on an intention-to-treat analysis but was similar (100% vs 94.3%, P = .18) in those with successful biopsy. The requirement of sedative/analgesic agents was higher in the rigid thoracoscopy arm. The scar size was slightly larger (mean ± SD, 23.1 ± 4 vs 18.7 ± 3.2 mm, P = .0001), whereas the biopsy sample size was distinctly larger in the rigid arm (mean ± SD, 13.9 ± 4.4 vs 4.4 ± 1.4 mm, P = .001). The operator-rated visual analog scale score for the ease of taking a biopsy sample was significantly higher with the rigid instrument (mean ± SD, visual analog scale 86 ± 12 vs 79 ± 12 mm, P = .01), while the quality of image was superior in the semirigid arm (mean ± SD, visual analog scale 88 ± 7 vs 92 ± 5 mm, P = .002). The number of complications were similar in the 2 groups.

I Tong Z.-H. et al(34) n this research that is 9-year satisfactory pleural biopsy examples were obtained in 833 patients, and Medical thoracoscopy unveiled cancerous pleural effusion in 342 (41.1%) clients, benign pleural effusion in 429 (51.5%) patients, and 62 (7.4%) clients could not get definite diagnoses. The entire efficiency that is diagnostic of was 92.6% (771/833). After Medical thoracoscopy, the

only real complication that is serious empyema, seen in 3 clients (0.4%). The most typical small complication was transient upper body pain (44.1%) from the chest pipe that is indwelling.

In research Pleural controversies: image guided biopsy vs. thoracoscopy for undiagnosed pleural effusions? Done by article J Thorac Dis. 2015 Jun;7(36):1041-51. doi: 10.3978/j.issn.2072-1439.2015.01.36. Review. 22 case series assessing medical thoracoscopy for the diagnosis of malignant disease showed a 92.6% sensitivity . In the event series some patients received both blind biopsy that is pleural medical thoracoscopy. When people that have good biopsies which are blind excluded, the sensitivity stayed high at 90.1% (334/337; 95% CI, 86.6-92.9%). Also in malignancy, medical thoracoscopy may be considered in patients with suspected TB where biopsy that is standard neglected to elicit an analysis. One study that directly compared medical thoracoscopy to Abrams needle biopsy unearthed that thoracoscopy had 100% sensitiveness for diagnosing TB (35). Nonetheless, considering the fact that the research that is same that blind pleural biopsy features a sensitiveness of 79% in TB, this remains the research of choice in areas having a high burden of condition (35).

medical thoracoscopy includes a rate that is low of and mortality despite being fairly invasive. Rahman et al. calculated the combined complications and mortality prices in 47 studies of medical thoracoscopy . A mortality ended up being found by them rate of 0.34% (95% CI, 0.19-0.54), a large number of these (9/16) being from the large control that is randomised of talc poudrage which led to the recognition of the use of non-graded talc being a potentially harmful intervention (61). Significant

complications empyema that is including haemorrhage, port site tumour growth, bronchopleural fistula, postoperative pneumothorax or air leak and pneumonia had been reported in 1.8per cent of cases (95% CI, 1.4-2.2%).

In loganthan nattusamy et al(37) study **Utility of semi-rigid thoracoscopy in undiagnosed exudative pleural effusion** article Lung India. 2015 Mar-Apr; 32(2): 119–126 An overall total of 48 patients underwent semi-rigid thoracoscopy between August 2012 and December 2013 for undiscovered effusion that is pleural. Mean age was 50.9 ± 14.1 years (range: 17–78 years). Pre-procedure clinico-radiological diagnoses had been malignant effusion that is pleural patients (75%)], tuberculosis (TB) [10 (20.83%) clients], and empyema [2 patients (4.17%)]. Clients with empyema underwent the process for pleural biopsy, optimal keeping of intercostal tube and adhesiolysis. Thoracoscopic biopsy that is pleural pleural malignancy in 30 (62.5%) clients and TB in 2 (4.17%) patients. Fourteen (29.17%) clients had been diagnosed with non-specific pleuritis and pleura that is normal diagnosed for a pleural biopsy in 2 (4.17%) patients. Overall, a definitive diagnosis of either malignancy that is pleural TB was acquired in 32 (66.7%) patients. Combined sensitivity that is overall specificity, positive predictive value and negative predictive value of thoracoscopic pleural biopsy for cancerous pleural effusion were 96.77%, 100%, 100% and 66.67%, correspondingly. There was clearly no mortality that is procedure-related. On performing an evaluation that is systematic of, four studies on semi-rigid thoracoscopy from Asia had been identified.

In another article titled “Thoracoscopic pleural brushing- An addendum in diagnostic thoracoscopy’ by Yuvarajan Siva, T K Gangi Reddy

and colleagues(38) published in European Respiratory Journal 2017 they have reported Thoracoscopic pleural biopsy was diagnostic in 49 of 52 patients (94.2%). Thoracoscopic pleural brushing was diagnostic in 47 patients (90.4%). Histhopathology revelaed malignancy (82.7%), granulomatous inflammation(11.5%) and nonspecific inflammation(5.7%). The sensitivity and specificity of pleural brushing were 93.8% and 66.7% respectively. Interestingly, pleural brushing was the only diagnostic modalilty in one patient which was reported as adenocarcinoma.

This was a prospective study of 52 patients. Data were obtained before thoracoscopy by thorough clinical history, patient interview, and physical examination. This prospective study was done in the Department of Pulmonary Medicine, Sri Manakula Vinayagar Medical College, Pondicherry, India on 52 patients with exudative pleural effusion in whom pleural fluid analysis and closed pleural biopsy results were inconclusive.

In Bejui-Thivolet et al study conducted in 1984 under the heading of ‘’Thoracoscopy with ple Revue de pneumologie clinique. 1984;40(5):311-9.ural brushing. A new diagnostic method for pleural diseases’’ published in they concluded Pleural brushing could become performed under thoracoscopic examination.Pleural brushing can be performed under thoracoscopic examination. The combined usage of all the three techniques of diagnosis (macroscopy, biopsy, cytology) achieved optimal diagnostic results. From September 1980 to October 1981 we all have performed 150 thoracoscopies for pleural effusions, while the results of conventional pleural cytology and biopsy were negative. In 108 cases pleural brushing and biopsy had been both performed. The diagnosis was in thirty-seven cases non malignant disease states

associated with effusions and in 71 cases tumoural effusions. Among the thirty-seven cases of non malignant diseases shows associated with effusions were 6 mechanical effusions, 27 inflammatory processes, 4 infectious processes. Among the seventy-one cases of tumoural effusions were 3 benign pleural lipomas, 50 metastatic carcinomas, 18 carcinomatous mesotheliomas. We analyzed the diagnostic accuracy of pleural brushing: in non malignant diseases pleural brushing show the non tumoural features of the process, in metastatic tumours biopsy was positive in 80% of the cases; pleural brushing in 78% of cases; taken together they allowed the diagnosis in 86% of the cases, in carcinomatous mesotheliomas biopsy was positive in 82.3%, pleural brushing in 78%; taken together they allowed the diagnosis in 89% of the cases. Pleural brushing helps a rapid cytological diagnosis, improves the histological outcome as well as may be utilized to get cellular material in areas dangerous to biopsy.Pleural brushing helps a rapid cytological diagnosis, increases the histological results and may be used to get cellular material in areas dangerous to biopsy.

AIM

Primary objective:

A)Comparison between medical thoracoscopic pleural biopsy and pleural brush cytology in undiagnosed exudative pleural effusions.

b)To compare the yield of thoracoscopic pleural biopsy and thoracoscopic pleural brush cytology in undiagnosed exudative pleural effusions.

Secondary objective:

c)To minimize the thoracoscopy pleural biopsy complication by doing pleural brush cytology for undiagnosed exudative pleural effusions.

MATERIALS AND METHODS

Study population :

Inpatients with undiagnosed exudative pleural effusion in Department of respiratory medicine, Stanley Medical College and Govt. Hospital of Thoracic

Medicine, Tambaram.

Place of study:

GHTM ,TAMBARAM AND DEPT OF RESPIRATORY MEDICINE .

Study duration : 1 year

SUBJECT SELECTION:

Inclusion criteria :

1.All inpatients with undiagnosed exudative pleural effusions.

Exclusion criteria

1.Transudative effusion

2.Neutrophilic effusion

3.Pyothorax

4.Hemothorax

5.Patients less than 12 years of age

6.Pregnant and lactating mother

7.Patients with blood coagulation disorder

8.Co morbid conditions like coronary artery disease, cerebrovascular disease

patients not willing to give consent for thoracoscopy

METHODOLOGY:

- All inpatients with undiagnosed exudative pleural effusion shall be taken up in the study.
- Patients will explain about the nature of study and informed consent will be obtained.
- Patients' blood investigations and pleural fluid analysis shall be done. Chest ultrasonography and computed tomography (CT) of the chest shall be performed to assess the feasibility of thoracoscopy.
- Also patients with bleeding diathesis, hemodynamic instability, arrhythmias and intractable cough are ineligible for doing thoracoscopy**.**
- The medical thoracoscopy will be done with complete aseptic precaution under local anaesthesia, conscious sedation and potent analgesia.
- The procedures have to be performed through a single puncture technique using semi rigid thoracoscope . Patients will be placed in the lateral decubitus position with the affected side upward.(40)

- The patient's blood pressure, pulse rate, and oxygen saturation will be monitored continuously.
- Supplemental oxygen has to be given to the patients to maintain oxygen saturation. Lidocaine 2% 10–20 ml is used for local anaesthesia
- Conscious sedation may be achieved with intravenous midazolam (0.05 mg/kg body weight) to be given for analgesia prior to the commencement of the procedure.
- After local anaesthesia is placed, a small skin incision is to be made in the mid-axillary line either in the fifth or sixth inter-costal space(40).
- The skin incision is to be followed by introduction of a 10-mm blunt trocar with a cannula into the thoracic cavity. After the trocar is removed, all fluid is suctioned, and then thoracoscope is to be introduced into the pleural cavity, where the parietal and visceral pleura are to be successively inspected.
- Pleural brush is to be used first, followed by forceps biopsy to obtain pleural specimens from suspect areas under visual control.
- The procedure shall be followed by the placement of a 24F standard chest tube. A chest radiograph will be obtained post procedure.(40)
- The histopathological results will be noted. Major and minor complications are to be routinely recorded.
- Major complications are to be retrospectively defined as events requiring active medical management during the hospital stay. Minor complications are events requiring medical supervision only.
- The results so obtained will be analysed using statistical methods.

EVALUATING UNDIAGNOSED PLEURAL EFFUSION IN GOVERNMENT TAMBARAM SANITORIUM:

- patients who are all admitted with dyspnoea and pleurisy type of chest pain, dry or productive cough inward evaluating proper basic investigations CBC, LFT, RFT, RBS, HIV, and viral markers were done.
- the clinical examination then patient refer to chest radiograph posterior-anterior view and lateral view in a pathological area taken

  if the patient has evidence of pleural effusion in chest x-ray ultrasound chest and ultrasound neck and axilla did
- ultrasound abdomen and pelvis mandatory for patients who are all have pleural effusion evidence in clinical examination and chest x-ray.

  in ultrasound chest itself quantify the pleural fluid in pleural space and ultrasound-guided pleural fluid aspiration done around 60-80 ml for pleural fluid examination like pleural fluid cell count, protein, glucose, LDH, ADA, gram stain, acid-fast bacilli, cytology and cell block sent to laboratory with precaution
- pleural fluid met lights criteria and modified lights criteria differentiate transudate and exudate.

  if the exudative pleural fluid cause of pleural fluid analysis.in India like country tuberculosis pleural effusions and parapneumonic effusion and malignant pleural effusion rule out.
- in pleural fluid ADA, three consecutive pleural fluid cytology and cell block we considered undiagnosed pleural effusion after wards patients evaluating for

medical thoracoscopy fitness cardiology opinion get pre-evaluation for thoracoscopy done after consent gets from a patient.

- in our study, we selected for forty patents to have undiagnosed pleural effusion then get consent for medical thoracoscopy doing.

OBSERVATION AND RESULTS:

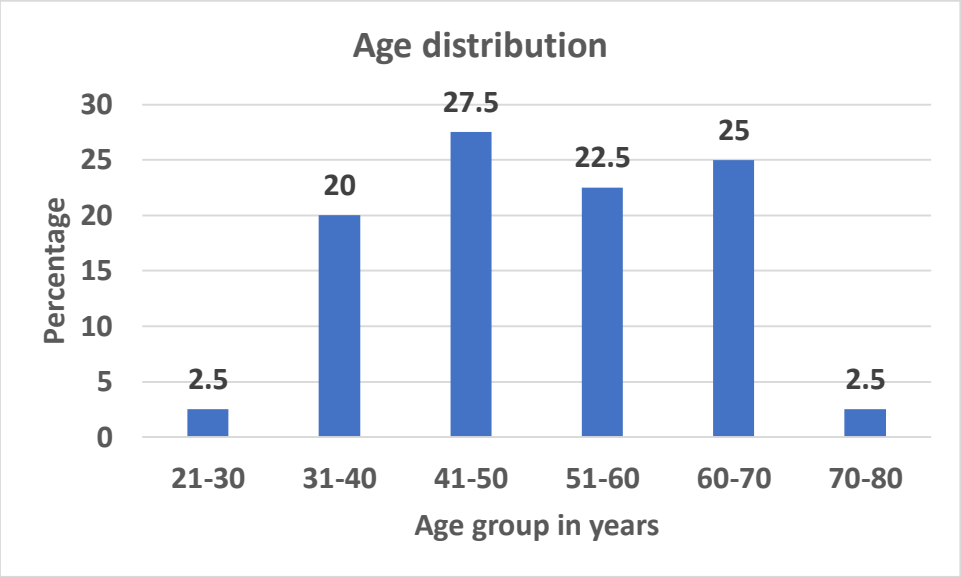
Mean (SD) age was 51 (13) years. Minimum age was 21 years and maximum age was 76 years

TABLE-1. AGE DISTRIBUTION

Age (years)	Frequency	Percentage
21-30	1	2.5
31-40	8	20.0
41-50	11	27.5
51-60	9	22.5
60-70	10	25.0
70-80	1	2.5
Total	40	100

In this study most of the patients were in the age group of 40-60 years. 50% of the study population was in the age group of 40 -60 years and 27.5% were in the age group of > 60 years.

FIGURE-18 AGE DISTRIBUTION



GENDER DISTRIBUTION:

TABLE-2 GENDER DISTRIBUTION (N=40)

Gender	Frequency	Percentage
Male	27	67.5
Female	13	32.5
Total	40	100

In this study most of the patients were male.

67.5% of the study population were males and 32.5% females.

FIGURE 19 GENDER DISTRIBUTION

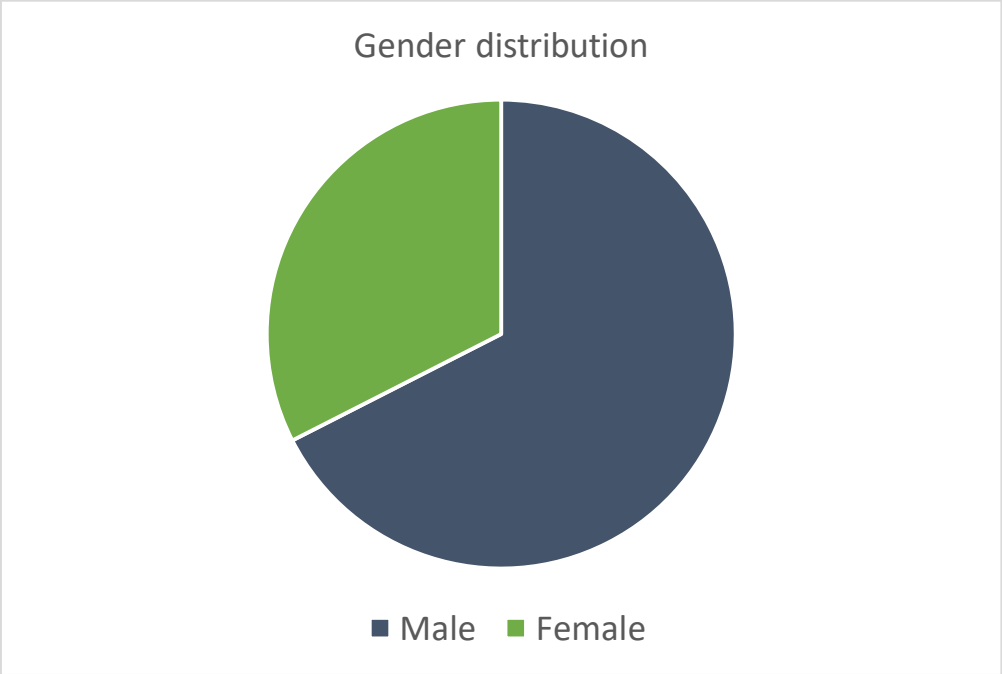
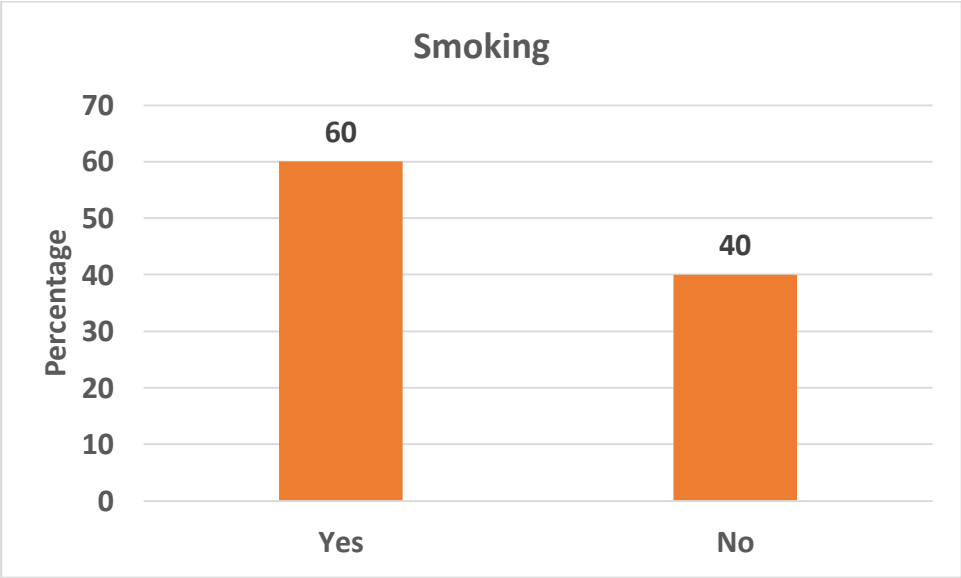


TABLE-3. SMOKERS DISTRIBUTION

Smoking	Frequency	Percentage
Yes	24	60
No	16	40
Total	40	100

Median smoking index was 30(minimum-0 and maximum 40)

FIGURE20 SMOKERS DISTRIBUTION



DESCRIPTION OF PLEURAL FLUID PARAMETERS:

TABLE-4 LEVELS OF PLEURAL AND SERUM PARAMETERS

Parameter	Statistic	Values
Protein	Mean (SD)	4.96 (0.83)
ADA	Mean (SD)	40.5 (11.1)
LDH	Median (Min-Max)	476 (145-2314)

The mean value of pleural fluid protein 40 undiagnosed pleural effusion 4.96, the mean value of ADA 40.5 40.5 , the median value of LDH 476.

TABLE-5. LATERALITY OF PLEURAL EFFUSION

Laterality	Frequency	Percentage
Right	21	52.5
Left	17	42.5
Bilateral	2	5.0
Total	40	100

- chest x-ray posterior-anterior view:

. we identified 21 patients had a right-sided pleural effusion,17 had left-sided effusion 2 patients were bilateral effusion .

FIGURE21 LATERALITY OF PLEURAL EFFUSION

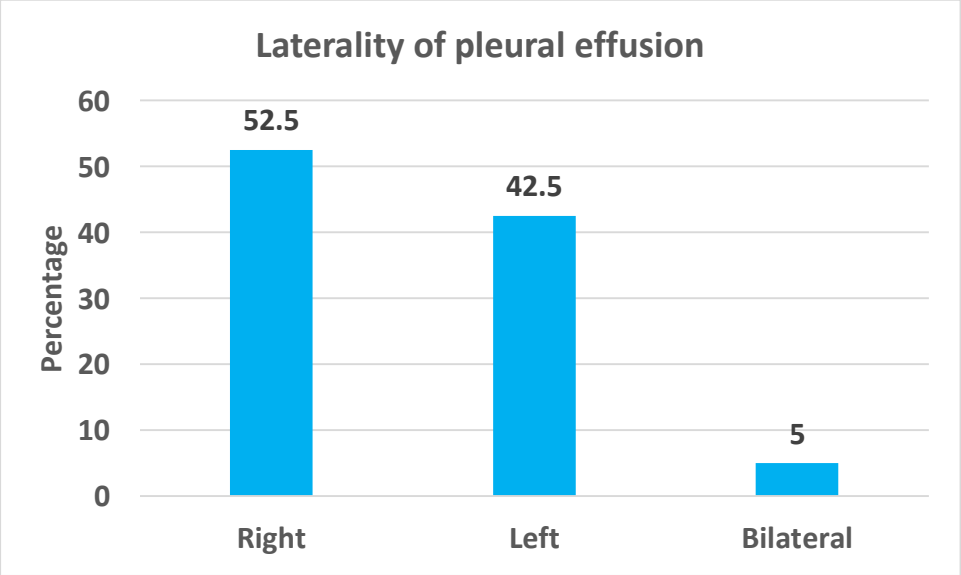


TABLE-6. SEVERITY OF EFFUSION

Laterality & Severity	Frequency	Percentage
Right Massive	21	52.5
Left Massive	16	40.0
Left Moderate	1	2.5
Bilateral	2	5.0
Total	40	100

40% study population had left side massive effusion undiagnosed pleural effusion.

FIGURE22.SEVERITY OF EFFUSION

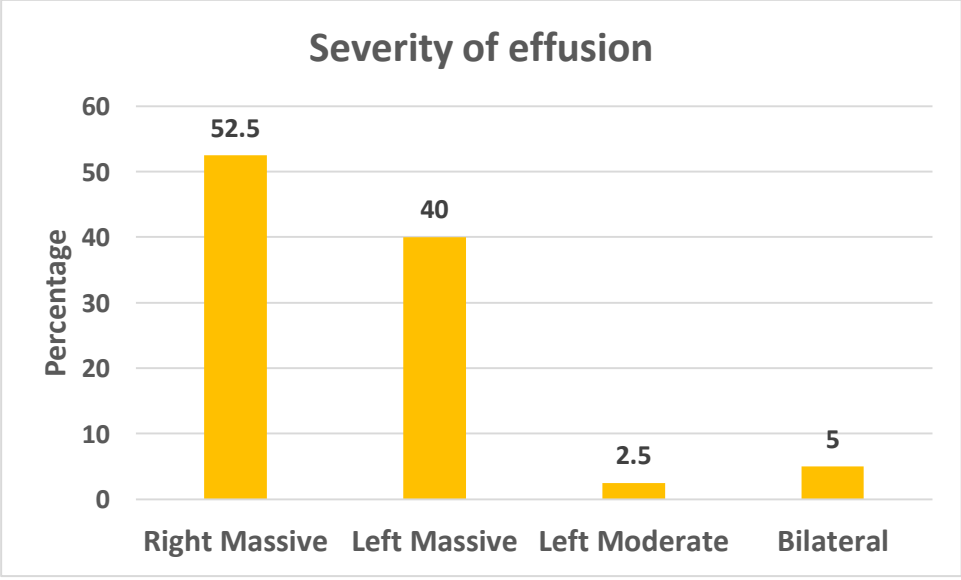


TABLE-7 CBNAAT RESULTS

TABLE-7 CBNAAT RESULTS

Result	Frequency	Percentage
Positive	5	12.5
Negative	35	87.5
Total	40	100

In pleural fluid cartridge based nucleic acid amplification test diagnosed 5 patients had tuberculosis.

FIGURE23 CBNAAT RESULTS

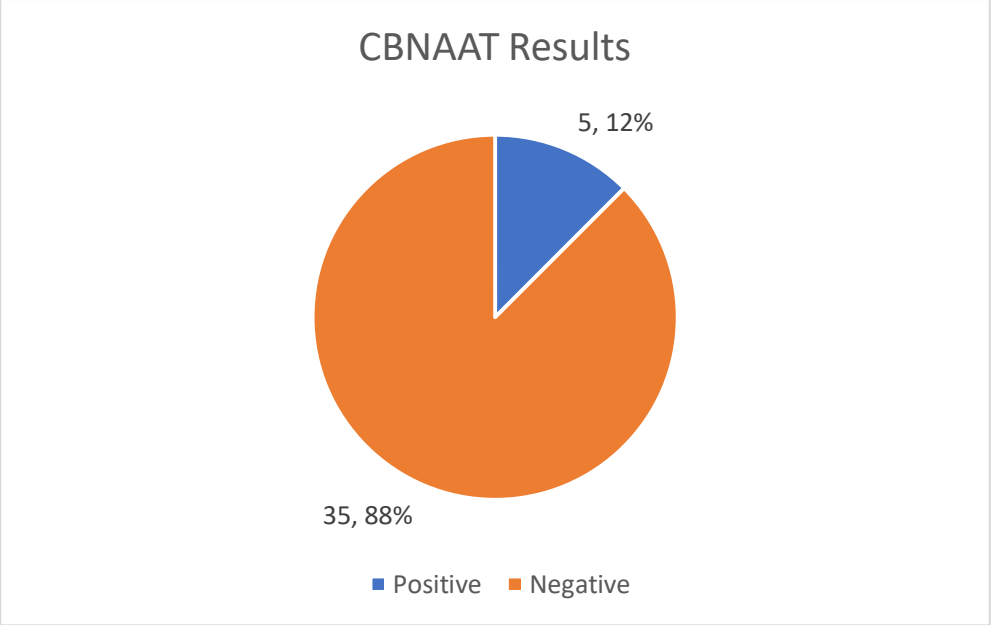


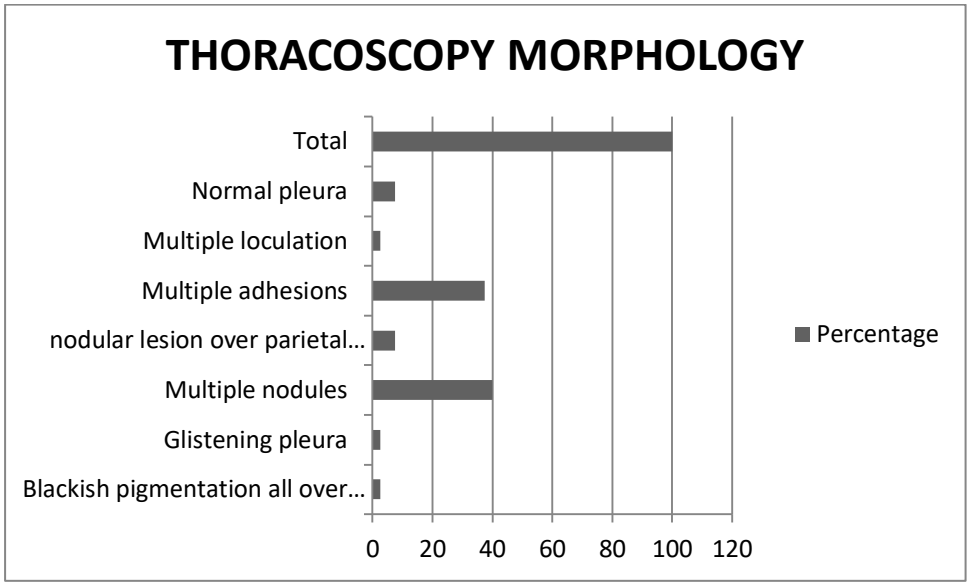
TABLE-8 THORACOSCOPY MORPHOLOGY DISTRIBUTION

Thoracoscopy morphology	Frequency	Percentage
Blackish pigmentation all over pleura	1	2.5
Glistening pleura	1	2.5
Multiple nodules	16	40
Nodular lesions over parietal pleura and visceral pleura	3	7.5
Multiple adhesions	15	37.5
Multiple loculation	1	2.5
Normal pleura	3	7.5
Total	40	100

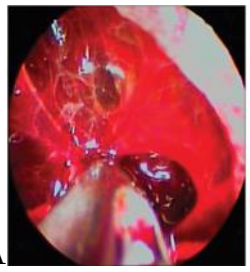
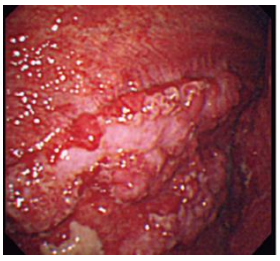
- In our study population ,Visualization of the pleural space by thoracoscopy , nodule was the most predominant finding in parietal pleura . Most of the detected lesions were nodules on parietal and visceral pleura found in 19 patients. Among them 16 were obseverd with nodules on the parietal pleura while 3 were observed with nodules on the visceral pleura in 3 patient.

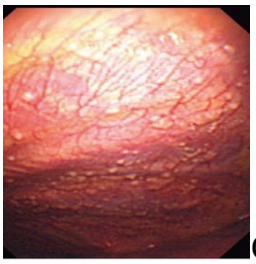
Adhesions 15 and loculation were found 3 patients out of 40

FIGURE 24 THORACOSCOPY MORPHOLOGY DISTRIBUTION

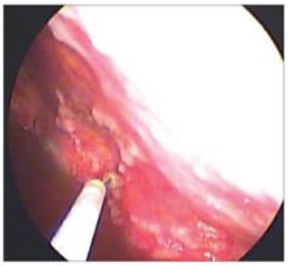
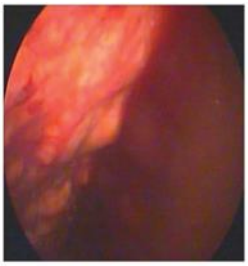
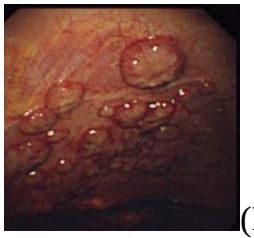


THORACOSCOPIC PLEURAL ABNORMALITIES:(A)Dense adhesions at the parietal pleura which are being broken by help of biopsy forceps.(b).malignant mesothelioma (c).sago grain appearance in tuberculosis (d) Brush samplings on nodule in parietal pleura (e) pleural metastasis of lung adenocarcinoma

A   B

 C

Brush samplings on nodule in parietal pleura

   (D)

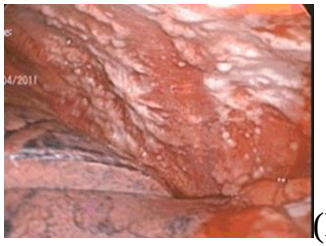
 (E) pleural metastasis of lung adenocarcinoma

TABLE-9 DISTRIBUTION OF HAEMORRHAGIC EFFUSION

Colour of pleural effusion	**Frequency**	**Percentage**
Haemorrhagic effusion	13	32.5
Straw colour effusion	27	67.5
Total	40	100

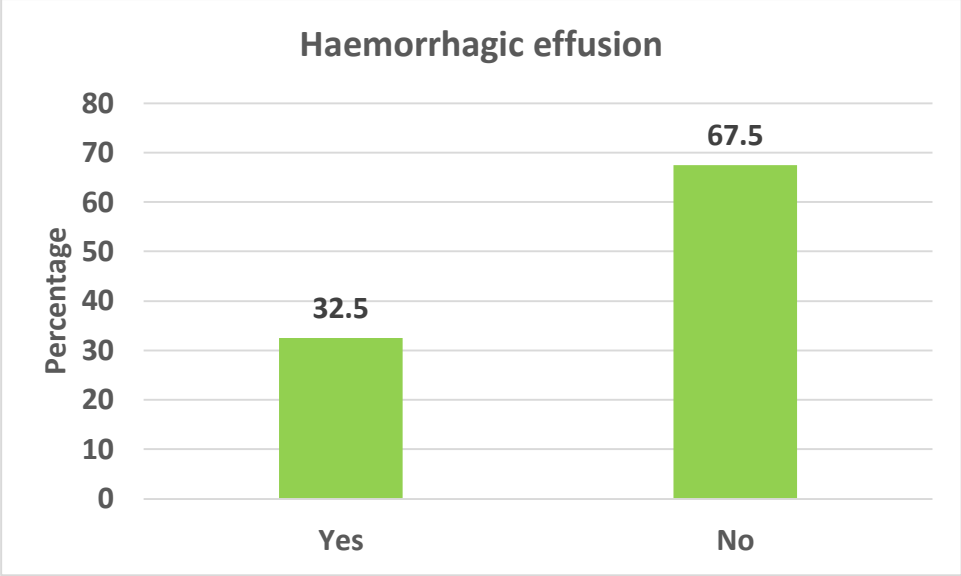


FIGURE26 DISTRIBUTION OF HAEMORRHAGIC EFFUSION

In our study population 32.5% had Haemorrhagic pleural effusion .

TABLE-10 DISTRIBUTION OF ADHESION

Adhesion	**Frequency**	**Percentage**
Yes	15	37.5
No	25	57.5
Total	40	100

In our study population 42.5 patients were present adhesion in pleural cavity

TABLE-11 DISTRIBUTION OF NODULE

Nodule	Frequency	Percentage
Yes	19	47.5
No	21	52.5
Total	40	100

In our study population , Most of the detected lesions were nodules on parietal and visceral pleura found in 19 patients. Among them 16 were obseverd with nodules on the parietal pleura while 3 were observed with nodules on the visceral pleura in 3 patient.

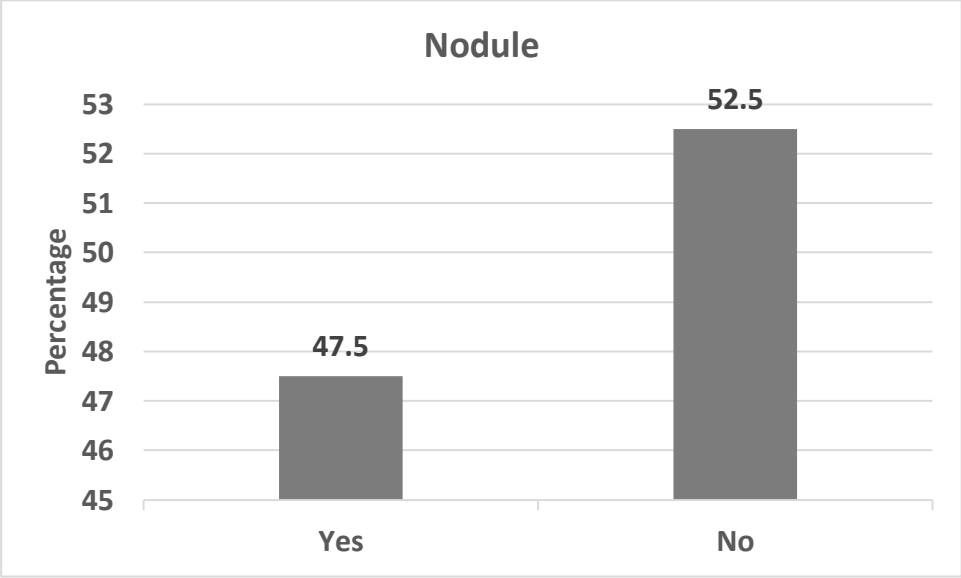


FIGURE26 DISTRIBUTION OF NODULE

TABLE-12. DISTRIBUTION OF THORACOSCOPIC PLEURAL BRUSH CYTOLOGY REPORT

Thoracoscopy Brush Report	Frequency	Percentage
Positive for Malignancy	11	25.0
Adenocarcinoma	6	15.0
Malignant melanoma	1	2.5
Granuloma	13	32.5
Necrotic Material	4	10.0
Squamous cell carcinoma	1	2.5
Inconclusive	4	10.0
Total	40	100

In our study population ,the thoracoscopic pleural brushing revealed granuloma in 32% of patients and malignancy in 45% patients.

FIGURE 27 DISTRIBUTION OF THORACOSCOPIC PLEURAL BRUSH CYTOLOGY REPORT

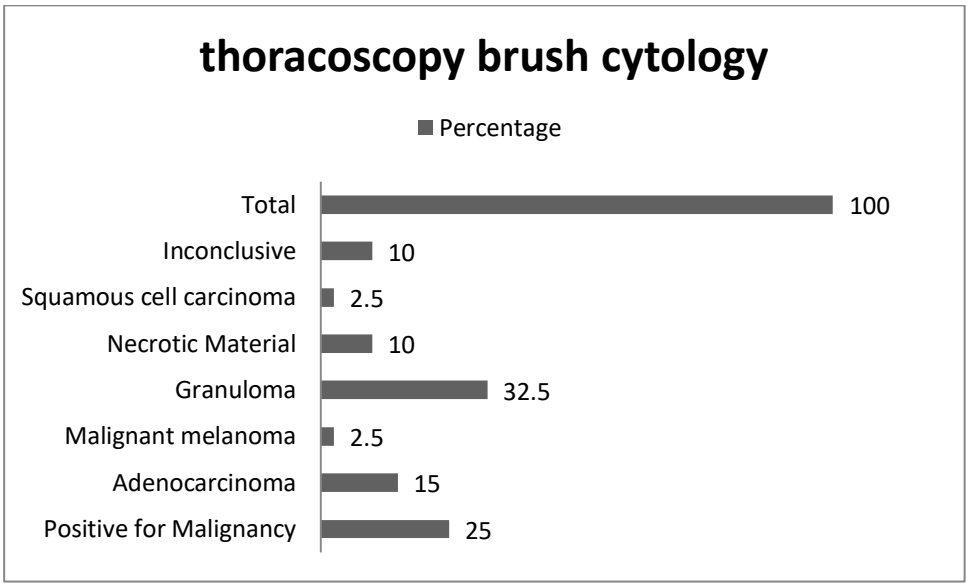


TABLE13 DISTRIBUTION THORACOSCOPIC PLEURA BIOPSY HISTOPATHOLOGY REPORT

Thoracoscopy histopathology	Frequency	Percentage
Malignant melanoma	1	2.5
Adenocarcinoma	11	27.5
mesothelioma	1	2.5
Small cell lung carcinoma	1	2.5
Tuberculosis	14	35
Osteosarcoma Secondary's	1	2.5
Squamous cell carcinoma	5	12.5
Inconclusive	6	15.0
Total	40	100

In our study population medical thoracoscopy diagnosed malignancy in 20 patients its about 50% of this study population.

FIGURE29 DISTRIBUTION OF THORACOSCOPY HISTOPATHOLOGY

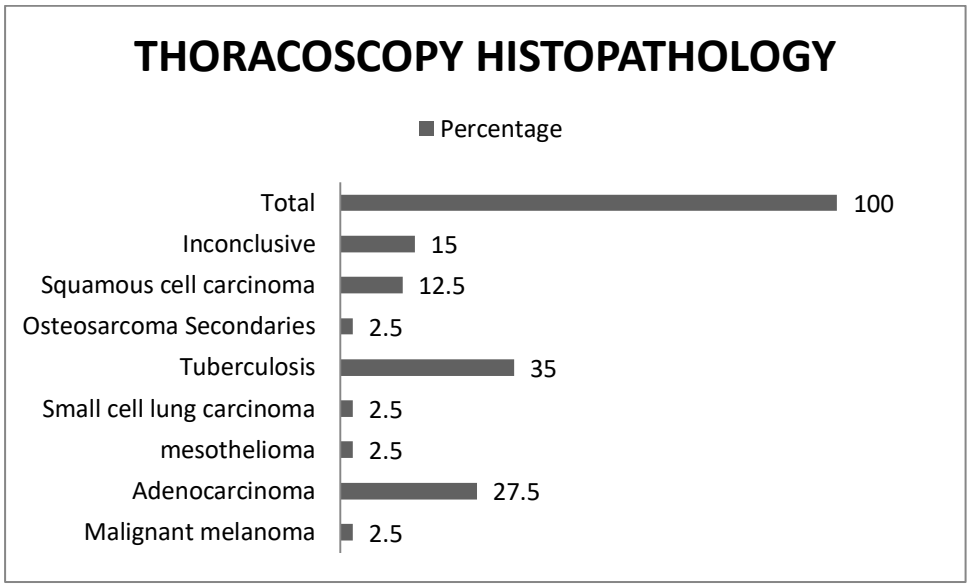


TABLE-14. DISTRIBUTION OF COMBINED PROCEDURE THORACOSCOPIC PLEURAL BIOPSY AND PLEURAL BRUSH CYTOLOGY REPORT:

Malignancy	Frequency	Percentage
Yes	21	52.5
No	19	47.5
Total	40	100

Considering the results obtained by both forceps and brush in the same patient 52.5% undiagnosed pleural effusion cases confirm a case of malignancy.

FIGURE30 DISTRIBUTION OF COMBINED PROCEDURE PLEURAL BIOPSY AND PLEURAL BRUSH CYTOLOGY

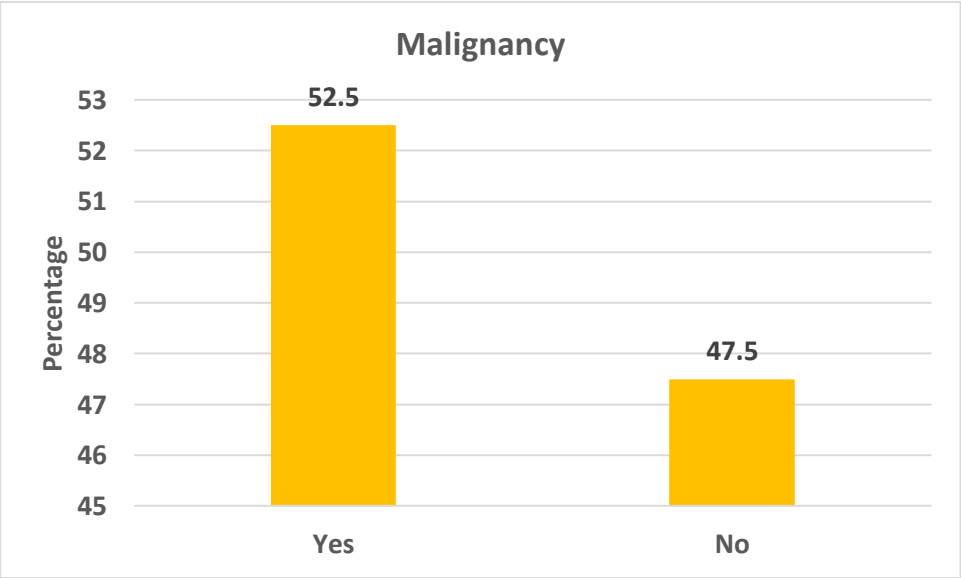


TABLE-15. DISTRIBUTION OF TUBERCULOSIS AS FINAL DIAGNOSIS IN COMBINED PROCEDURE

Tuberculosis	Frequency	Percentage
Yes	14	35.0
No	26	65.0
Total	40	100

In pleural biopsy plus pleural brush doing in the same patient revealed 35% of patients have tuberculosis in our study population.

FIGURE31 DISTRIBUTION OF TUBERCULOSIS PATIENTS

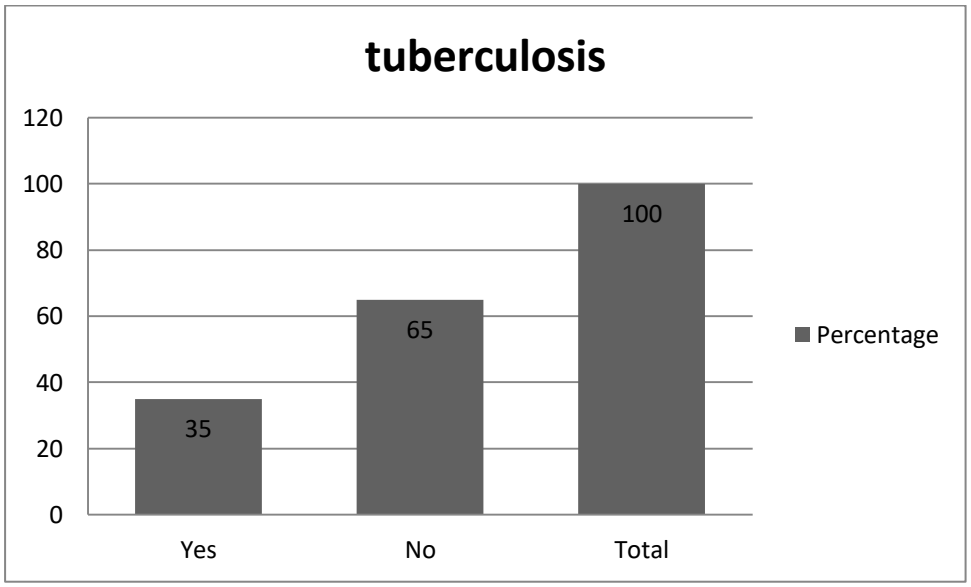


TABLE-16 DISTRIBUTION OF. 'INCONCLUSIVE' REOPRT

Result	Frequency	Percentage
Inconclusive	5	12.5
Definitive diagnosis	35	87.5
Total	40	100

In the combined procedure, an inconclusive report arrived at 12.5% of patients of the study population, definitive diagnosis in 87.5% of patients. The pleural brush alone 20% inconclusive, pleural biopsy alone 15% inconclusive

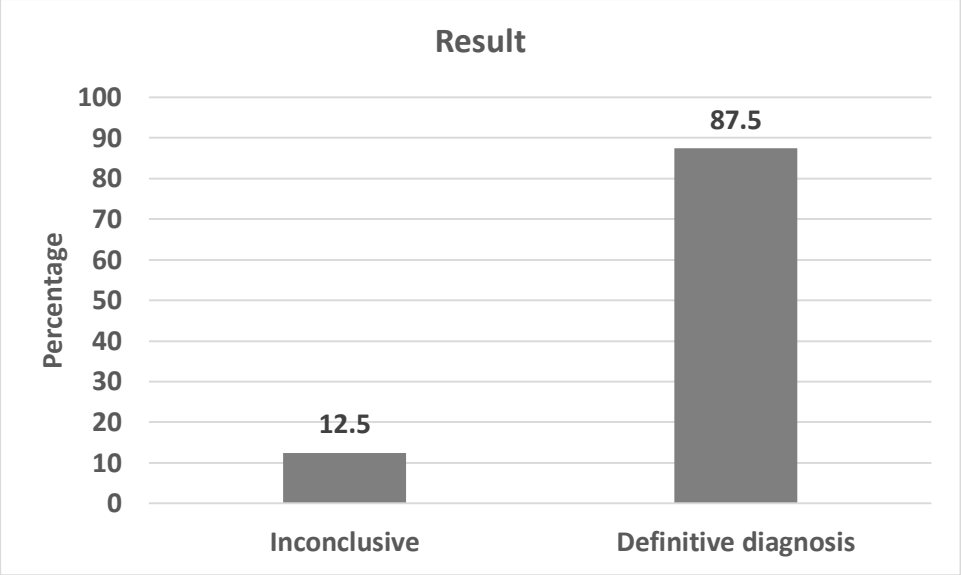


FIGURE 32 DISTRIBUTION OF INCONCLUSIVE REPROT

TABLE-17 DISTRIBUTION OF THORACOSCOPY COMPLICATIONS

Complication	Number	percentage
1.subcutaneous emphysema	4	10
2.fever	8	20
3.hypoxia	1	2.5
4.pain	9	22.5

In the combined procedure, an inconclusive report arrived at 12.5% of patients of the study population, definitive diagnosis in 87.5% patients. The pleural brush alone 20% inconclusive, pleural biopsy alone 15% inconclusive

FIGURE 33 DISTRIBUTION OF THORACOSCOPY COMPLICATIONS

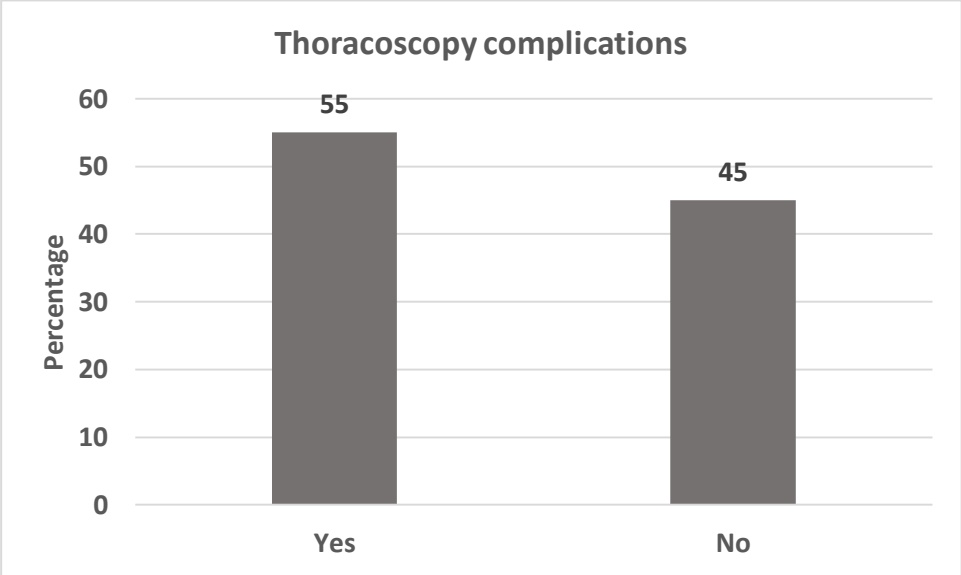


Table-18. THORACOSCOPIC PLEURAL BIOPSY SENSITIVITY IN MALIGNANT PLEURAL EFFUSION :

Thoracoscopy Brush	Biopsy		Total
	Malignancy	Others	
Malignancy	20	0	**20**
Other diagnosis	1	19	**20**
Total	**21**	**19**	**40**
Diagnostic accuracy			
Sensitivity	95.2% (88.6%-100%)		
Specificity	100% (100%-100%)		
PPV	100% (100%-100%)		
NPV	95% (88.3%-100%)		

In our study population , malignant pleural effusion medical thoracoscopy biopsy sensitivity 95.2% in this study.

TABLE-19. : THORACOSCOPIC PLEURAL BRUSH CYTOLOGY

SENSITIVITY :

Thoracoscopy Brush	**Biopsy**		**Total**
	Positive	**Negative**	
Positive	26	1	**27**
Negative	8	5	**13**
Total	**34**	**6**	**40**
Diagnostic accuracy			
Sensitivity	76.47 (58.83%-89.25)		
Specificity	91.6% (61.52%-99.79%)		
PPV	96.6% (90.9%-100%)		
NPV	57.89% (42.29-72.%)		

The sensitivity of pleural brush procedure 76.47%, negative predictive value 57.89%.

Sensitivity and specificity of medical thoracoscopy pleural biopsy and pleural brush cytology

	Pleural biopsy	Pleural brush
sensitivity	91.8	76.47
specificity	100	91.6%
Positive predictive value	100%	96.6%
Negative predictive value	66.6	57.89%
Accuracy	96	76

Table20 Sensitivity and specificity of medical thoracoscopy pleural biopsy and pleural brush cytology

Pleural biopsy sensitivity 91.6% ,pleural brush cytology sensitivity 76.47%..combined pleural biopsy and pleural brush cytology augment the yield of medical thoracoscopy diagnostic procedure

TABLE21 COMBINED PLEURAL BIOPSY AND PLEURAL BRUSH CYTOLOGY AUGMENT THE YIELD OF MEDICAL THORACOSCOPY DIAGNOSTIC PROCEDURE

Yield of pleural biopsy	Yield of pleural brush cytology	Yield of combined procedure
81.6%	69.7%	90%

The diagnostic yield of combined procedure 90%

DISCUSSION:

- we had evaluated 40 patients with undiagnosed pleural effusion for medical thoracoscopy after proper pre-evaluation and getting written consent.
- During period of one year from August 2018 to August 2019, 40 patients undergone a medical thoracoscope in our thoracoscopy unit to attain final diagnosis for undiagnosed exudative pleural effusion.
- 40 patients (27 male) (13 female) whose Mean (SD) age was 54 years ,with minimum age 21 years and the maximum age 76 years.
- In this group of patients 24 were smokers whose smoking index was 30.
- After taking a chest X-ray,in posterior antero view,we had identified that 21patients had pleural effusion in right side,17 had left sided effusion 2 patients were bilateral effusion.
- In 40 patients ,13 patients had haemorrhagic pleural effusion. Remaining patients had straw colour pleural fluid in ultrasound-guided thoracentesis. In pleural fluid, biochemical values The mean value of pleural fluid protein 40 undiagnosed pleural effusion 4.96, the mean value of ADA 40.5 , the median value of LDH 476.
- In the cytological evaluation of pleural fluid 36 patients lymphocytic effusion in this, we identified secondary deposits of adenocarcinoma in 2 patients others had reactive pleural effusion.
- During medical thoracoscopy, we inspected parietal pleura, visceral pleura, lung and mediastinum pathological area .

- In our study population ,Visualization of the pleural space by thoracoscopy , nodule was the most predominant finding in parietal pleura . Most of the nodules to be found on both parietal and visceral pleura in 19 patients out of 40. Among them 16 were obseverd with nodules on the parietal pleura while 3 were observed with nodules on the visceral pleura .
- Adhesions(15patients) and loculation (3patients)were found in 18 patients out of 40.In nodular area ,we get a pleural biopsy with a help of thoracoscopic pleural biopsy forceps at least took 4-6 biopsy bits. done at various parietal pleural area, where we took pleural biopsy we trying to take pleural brush cytology with a help of thoracoscopic pleural brushcytology (brush bc 2020-3010 mode) various parietal pleural area particularly in nodules and adhesion were predominant.

After doing the previous analytic procedure following the result arrived:

- In this study population malignant pleural effusion common followed by tuberculosis infection and inconclusive. We broadly classified our patients based on reports into three groups – malignancy, infectious disease, and indeterminate.
- In this 40 cases 21(52.5%) were identified as malignancy . adenocarcinoma 11(27%)cases, squamous cell carcinoma 5 (12.5%)cases, small cell carcinoma 1 case 2.5% ,malignant melanoma1 case 2.5%, osteosarcoma 1 case 2.5% and mesothelioma 1 case 2.5%.among this adenocarcinoma 5 cases were

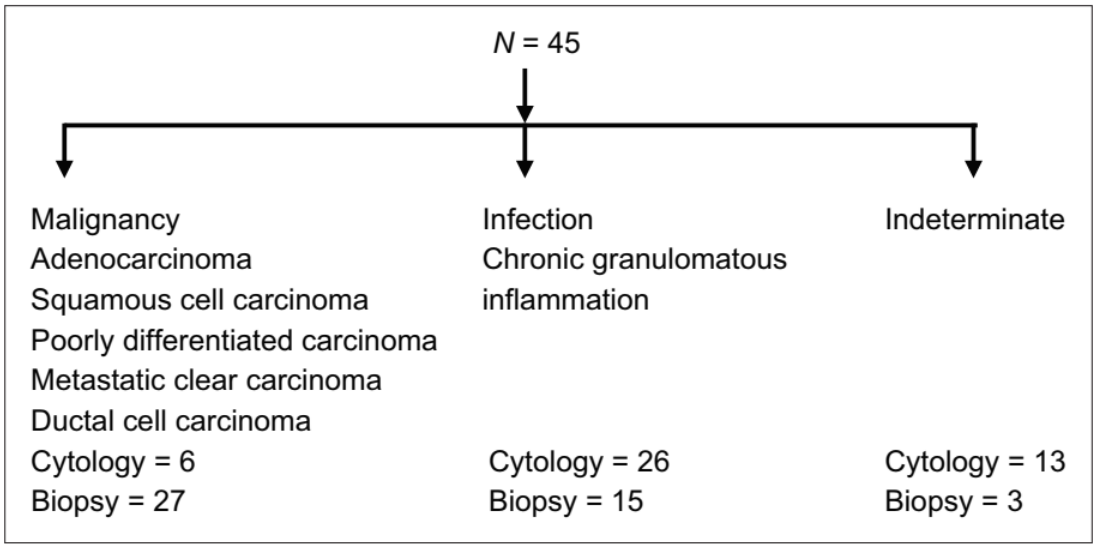
previously treated for breast carcinoma and completed chemo therapy and radiation therapy .

- In this study 14 patients were(35%)tuberculosis infection identified ,indeterminate report came for 6 patients (15%).
- The adenocarcinoma was diagnosed by thoracoscopic pleural brush cytology 6 (15%) patients and by thoracoscopic pleural biopsy in 11(27%patients). The second group was of infectious disease comprising of acute necrotizing inflammation and chronic granulomatous inflammation in medical thoracoscopic pleural brush cytology 13(32.5%). The third group consisted of patients with indeterminate results.6 case were indeterminate.
- In this study diagnostic yield of medical thoracoscopy biopsy 81.6% while medical thoracoscopy pleural brush cytology 69.7%,when two procedures combine diagnostic yield increase upto 90%.
- Comparing with other studies:

  Rakhee Sodhi Khanduri et al study

‘’Efficacy of Pleural Brush Cytology in the Diagnosis of Pleural Diseases’’ conducted in Departments of Pulmonary Medicine and 2Pathology, Himalayan Institute of Medical Sciences, Dehradun, 1Department of Pulmonary Medicine, All India Institute of Medical Science, Rishikesh, Uttarakhand, India , The study was done between December 2015 and June 2017 in all patients of undiagnosed exudative effusions who were taken for thoracoscopy. Both pleural biopsy and pleural brushings were obtained in each patient.

Distributions of patients as per thoracoscopy-guided pleural brush (cytology) and biopsy reports in sodhi khandhari et al study: (TABLE22)



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Distributions of patients as per thoracoscopy-guided pleural brush (cytology) and biopsy reports in our study:

(N=40)(TABLE 23)

malignancy	infection	indeterminate
1.Adenocarcinoma 2.Squamous cell carcinoma 3.Poorly differentiated carcinoma 4.Osteosarcoma 5.malignant melanoma **Cytology=19** **Biopsy=20**	Chronic granulomatous inflammation **Cytology=13** **Biopsy=15**	 **Cytology=8** **Biopsy=5**

- In sodhi khandhari study, sensitivity of pleural brush cytology in malignant pleural effusion 65.13%, specificity 73.68%, positive predictive value 81.48%, negative predictive value 77.78%
- In this study of pleural brush cytology sensitivity in malignant pleural effusion is 85.2%,specificity is 100% ,positive predictive value is 100%,negative predictive value is 85%.
- In this study semi rigid thoracoscopy lft type 160 is used but khandhari rigid thoracoscopy used.semi rigid thoracoscopy safer Comparing our study with sodhi khandhari study(32): Semi-rigid thoracoscopy is a safe and efficacious procedure in patients with undiagnosed pleural effusion. It is easy for manipulating like bronchoscopy procedure in pleural cavity with less complication when combine with pleural brush and biopsy. Pleural brushing could be done even difficult areas to get biopsy and even normal pleural space. We took brush cytology particularly in costophrenic sulcus area where more on lacunae.
- Comparing the studies to find a infective aetiology ;
- In khanduri et al study 100% accuracy to diagnose a tuberculosis infective patients, but our study showed only 75 percent of accuracy in tuberculosis infective patients
- Sodhi khandhuri et al study identified as tuberculosis patients in 26 cases out of 45 cases . this study we diagnosed tuberculosis patients 14 cases out of 40 cases .

Comparing khandhari et al and our study:TABLE 24

Khandhari et al	Our study
1.Using rigid thoracoscopy	1.semiregid thoracoscopy
2.pleural brush sensitivity in malignancy 65%	2.pleural brush sensitivity in malignancy 85%
3.pleural brush acurracy in tubeculosis 100%	3.pleural brush auuracy in tubeculosis 75%

- Mohamed A. Zamzam et al (31)studied Role of thoracoscopic pleural lavage and brush in undiagnosed exudative pleural effusion Department of Chest Diseases & Tuberculosis, Faculty of Medicine, Menoufia University, Menoufia, Egypt b Department of Pathology, Faculty of Medicine, Menoufia University, Menoufia, Egypt they studied 25 patients All patients submitted to medical thoracoscopy, where forceps biopsy, pleural brush and pleural lavage specimens were taken for all patients and sent for histopathological and cytological examination.
- In Mohamed A. Zamzam et al (31)Combined thoracoscopic pleural specimens were diagnostic in 24 patients (96%), and all of them were malignant. Forceps biopsy was positive in 23 patients (92%), while pleural brush and pleural lavage were positive in 18 patients (72%) and 15 patients (60%) respectively. Pleural brush was the only diagnostic modality in one patient. Minimal complications were recorded.

- In Mohamed et al (31)study results of the diagnostic procedure in studied cases positive finding in biopsy 23 (93%), brush 18 (72%) In our study positive finding in biopsy 35 (87.5%), in brush 32(80%) .

- In our study population medical thoracoscopic pleural biopsy is 95.8%,specificity is 100, positive predictive value is 100 negative predictive value is 95 in malignant pleural effusion confirmed cases.

- **Sensitivity ,specificity and of forceps biopsy ,pleural brush in Mohamed et al study (TABLE25)**

	sensitivity	specificity	positive predictive value	negative predictive value
biopsy	95.8	100	100	50
brush	75	100	100	14.3

Sensitivity and specificity of forceps biopsy and pleural brush cytology in our study (TABLE26)

	Pleural biopsy	Pleural brush
sensitivity	91.8(78.09-98.30)	76.47 (58.83%-89.25)
specificity	100(54%-100%)	91.6% (61.52%-99.79%)
Positive predictive value	100%	96.6% (90.9%-100%)
Negative predictive value	66.6(40.33%-85.54%)	57.89% (42.29-72.%)

- In Mohamed et al study malignant pleural effusion was found to be the

only cause of exudative undiagnosed pleural effusion. In 24 out of 25 patients they did not find any case of TB . Incidence of tuberculosis for Egypt was 13 cases per 100,000 people. In India like country 211 cases per 100,000 people in our study we find 14 cases of tuberculosis disease in 40 cases of undiagnosed pleural effusion in combined procedure of pleural biopsy and pleural cytology n medical thoracoscopy.

- In our study population we found 21 case of malignancy in 40 cases of undiagnosed pleural effusion.in Mohamed et al study 24 case of malignancy in 25 case of undiagnosed pleural effusion.

Results of combined procedure of pleural biopsy and pleural brush cytology in Mohamed et al study .(TABLE26)

1.Adenocarcinoma	12 cases	48%
2.Mesothelioma	5 cases	20%
3.Undifferentiated neoplasm	6 cases	24%
4.Non-Hodgkin lymphoma	1 case	4%
5.Pathology not detected	1 case	4%

RESULTS OF COMBINED PROCEDURE OF THORACOSCOPIC PLEURAL BIOPSY AND PLEURAL BRUSH CYTOLOGY IN OUR STUDY:(TABLE27)

1.adenocarcinoma	14 cases	53.84%
2.squamous cell carcinoma	3 cases	11.53%
3.mesothelioma	1 case	3.84%
4.small cell carcinoma	1 cases	3.84%
5.osteosarcoma	1 cases	3.84%
6.malignant melanoma	1 cases	3.48%
7.pathology not detected	5 case	19.23%

- In Mohamed et al study pleural metastasis is the most common cause of malignant pleural effusions. Metastatic adenocarcinoma was diagnosed in 12 patients .
- In our study 9 patients were metastatic malignant carcinoma in this 6 cases previously treated breast carcinoma .
- In Mohamed et al(31) study pleural brush was positive in 18 out of 25 patients (72%). Pleural brush was the only diagnostic modality in one patient in whom no

nodules were seen over the parietal pleura while many nodular lesions over the visceral pleura.

- In our study pleural brush was positive in 32 out of 40 cases(80%) pleural brush was only diagnostic in two cases in whom pleural area absolutely normal.
- In Mohamed et al(31) study Both forceps biopsy and pleural brush to take thoracoscopic specimens could augment the final positive thoracoscopic yield to be 92.9% instead of 78.6% (for forceps biopsy alone) or 60.7% (for pleural brush alone).
- In our study the use of medical Thoracoscopic Pleural biopsy and pleural brush to take thoracoscopic specimens could augment the final positive thoracoscopic yield to be 90% instead of 81.6% (for forceps biopsy alone) or 69.7% (for pleural brush alone).
- Shaaban et al (40)study held in Chest Department, Assiut University Hospital, Egypt under the heading of Value of thoracoscopic pleural brush in the diagnosis of exudative pleural effusion The study was conducted upon 28 patients with exudative pleural effusion from January 2011 to December 2011, in whom both the conventional pleural tapping and closed pleural biopsy were not conclusive.
- In shaaban et al the yield of thoracoscopic pleural biopsy was 92.9% (26/28) patients in this study.in our study population yield of thoracoscopy pleural biopsy In Shaaban et al study pleural metastasis was the most common cause of malignant pleural effusions than mesothelioma as they could diagnose three cases of mesothelioma out of 20 cases proved finally to have malignant lesions Regarding

non-neoplastic results of this study there were only two patients in whom the thoracoscopic biopsy was suggestive of tuberculosis.

- In shaaban Patients while pleural brush was positive in 17 out of 28 patients (60.7%) and it was the only diagnostic modality in four patients; in three of them bleeding occurred during biopsy forceps procedures leading to tiny specimens and the manoeuvre could not be completed, also in the fourth patient revealed only small nodule over the diaphragmatic pleura while many nodular lesions over the visceral pleura where biopsy forceps difficult to be done and pleural brush specimens taken safely.

n our study comparing with shaaban et al study thoracoscopy pleural biopsy yield 85% (34/40), pleural brush cytology yield 80% (32/40) combing these procedure in same patients it augment the yield of diagnosis up to 90%.

As per shabaan et al study we tried taking visceral pleura area pleural brushing patient two patients were pleural biopsy difficult to be done not further complication happened in particular patients but not improve the diagnostic yield in visceral pleural brush procedure .only pleural brush cytology is diagnostic modality in four cases in shabaan et al study in same scenario occurred in two cases in our study.

Complication comparing shabban et al study

Complication of medical thoracoscopy in shabban et al study doing combing pleural biopsy and pleural brush cytology 28 patients within 24 hours of the procedures (TABLE28)

Complication	Number	percentage
1.subcutaneous emphysema	3	10.7
2.fever	3	10.7
3.hypoxia	2	7.2
4.pain	1	3.6

Complication of medical thoracoscopy in our study doing combing pleural biopsy and pleural brush cytology 40 patients within 24 hours of the procedure

Complication	Number	percentage
1.subcutaneous emphysema	4	10
2.fever	8	20
3.hypoxia	1	2.5
4.pain	9	22.5

Pleural brush cytology procedure very safe when comparing with pleural biopsy in difficult get biopsy cases. Pleural brushing procedure reduce the subcutaneous emphysema events and less painful.

LIMITATION:

- This is a single centre observational study
- Pleural brush cytology when compared to pleural biopsy, was found to be more sensitive and specific .Pleural brush could not be adapted as single technique to diagnose the undiagnosed pleural effusion.
- In more than one third of our cases, Pleural brush was found to be positive for malignancy .this specific type of pathology in malignant pleural effusion procedure does not arrive
- **RECOMMENDATION:**

In medical Thoracoscopy Pleural brush cytology technique is an additional diagnostic technique. this procedure augment the diagnostic yield of medical thoracoscopy. We recommend to include this technique for doing medical Thoracoscopy technique.

CONCLUSION:

- By combining medical Thoracoscopic Pleural biopsy and Pleural brush cytology in one the diagnostic yield will be increased in medical Thoracoscopic procedure .

- In medical Thoracoscopy procedure, Pleural brush is the additional diagnostic technique that would help to initiate the treatment without further waiting for biopsy report.

- At this particular study ,we could conclude that Thoracoscopic Pleural brush could be done simple , safer and allow for obtaining pleural cellular material even in harmful areas in order to get biopsy specimens. It could augment the diagnostic yield of medical Thoracoscope..

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INSTITUTIONAL ETHICAL COMMITTEE APPROVAL

GOVERNMENT STANLEY MEDICAL COLLEGE & HOSPITAL,CHENNAI_-01

INSTITUTIONAL ETHICS COMMITTEE

TITLE OF THE WORK : COMPARISON BETWEEN MEDICAL THORACOSCOPIC PLEURAL BIOPSY AND PLEURAL CYTOLOGY BRUSH IN UNDIAGNOSED EXUDATIVE PLEURAL EFFUSIONS_ A PROSPECTIVE STUDY.

PRINCIPAL INVESTIGATOR : DR. MATHIYALAGAN
DESIGNATION : PG IN MD TUBERCLOSIS AND RESPIRATORY DISEASES.
DEPARTMENT : DEPARTMENT OF TB & RESPIRATORY DISEASES, GOVT. STANLEY MEDICAL COLLEGE.

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 27.06.2018 at the Council Hall, Stanley Medical College, Chennai-1 at 10am.

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate from the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

MEMBER SECRETARY,
IEC, SMC, CHENNAI

EVALUATION FORM:

- NAME:
- AGE/SEX:
    - IP/OP NO:
    - Chief complaints:
    - Prior h/o ATT
    - Family history of malignancy
    - Exposure to irradiation
- Occupation:
- Smoking history:
- Biomass exposure:
- Marital history:
- Vitals:Pulse rate:

  Respiratory rate:

  Blood pressure:

    - Modified Medical Council grades(mMRC):
- Blood investigations: CBC

  RFT:

  Sr.LDH:

  Sr.Protein:

- Chest radiograph:

- Chest xray:
- Pleurl fluid analysis:

    Protein:

    Glucose:

    ADA:

    LDH:

    Cytology:

    Culture and sensitivity:

    Lymphocyte count

Medical thoracoscopy

Gross thoracoscopic findings:

Pleural biopsy histopathology:

Pleuaral brush cytology :

PATIENT INFORMATION SHEET

TITLE OF THE STUDY: **"comparison between medical thoracoscopic pleural biopsy and pleural brush cytology in undiagnosed exudative pleural effusions"**

We are conducting a study among patients attending Department of Pulmonary Medicine, Stanley Medical College and Govt Hospital of Thoracic Medicine, Tambaram. The purpose of this study is to analyze the yield medical thoracoscopic pleural brush cytology in undiagnosed exudative pleural effusions.

We are selecting patients with undiagnosed exudative pleural effusion.compare the yield of medical thoracoscopic pleural biopsy and pleural brush cytology in undiagnosed pleural effusion . Patients are prospectively followed. Routine blood investigations, chest radiograph pleural fluid analysis , pleural biopsy histopathology examination and pleural brush cytology is performed.

The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.

The results of the study will be intimated to you at the end of the study to aid in the management or treatment.

Signature of Investigator Signature of participant

Date:

PATIENT CONSENT FORM

STUDY DETAIL: "comparison between medical thoracoscopic pleural biopsy and pleural brush cytology in undiagnosed exudative pleural effusions – A PROSPECTIVE STUDY "

Study Centre:Dept of Respiratory medicine, Stanley Medical College and GHTM, Tambaram.

Patient's Name:

Patient's Age/sex:

ID No:

Patient may check (√) these boxesa) I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction ❑

b) I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected . ❑

c) I understand that sponsor of the clinical study, others working on the sponsor's behalf, the ethical committee and the regulatory authorities will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study. ❑

d) I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or wellbeing or any unexpected or unusual symptoms. ❑

e) I hereby consent to participate in this study.
❑

f) I hereby give permission to undergo detailed clinical examination, radiographs ,blood investigation as required.
❑

Signature/thumb impression **Signature of Investigator**

Patient's Name and Address: **Study Investigator's Name:017**

ஆராய்ச்சி தகவல் தாள்

ஆராய்ச்சி தலைப்பு:

ஒரு மூன்றாம் நிலை மருத்துவமனையில் ஒரு வருங்காலஆய்வின் மூலம் விலா இடை சோதனை குழாய் மூலம் கண்டறிய முடியாத புடைச்சவ்வு ஊரணி இன் புடைச்சவ்வு திசு பரிசோதனை மற்றும் புடைச்உவ்வு தூரிகைஉயிரணுக்கள் பரிசோதனை ஒப்பீடு செய்தல்.

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ஆராய்ச்சியாளர் பெயர் : மருத்துவர் ம. மதியழகன்

பங்கேற்பாளர் பெயர் :

ஆராய்ச்சியின் நோக்கம் :

தாம்பரம் நெஞ்சக நோய் மருத்துவமனைக்கும் அரசு ஸ்டான்லி மருத்துவமனை நெஞ்சக பிரிவுக்கும் வரும் கண்டறிய முடியாத புடைச்சவ்வு ஊறணி நோயாளிகளுக்கு விலா இடை குழாய் சோதனையை புடைசவ்வுபுடைச்சவ்வு திசு பரிதனையை யும் மற்றும் புடைச்சவ்வு தூரிகைஉயிரணு பரிசோதோனை யை ஒப்பிட்டு பாதுகாப்பான முறையில் நோயின் தன்மையை கண்டறிதல்.
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ஆய்வு முறை :

கண்டறிய முடியாத புடைச்சவ்வு ஊறணி நோயாளிகளை தேர்ந்தெடுத்து அவர்களுக்கு அடிப்படை இரத்த பரிசோதனை,புடைச்சவ்வு ஊறணி பரிசோதனை,விலா இடை சோதனை குழாய் பரிசோதனை மற்றும் பிற அடிப்படை பரிசோதனைகள் செய்யப்படும். இதன் அடிப்படையில் நோயாளிகளுக்கு தக்க மருத்துவம் அளிக்கப்படும்.

நோயாளிகளின் ரகசியத்தன்மை ஆய்வின் முழுவதும் பாதுகாக்கப்படும். ஆய்வில் பங்கேற்பது நோயாளிகளின் சொந்த விருப்பத்திற்கு உட்பட்டது. ஆய்வினிடையே நோயாளிகள் தொடர்ந்து பங்கேற்க விரும்பாவிட்டால் அவர்கள் விலகிக் கொள்ளலாம். இதனால் அவர்களுக்குண்டான எவ்வித மருத்துவ மற்றும் பிற சலுகைகளும் மறுக்கப்பட மாட்டாது. ஆய்வின் மூலம் கண்டறியும் முடிவுகள் நோயாளிகளிடம் தெரிவிக்கப்படும்.

ஆராய்ச்சி ஒப்புதல் படிவம்

ஆராய்ச்சி தலைப்பு:

ஒரு மூன்றாம் நிலை மருத்துவமனையில் ஒரு வருங்கால ஆய்வின் மூலம் கண்டறிய முடியாத புடைச்சவ்வு ஊறணியை விலா இடைசோதனை குழாய் மூலம் புடைச்சவ்வு திசு பரிசோதனை மற்றும் புடைச்சவ்வு தூரிகை உயிரணு சோதனை ஒப்பீடு செய்து நோயின் தன்மையை கண்டறிதல்.

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ஆய்வு நிலையம்: தாம்பரம் நெஞ்சக மருத்துவமனை மற்றும் ஸ்டான்லி மருத்துவ கல்லூரி

ஆராய்ச்சியாளர் பெயர் : மருத்துவர் ம. மதியழகன்

பங்கேற்பாளர் பெயர் :

பங்கேற்பாளர் எண் :

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது.

நான் இவ்வாய்வில் தன்னிச்சையாகத்தான் பங்கேற்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகி கொள்ளலாம் என்றும் அறிந்து கொண்டேன்.

இந்த ஆய்வு சம்மந்தமாகவோ இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகி கொண்டாலும் இது பொருந்தும் என அறிகிறேன்.

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயப்படுத்திக்கொள்ளவும் அதை பிரசுரிக்கவும் என் முழுமனதுடன் சம்மதிக்கின்றேன்

இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக்கொள்கிறேன்.எனக்கு கொடுக்கப்பட்ட அறிவுரைகளின்படி நடந்து கொள்வதுடன் இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்று உறுதியளிக்கிறேன்.

ஆராய்ச்சியாளர் கையொப்பம் பங்கேற்பாளர் கையொப்பம்

தேதி

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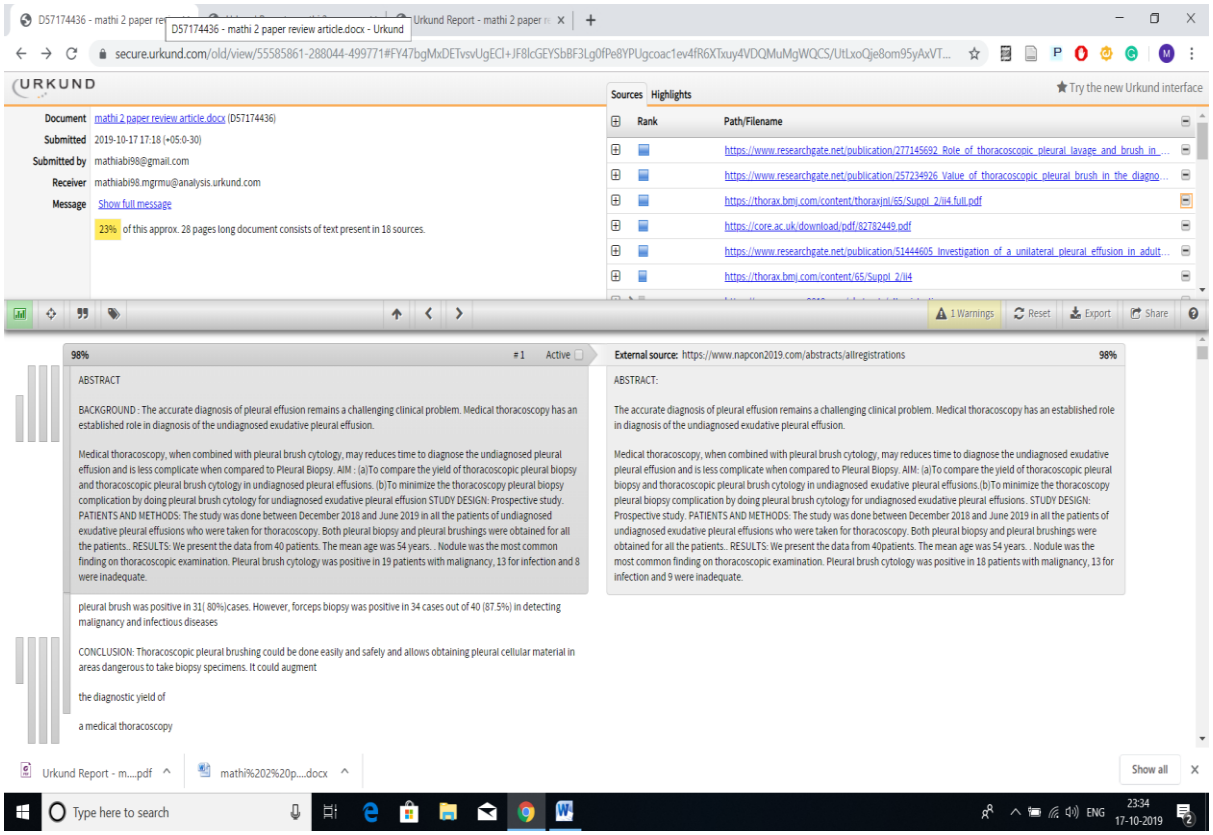
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BACKGROUND : The accurate diagnosis of pleural effusion remains a challenging clinical problem. Medical thoracoscopy has an established role in diagnosis of the undiagnosed exudative pleural effusion.
Medical thoracoscopy, when combined with pleural brush cytology, may reduces time to diagnose the undiagnosed pleural effusion and is less complicate when compared to Pleural Biopsy. AIM : (a)To compare the yield of thoracoscopic pleural biopsy and thoracoscopic pleural brush cytology in undiagnosed pleural effusions. (b)To minimize the thoracoscopy pleural biopsy complication by doing pleural brush cytology for undiagnosed exudative pleural effusion STUDY DESIGN: Prospective study. PATIENTS AND METHODS: The study was done between December 2018 and June 2019 in all the patients of undiagnosed exudative pleural effusions who were taken for thoracoscopy. Both pleural biopsy and pleural brushings were obtained for all the patients.. RESULTS: We present the data from 40 patients. The mean age was 54 years. . Nodule was the most common finding on thoracoscopic examination. Pleural brush cytology was positive in 19 patients with malignancy, 13 for infection and 8 were inadequate.
pleural brush was positive in 31(80%)cases. However, forceps biopsy was positive in 34 cases out of 40 (87.5%) in detecting malignancy and infectious diseases
CONCLUSION: Thoracoscopic pleural brushing could be done easily and safely and allows obtaining pleural cellular material in areas dangerous to take biopsy specimens. It could augment
the diagnostic yield of
a medical thoracoscopy
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The accurate diagnosis of pleural effusion remains a challenging clinical problem. Medical thoracoscopy has an established role in diagnosis of the undiagnosed exudative pleural effusion.
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MASTERCHART:

NAME	AGE	SEX	SMOKER	SMOKING INDEX	PLEURAL FLUID CYTOLOGY	PLEURAL FLUID PROTEIN
SHANTHY	56	F	NO	0	REACTIVE EFFUSION	4.8
CHANDRA	65	F	NO	0	LYPHOCYTIC EFFUSION	5.9
CHINAMMAL 70	70	F	NO	0	LYPHOCYTIC EFFUSION	4.7
MANGAYARKARASI	65	F	NO	0	REACTIVE EFFUSION	4.6
MARAGATHAM	55	F	NO	0	LYMPHOCTIC EFFUSION	4.3
SHALINI	31	F	NO	0	LYMPHOCYTIC EFFISION	5.3
DEBORAL	70	F	NO	0	LYMPHOCYTIC EFFUSION	4.3
PAPPTHI	60	F	NO	0	LYMOHOCYTIC EFFUSION	4.3
JAYA	56	F	NO	0	LYPMHOCYTIC EFFUSION	4.9
KOTHIYAN	61	M	YES	40	LYMPHOCTIC EFFUSION	5.3
VENKATA REDDY	48	M	YES	35	LYMPHOCYTIC EFFUSION	4.3
ELAYARAJA	21	M	NO	0	LYMPHOCYTIC EFFUSION	3.9
GOVINDASAMY	43	M	YES	35	LYMPHOCYTIC EFFUSION	5.9
NAGESHWARA RAO	48	M	YES	30	LYMPHOCYTIC EFFUSISON	6.8
MANI	65	M	YES	40	LYMPHOCTIC EFFUSION	3.7
KARUPPAN	61	M	YES	40	LYMPHOCYTIC EFFUSION	4.9
MOHAN	53	M	YES	35	LYMPHOCYTIC EFFUSION	4.8
MUNNUSAMY	48	M	YES	32	LYMPHOCYTIC EFFUSION	4.6
MANOHAR	38	M	YES	30	REACTIVE EFFUSION	5.9
JAGANATHAN	44	M	YES	30	LYMPHOCYTIC EEFUSION	6.9
RAVI	37	M	NO	0	LYMPHOYTIC EFFUSION	4.9
MADIVANNAN	40	M	YES	30	LYMPHOCTIC EFFUSION	5.9
ASIRVATHAM	38	M	YES	20	REACTIVE EFFUSION	6.8
MOHD IRFAN	36	M	YES	30	LYMPHOCTIC EFFUSION	3.7
MADHU	41	M	YES	32	LYMPHOCYTIC EFFUSION	4.6
KARUNAMOORTHY	42	M	YES	34	LYMPHOCYTIC EFFUSION	4.1
VINOTHKUMAR	31	M	YE	15	LYMPHOCYTIC EFFUSION	4.8
KUMAR	52	M	YES	30	LYMPHOCYTIC EFFUSION	5
LAKSHMI	58	M	NO	0	LYMPHOCYTIC EFFUSION	4.9
RAMU	45	M	YES	35	LYMPHOCTIC EFFUSION	3.9
VIJAYRAGHVAN	60	M	YES	30	LYMPHOCYTIC EFFUSION	4.8
MANOHAR	38	M	YES	30	LYMPHOCYTIC EFFUSION	5.8
GEORGE	70	M	YES	40	LYMPHOCYTIC EFFUSION	5
DHANASEKAR	41	M	YES	32	LYMPHOCYTIC EFFUSION	5.9
CHANRAN	70	M	YES	35	LYMPHOCYTIC EFFUSION	4.5
MANIKAVEL	76	M	YES	35	LYMPHOCYTIC EFFUSION	5.9
ARCHANA	45	F	NO	0	LYMOHOCYTIC EFFUSION	3.9
KUMARI	50	F	NO	0	LYMPHOCYTIC EFFUSION	4.9
PRIYA	63	F	NO	0	LYMPHOCYTIC EFFUSION	4.7

PLEURAL FLUID ADA	PLEURAL FLUID	XRAY FINDING	RT SIDE EFFUSION	LT SIDE EFFUSION	BILATERAL EFFUSION	PLEURAL FLUID CBNATT POSITIVE

	LDH	UNILATERL EFFUSION				
23	356	BILATERAL EFFUSION RT	NO	NO	YES	NEGATIVE
40	680	MASSIVE EFFUSION	YES	NO	NO	POSITIVE
57	540	LTMASSIVE EFFUSION LT	NO	YES	NO	NEGATIVE
35	1245	MASSIVE EFFUSION LT	NO	YES	NO	NEGATIVE
26	657	MASSIVE EFFUSION RT	NO	YES	NO	NEGATIVE
43	311	MASSIVE EFFUSION LT	YES	NO	NO	NEGATIVE
38	374	MASSIVE EFFUSION RT	NO	YES	NO	NEGATIVE
35	475	MASSIVE EFFUSION LT	YES	NO	NO	NEGATIVE
43	290	MASSIVE EFFUSION LT	NO	YES	NO	NEGATIVE
35	560	MASSIVE EFFUSION RT	NO	YES	NO	NEGATIVE
22	678	MASSIVE EFFUSION LT	YES	NO	NO	NEGATIVE
43	523	MASSIVE EFFUSION LT	NO	YES	NO	POSITIVE
48	780	MASSIVE EFFUSION RT	NO	YES	NO	NEGATIVE
41	234	MASSIVE EFFUSION RT	YES	NO	NO	NEGATIVE
49	256	MASSIVE EFFUSION RT	YES	NO	NO	NEGATIVE
47	289	MASSIVE EFFUSION LT	YES	NO	NO	POSITIVE
32	456	MASSIVE EFFUSION RT	NO	YES	NO	NEGATIVE
41	678	MASSIVE EFFUSION RT MASIVE	YES	NO	NO	NEGATIVE
41	345	EFFUSION RT	YES	NO	NO	NEGATIVE
29	365	MASSIVE EFFUSION RT	YES	NO	NO	NEGATIVE
51	422	MASSIVE EFFUSION LT	YES	NO	NO	NEGATIVE
61	211	MODERATE EFFUSION R MASSIVE	NO	YES	NO	POSITIVE
23	1678	EFFISION RT	YES	NO	NO	NEGATIVE
43	1231	MASSIVE EFFUSION	YES	NO	NO	NEGATIVE
56	145	RT	YES	NO	NO	NEGATIVE

		MASSIVE EFFUSION LT				
54	431	MASSIVE EFFUSION RT	NO	YES	NO	NEGATIVE
31	2314	MASSIVE EFFUSION LT	YES	NO	NO	NEGATIVE
21	456	MASSIVE EFFUSION LT	NO	YES	NO	NEGTIVE
43	213	MASSIVE EFFUSION LT	NO	YES	NO	NEGATIVE
45	234	MASSIVE EFFUSION LT	NO	YES	NO	NEGATIVE
56	431	MASSIVE EFFUSION RT	NO	YES	NO	NEGATIVE
34	2167	MASSIVE EFFUSION LT	YES	NO	NO	NRGATIVE
58	489	MASSIVE EFFUSION RT	NO	YES	NO	POSITIVE
31	1643	MASSIVE EFFUSION RT	YES	NO	NO	NEGATIVE
43	1324	MASSIVE EFFUSION LT	YES	NO	NO	NEGATIVE
42	654	MASSIVE EFFUSION RT	NO	YES	NO	NEGATIVE
57	590	MASSIVE EFFUSION RT	YES	YES	NO	NEGATIVE
35	478	MASSIVE EFFUSION	YES	NO	NO	NEGATIVE

THORACOSCOPY MORPHOLOGY	HEMMHARGIC PLEURLA EFFUSION
BLAKISH PIGMENTAION ALL OVER PLEURAL SPACE	YES
MULTIPLE ADHESIONS	NO
MUTIPLE PARIETAL PLEURAL NODULES	YES
MULTIPLE IRRERUGLAR NODULE	YES
HEMORRHAGIC EFFUSION	YES
MULTIPLE ADHESIONS	NO
MULTIPLE NODULE	NO
MULTIPLE NODULE	YES
MULTIPLE NODULE	YES
NODULAR LESION IN PARIETAL PLEURA	YES
FLESHY NODULES OVER PARITAL PLEURA	NO
MULTIPLE NODULAR LESION	NO
MULTIPLE ADHESIONS	NO
MULTIPLE ADHESIONS	NO
MULTIPLE ADHSIONS	NO
MULTIPLE ADHSIONS	NO
MULTIPLE ADHESIONS	NO
MULTIPLE NODULES	NO
MULTIPLE ADHESION	NO

MULTIPLE ADHESION	NO
MULTIPLE ADHESIONS	NO
MULTIPLE LOCULATION	NO
MULTIPLE ADHESION	NO
MULTIPL NODULAR LESION	NO
MULTIPLE ADHESION	NO
GLESTINING PLEURA	NO
MUTIPLE ADHESION	NO
MUTIPLE ADHESION	YES
MULTIPLE NODULE	YES
MULTIPLE ADHSEION	NO
MUTIPLE NODULE	NO
MULTIPLE NODULE	YES
MULTIPLE ADHESION	NO
MULTIPLE NODULE	NO
MULTIPLE NODULE	YES
MULTIPLE NODULE	YES
MULTIPLE NODULE	YES
MULTIPLE ADHESION	NO
MULTIPLE ADHESION	NO

THICK/THIN ADHESION	NODULES OVER PARITEL PLEURA	THORACOSCOPY BRUSH REPORT
NO	YES	MALIGNANT MELANOMA
YES	NO	GRANULOUMA
YES	NO	POSITIVE FOR MALIGNANCY
NO	YES	POSITIVE FOR MALIGNANCY
NO	YES	ADENOCARCINOMA
YES	NO	GRANULOUMA
YES	YES	ADENOCARCINOMA
NO	YES	ADENOCARCINOMA
NO	YES	ADENOCARCINOMA
NO	YES	POSITIVE FOR MALIGNANCY
NO	YES	POSITIVE FOR MALIGNANCY
NO	YES	OSTEOSARCOMA SECONDARIES
YES	YES	NECROTIC MATERIAL
YES	NO	GRANULOMA
YES	NO	NECROTIC MATERIAL
YES	NO	GRANULOUMA
YES	NO	NECROTIC MATERIAL
NO	YES	ADENOCARCINOMA
YES	NO	NECROTIC MATERIAL
YES	NO	GRANULOUMA
YES	NO	INCONCLUSIVE
YES	NO	INCONCLUSISVE
YES	NO	GRANULOUMA
NO	YES	POSITIVE FOR MALIGNANCY
YES	NO	GRANULOUMA
YES	NO	GRANULOUMA
YES	NO	GRANULOUMA

NO	YES	POSITIVE FOR MALIGNANCY
NO	YES	ADENOCARCINOMA
YES	NO	INCONCLUSIVE
NO	YES	POSITIVE FOR MALIGNANCY
NO	NO	ADENOCARCINOMA
NO	YES	SQUAMOUS CELL CARCINOMA
YES	NO	GRANULOUMA
NO	YES	POSITIVE FOR MALIGNANCY
NO	YES	POSITIVE FOR MALIGNANCY
NO	YES	POSITIVE FOR MALIGNANCY
NO	NO	GRANULOUMA
NO	NO	INCONCLUSIVE

THORACOSCOPY BRUSH CYTOLOGY	THORACOSCOPY BIOPSY REPORT	THORACOSCOPY HISTOPATHOLOGY
POSITIVE	POSITIVE	MALIGNANT MELANOMA
POSITIVE	POSITIVE	GRANULOUMA
POSITIVE	POSITIVE	ADENOCARCINOMA
POSITIVE	POSITIVE	ADENOCARCINOMA
POSITIVE	POSITIVE	ADENOCARCINOMA
POSITIVE	POSITIVE	GRANULOUMA
POSITIVE	POSITIVE	ADENOCARCINOMA
POSITIVE	POSITIVE	ADENOCAECINOMA
POSITIVE	POSITIVE	ADENOCARCINOMA
POSITIVE	POSITIVE	SMALL CELL LUNG CARCINOMA
POSITIVE	POSITIVE	SQUAMOUS CELL CARCINOMA
POSITIVE	POSITIVE	OSTEOSARCOMA SECONDARIES
NEGATIVE	NEGATIVE	INCONCLUSIVE
POSITIVE	POSITIVE	GRANULOUMA
NEGATIVE	POSITIVE	GRANULOUMA
POSITIVE	POSITIVE	GRANULOUMA
POSITIVE	POSITIVE	GRANULOUMA
POSITIVE	POSITIVE	ADENOCARCINOMA
NEGATIVE	NEGATIVE	INCONCLUSIVE
NEGATIVE	POSITIVE	GRANULOUMA
NEGATIVE	POSITIVE	INCONCLUSIVE
NEGATIVE	NEGATIVE	INCONCLUSIVE
POSITIVE	POSITIVE	TUBERCULOSIS
NEGATIVE	POSITIVE	SQUAMOUS CELL CARCINOMA
POSITIVE	POSITIVE	GRANULOUMA
POSITIVE	POSITIVE	GRANULOUMA
POSITIVE	POSITIVE	GRANULOUMA
POSITIVE	POSITIVE	SQUAMOUS CELL CARCINOMA
POSITIVE	POSITIVE	ADENOCARCINOMA
NEGATIVE	NEGATIVE	INCONCLUSIVE
POSITIVE	POSITIVE	SECONDARIES FROM RENAL CELL CARCINOMA
POSITIVE	NEGATIVE	ADENOCARCINOMA
NEGATIVE	POSITIVE	SQUAMOUS CELL CARCINOMA
NEGATIVE	POSITIVE	GRANULOUMA
POSITIVE	POSITIVE	SQUAMOUS CELL CARCINOMA

POSITIVE	POSITIVE	ADENOCARCINOMA
POSITIVE	POSITIVE	ADENOCARCINOMA
POSITIVE	POSITIVE	GRANULOUMA
NEGATIVE	NEGATIVE	INCONCLUSIVE

MALIGNANCY	TUBERCULOSIS	INCONCLUSIVE	THORACOSCOPY COMPLICATION
POSITIVE	NEGATIVE	NO	YES
NEGATIVE	POSITIVE	NO	NO
POSITIVE	NEGATIVE	NO	NO
POSITIVE	NEGATIVE	NO	YES
POSITIVE	NEGATIVE	NO	NO
NEGATIVE	POSITIVE	NO	NO
POSITIVE	NEGATIVE	NO	YES
POSITIVE	NEGATIVE	NO	YES
POSITIVE	NEGATIVE	NO	NO
POSITIVE	NEGATIVE	NO	NO
POSITIVE	NEGATIVE	NO	YES
POSITIVE	NEGATIVE	NO	NO
NEGATIVE	NEGATIVE	YES	NO
NEGATIVE	POSITIVE	NO	YES
NEGATIVE	POSITIVE	NO	NO
NEGATIVE	POSITIVE	NO	NO
NEGATIVE	POSITIVE	NO	NO
POSITIVE	NEGATIVE	NO	YES
NEGATIVE	NEGATIVE	YES	YES
NEGATIVE	POSITIVE	NO	NO
NEGATIVE	NEGATIVE	YES	YES
NEGATIVE	POSITIVE	NO	YES
NEGATIVE	POSITIVE	NO	NO
POSITIVE	NEGATIVE	NO	YES
NEGATIVE	POSITIVE	NO	YES
NEGATIVE	POSITIVE	NO	NO
NEGATIVE	POSITIVE	NO	NO
POSITIVE	NEGATIVE	NO	YES
POSITIVE	NEGATIVE	NO	YES
NEGATIVE	NEGATIVE	YES	NO
POSITIVE	NEGATIVE	NO	YES
POSITIVE	NEGATIVE	NO	YES
POSITIVE	NEGATIVE	NO	NO
NEGATIVE	NEGATIVE	YES	YES
POSITIVE	NEGATIVE	NO	YES
POSITIVE	NEGATIVE	NO	YES
POSITIVE	NEGATIVE	NO	YES
NEGATIVE	POSITIVE	NO	YES
NEGATIVE	NEGATIVE	NO	NO