# Evaluation of the role of Video - Assisted Thoracoscopy in Management of Empyema

*Thesis*

*Submitted for partial fulfillment of M.D. degree in Chest Diseases*

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**2018**

# تقييم استخدام منظار التجويف الصدري في علاج حالات الصديد البلوري

رسالة

**توطئة للحصول علي درجة الدكتوراة في الأمراض الصدرية**

**مقدمة من**


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2018


سورة البقرة الآية: ٣٢

# Acknowledgement

***First and foremost thanks to ALLAH, the Most Merciful.***

*I wish to express my deep appreciation and sincere gratitude to* ***Prof Dr Mohammed Ali Farrag,*** *Ain Shams University, for his close supervision, valuable instructions, continuous help, patience, advices and guidance. He has generously devoted much of his time and effort for planning and supervision of this study. It was a great honor to me to work under his direct supervision.*

*I wish to express my great thanks and gratitude to* ***Prof Dr Hatem Yazed Al Bawab*** *, Ain Shams University, for his kind supervision, indispensable advice and great help in this work*

*. I wish to express my great thanks and gratitude to* ***Prof Dr Neven Mohamed Mohamed Abd el Fattah*** *, Ain Shams University, for her kind supervision, indispensable advice and great help in this work.*

*I wish to express my great thanks and gratitude to* ***Dr Eman Badawy Abd el fattah*** *, Ain Shams University, for her kind supervision, indispensable advice and great help in this work.*

*Last and not least, I want to thank all my family, my colleagues,, for their valuable help and support.*

*Finally I would present all my appreciations to my patients without them, this work could not have been completed.*

# Contents

# List of Abbreviations

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| **BAL** | : Broncho alveolar lavage |
| **CAP** | : Community aquired pneumonia |
| **CHF** | : Congestive heart failure |
| **CL** | : Chloride |
| **CRP** | : C- reactive protein |
| **CT** | : Computed topography |
| **CXR** | : Chest x ray |
| **DM** | : Diabetes mellitus |
| **Fr** | : French |
| **HCO3** | : Bicarbonate |
| **ICT** | : Intercostal tube |
| **IL8** | : Interleukin eight |
| **IV** | : Intravenous |
| **K** | : Potassium |
| **LDH** | : Lactate dehdrogenase |
| **MCP** | : Monocyte chemotactic protein 1 |
| **Mm** | : Micrometer |
| **Na** | : Sodium |
| **NT- proBNP** | : N- terminal pro brain natriuretic peptide |
| **PF** | : Pleural fluid |
| **TBLB** | : Trans- bronchial lung biopsy |
| **TLC** | : Total leucocytic count |
| **TNF** | : Tumor necrosis factor |
| **US** | : Ultrasound |
| **VATS** | : Video assisted thoracoscopy |
| **VEGF** | : Vascular endothelial growth factor |

# List of Tables

# *List of Figures*

# Introduction

Thoracic empyema is a dynamic process, inflammatory in origin that occurs within a preformed space bordered by both the visceral and parietal pleura. It is a complex clinical entity, neither a sole clinical, laboratory, nor a radiological diagnosis***. (Michael et al., 2015)***

Pleural empyema is defined as a collection of pus in the pleural space and is usually classified as simple early empyema without pleural loculations (stage 1 and stage 2) and complex empyema, *i.e.*, multiloculated empyema (stage 3) ***(Mason et al., 2010).***

Pleural empyema has a significant morbidity and an overall mortality of 2% to 30% ***(Michael et al., 2015)***

The most common form of empyema thoracis is post- or para-pneumonic, representing 40%—60% of all cases. Thirty percent or less of all the adult cases originate in thoracic surgical procedures (lung, esophageal, mediastinal or other intrathoracic procedures). About 1.6%—4.2% of thoracic trauma develops empyema thoracis. Other sources like non-operative oesophageal, subdiaphragmatic and infected malignant pleural effusions are occasionally mentioned ***(Mason et al., 2010).***

The complete un-intervened process of development of thoracic empyema takes about 5—6 weeks, if a full-blown sepsis does not affect the patient earlier, but the

length of the individual stages is not clearly defined (***Edmond and Brodsky ., 2000).***

The evolution of a para pneumonic pleural effusion can be divided into 3 stages: including exudative, fibrino-purulent, and organization stages ***(Mason et al., 2010).***

During the exudative stage (Stage 1), sterile pleural fluid rapidly accumulates in the pleural space. The pleural fluid originates in the interstitial spaces of the lung and in the capillaries of the visceral pleura because of increased permeability. The pleural fluid has a low white blood cell (WBC) count and a relatively low LDH level. The pleural fluid glucose and pH levels are within the reference range. These effusions resolve with antibiotic therapy, and chest tube insertion is not required. This stage takes approximately 2-5 days from the onset of pneumonia ***(Chapman and Davies ., 2004)***

In (stage 2) or fibrino-purulent stage, bacterial invasion of the pleural space occurs, with accumulation of polymorphonuclear leucocytes, bacteria, and cellular debris. A tendency toward loculation and septation exists, pleural fluid pH (< 7.20) and glucose levels are lower (< 60 mg/dL), and the LDH levels increase. At this stage, bacteriological stains and cultures of the pleural fluid can be positive for microorganisms. This stage takes approximately 5-10 days after pneumonia onset ***(Yunus et al., 2013)***

In (stage 3) or organization stage, fibroblasts grow into the exudates from both the visceral and parietal pleural surfaces, and they produce an inelastic membrane called a pleural peel. Pleural fluid is thick. In an untreated patient, pleural fluid may drain spontaneously through the chest wall (ie, empyema thoracis necessitanis). This last stage may take 2-3 weeks to develop ***(Yunus et al., 2013).***

Thoracocentesis (tapping) with a large bore needle is for diagnosis and evidences support its usefulness in early empyema cases. Drainage performed as a single procedure is usually a first-line intervention with a success rate between 67% and 74% (***Edmond and Brodsky ., 2000).***

Different modalities are established to treat a case of para-pneumonic effusion. This depends mainly on staging and the general condition of the patient where in the exudative stage just antibiotic therapy can be efficient, while in the fibrino-purulent stage, drainage is manadatory either by simple thoracostomy or thoracoscopic guided and finally in the organization phase, decortication or pneumenectomy is the option found **(*Solaini et al., 2006)***

Although stage I should be treated with adequate antibiotics and may need intercostal tube drainage with simple thoracostomy, many cases will progress to stage II or III if the treatment is inadequate. For stage II, several strategies have been reported, including anti-fibrinolytic enzymatic debridement, tube thoracotomy and surgical

dissolution of loculation or decortication. Lastly, fenestration of the chest wall and thoracoplasty is imperative for stage III ***(Michael et al., 2015)***

The goal of surgical intervention for stage II should be re expansion of the lung. This surgical treatment has been performed through conventional thoracotomy. However, the recent development of endoscopic techniques of video-assisted thoracic surgery (VATS) gives capability to perform surgical procedures without previously requiring a large thoracotomy for thoracic empyema ***(Michael et al., 2015)***

From the mid-1990s, video-assisted thoracoscopic evacuation of empyema sac has gained popularity. Subsequent papers have supported the original observations and satisfactory results in the management of empyema have been reported in the recent literature **(*Chung et al., 2014)***

VATS is superior to traditional thoracoscopy as it provides an excellent surgical view for a complicated empyema cavity, thus making it possible to perform a sufficient evacuation of all empyema membranes and fluids and the removal of fibrous peel in the same way as in open surgery (***Chung et al., 2014)***

Success rate ranges from 68% to 93% and seems to be in close correlation with the composition of the investigated patient group (***Chung et al., 2014)***

Patients with a history shorter than 4 weeks had a good chance to be cured by VATS alone while histories over 5 weeks (presumed Stage III) tended to necessitate a decortication (***Chung et al., 2014)***

VATS is effective for fibro-purulent thoracic empyema and less invasive, and it may be important as a bridge between minimally invasive and conventional open thoracic surgical management where the VATS procedure using two or three ports gives capability to preserve chest wall muscles, and this made it possible to use these muscles for future thoracoplasty ***(Michael et al., 2015)***.

# Aim of the work

**The aim of this study** was to determine the optimal treatment of parapneumonic effusion in the fibrinopurulent stage comparing blind thoracostomy versus VATS with regards to efficacy, duration of hospitalization and ICT insertion and need for further surgery or not.

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# Pleural effusion

## Anatomy of the pleura:

The visceral pleura envelopes the entire surface of both lungs except at the hilum, where the bronchi, pulmonary vessels and nerves enter the lung substance. The parietal pleura covers surface of the chest wall, mediastinum and diaphragm ***(Von Hayek., 1969)***.

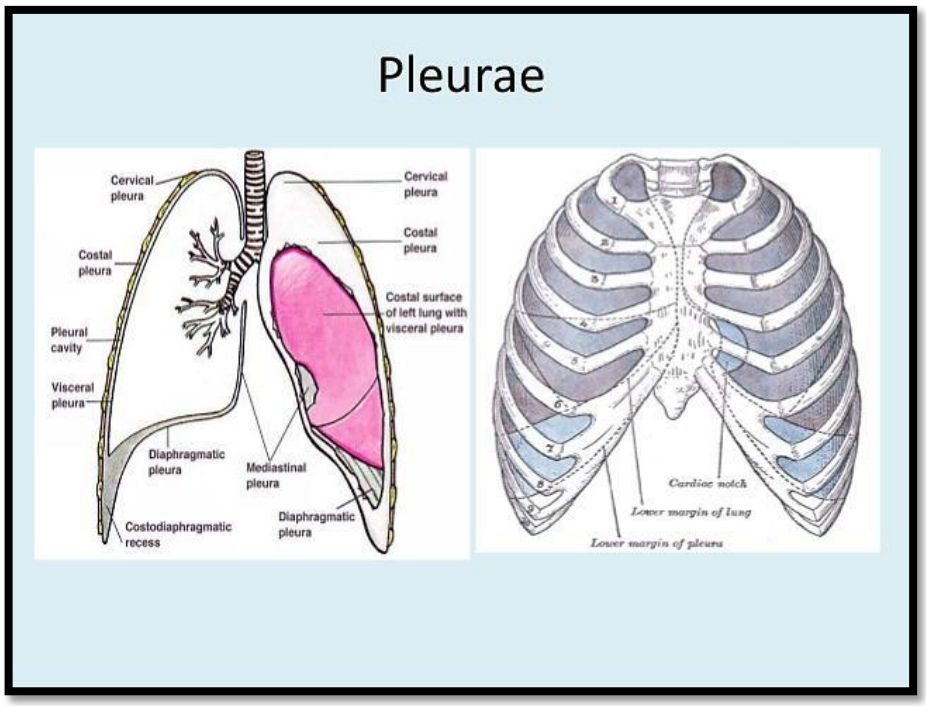


**Figure (1):** Anatomy of pleura ***(Von Hayek., 1969)***.

Below the merger of visceral and parietal pleura at the hilum, pleural reflections from the dorsal and ventral surface of the lungs usually extend to the diaphragm as a