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DIAGNOSTIC YEILD OF MEDICAL THORACOSCOPY IN CASES OF UNDIADNOSED PLEURAL EFFUSION IN KOBRI EL-KOBBA MILITARY HOSPITAL

Thesis

Submitted in partial fulfillment of the requirements for M.D. Degree in chest diseases

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List of Abbreviations

5-ALA: 5-Aminolevulinic acid

ABG: Arterial blood gas

ADA: Adenosine deaminase

AFB: Acid fast bacilli

AIDS: Acquired immunodeficiency diseases

ANA: Antinuclear antibody

ARDS: Acute respiratory distress syndrome

BAPE: Benign asbestos pleural effusion

BP: Blood pressure

BNP: Brain natriuretic peptides

CABG: Coronary arteries bypass graft

CHF: Congestive heart failure

Cop: Pericapillary colloid-osmotic pressure

CPc: Colloid-osmotic intracapillary plasma pressure

CSF: Cerebrospinal fluid

CT: Computed tomography

CTA: Tomographic angiogram computed

CXR: Chest x-ray

DLCO: Lung diffusion capacity for carbon monoxide

ECG: Electrocardiogram

ED: Emergency department

ESR: Erythrocyte sedimentation rate

FEV1: Forced expiratory volume in one second

FRC: Functional residual capacity

FVC: Forced vital capacity

HCG: Human chorionic gonadotropin

HER2: Human epidermal growth factor receptor 2

HF: Heart failure

HH: Hepatic hydrothorax

HIV: Human immunodeficiency virus

HP_c: Mean capillary hydrostatic pressure

HP_p: Mean pericapillary hydrostatic pressure

IFNs: Interferon's

IFN-γ: Interferon gamma

IL-1: Interleukin-1

IL-12: Interleukin-12

IL-2:Interleukin-2

IL-6: Interleukin-6

INR: International normalized ratio

IPC: Indwelling pleural catheter

LD, LDH: lactate dehydrogenase

Lp: Hydraulic conductivity

LPS: Lipopolysaccharide

MPEs: Malignant pleural effusions

MPM: Malignant pleural mesothelioma

MRI: Magnetic resonance imaging

MRSA: Methicillin-resistant Staphylococcus aureus

NSAID: Non-steroidal anti-inflammatory drugs

NT-proBNP: N terminal pro- brain natriuretic peptide

O2: Oxygen

OPC: Outpatient clinic

PA: Poster anterior

PCR: Polymerase chain reaction

PF: Pleural fluid

PMN: Polymorphonuclear

PNL: Polymorphonuclear leukocyte

PSI: Pleural space infection

RA: Rheumatoid arthritis

RCT: Randomized controlled trial

RPO: Re-expansion pulmonary edema

SBEM: spontaneous bacterial empyema

SLE: Systemic lupus erythromatosis

TB: Tuberculosis

TIME2: Therapeutic Intervention in Malignant Effusion Trial

TIPS: Transjugular intrahepatic portal systemic shunt

TLC: Total lung capacity

TNFα: Tumor necrosis factor

US: United States

VATS: Video-assisted thoracic surgery

VEGF: Vascular endothelial growth factor

WBC: White blood cell

Introduction

Pleural effusions are either transudates or exudates based on the biochemical characteristics of the fluid, which usually reflect the physiologic mechanism of its formation ***(Porcel& Light, 2006)***.

Undiagnosed pleural effusions remain a diagnostic challenge for pulmonologists. In a patient with an undiagnosed pleural effusion, the first question to answer is whether the fluid is an exudate or a transudate ***(Segura, 2004).***

Investigation of a pleural effusion evident on chest radiographs should follow a stepwise approach to diagnosis. Diagnosis begins with the clinical history, physical examination, and chest radiography and is followed by thoracentesis when appropriate ***(McGrath and Anderson, 2011).***

Recurrent and persistent pleural exudates are common in clinical practice, and in a large number of patients, thoracocentesis and blind pleural biopsy procedures do not provide a definitive diagnosis. In the Western world, the majority of these exudates are malignant. Thoracoscopy today remains the gold standard technique in providing diagnosis and management in these cases ***(Noppen, 2010).***

Thoracoscopy is a minimally invasive procedure that allows visualization of the pleural space and intrathoracic structures. It enables the taking of pleural biopsies under direct vision, therapeutic drainage of effusions and pleurodesis in one sitting ***(Lin et al, 2006).***

Pleural effusion of unknown origin remains the commonest indication of pleuroscopy and is considered to be one of the techniques with the highest diagnostic yield in "aspiration cytology negative exudative effusions" from the recent British Guidelines, with an efficacy almost comparable to video-assisted thoracoscopic surgery (VATS) ***(Rahman et al.,2010).***

Medical thoracoscopy should be considered in patients with undiagnosed pleural effusions, particularly those lymphocytic exudative effusions where TB and malignant pleural effusion are clinical possibilities and initial pleural fluid analysis is inconclusive ***(Mootha et al., 2011).***

Thoracoscopy is the gold standard for the diagnosis and treatment of pleural diseases. Its diagnostic yield is 95% in patients with malignant pleural disease, with approximately 90% successful pleurodesis for malignant pleural effusion and 95% for pneumothorax ***(Froudarakis, 2011).***

In patients with suspected tuberculous pleurisy, thoracoscopic pleural biopsy under local anesthesia should be actively performed, because the technique has a high diagnostic rate, and can be easily and safely performed***(Sakuraba et al., 2006 b).***

The semirigidthoracoscope achieves a diagnostic yield similar to that of the conventional rigid instrument despite the smaller biopsy size. Both instruments remain valuable in the evaluation and management of pleural disease***(khan et al., 2012).***

Thoracoscopy with flex-rigid thoracoscope is a useful diagnostic tool in the evaluation of pleural effusions with negative blind pleural biopsy and cytology ***(Thangakunam et al., 2010).***

AIM OF THE WORK

The aim of this study is to detect the diagnostic yield of medical thoracoscopy in the diagnosis of cases of exudative pleural effusions of unidentified aetiology.

The Pleura

Thepleura is the serous membrane that covers the lung parenchyma, themediastinum, the diaphragm and the rib cage ***(light,2007).***

Embryology

By 3 weeks of gestational age, the pleural, pericardial, and peritoneal spaces begin to form from the mesoderm, and by 9 weeks, the pleural cavity has become separated from both the pericardial and peritoneal spaces. When the primordial bronchial buds first appear, they and the trachea lie in a median mass of mesenchyme, cranial and dorsal to the peritoneal cavity. This mass of mesenchymal tissue is the future mediastiunum and it separates the two pleural cavities. In humans, no communication normally exists between the two pleural cavities. As the growing primordial lung buds bulge into the right and left pleural cavities, they carry with them a covering of the lining mesothelium, which becomes the visceral pleura. As the separate lobes evolve, they retain their mesothelial covering. This covering becomes the visceral pleura in the fissures. The lining mesothelium of the pleural cavity becomes the parietal pleura ***(Gray and Skandalakis, 1985).***

Anatomy of the Pleura

The pleura is made of two serosal membranes, one covering the lung (the visceral pleura) and one covering the inner chest wall (the parietal pleura). Their surfaces slide over each other, facilitating proper lung movements during the various phases of respiration. The transition between the parietaland visceral pleura is at the pulmonary hilum orroot of the lung. At this level, the reflection coversthe constituents of the hilum, except inferiorly,where the reflection extends down to the diaphragmand is called the triangular or inferiorpulmonary ligament.This ligament may contain large lymphatic vessels. Rarely, incomplete ligation or damage to these vessels during procedures may result in post-operative pleural effusion ***(Bertin and Deslauriers, 2011).***

The right and left pleural sacs form separate compartments and touch only behind the upper half of the sternal body، although they are also close to each other behind the esophagus. The left pleural cavity is smaller of the two because the heart extends further to the left. The upper and lower limits of the pleurae are about the same on the two sides, but the left sometimes descends lower in the midaxillary line***(Albertine et al., 1982).***

At deep inspiration, the lung fills the pleural cavity completely. During expiration or quiet respiration, because of the

retraction of the lung, the most caudal or distal reflected sites of the parietal pleura may be in direct contact with each other to form the recess.The recesses are found at the costodiaphragmatic and costomediastainal junctions where excess fluid in the pleural cavity often accumulates first. The pleura extend into the interlobar space; each lobe, therefore, may expand or collapse individually without affecting the other. Abnormal divisions of lobes and segments are common and interlobar fissures may be incomplete or separated by septa. These altered fissures may appear as linear shadows or "vanishing tumors", radiologically, when they trap fluid in heart failure ***(Wang, 1998).***

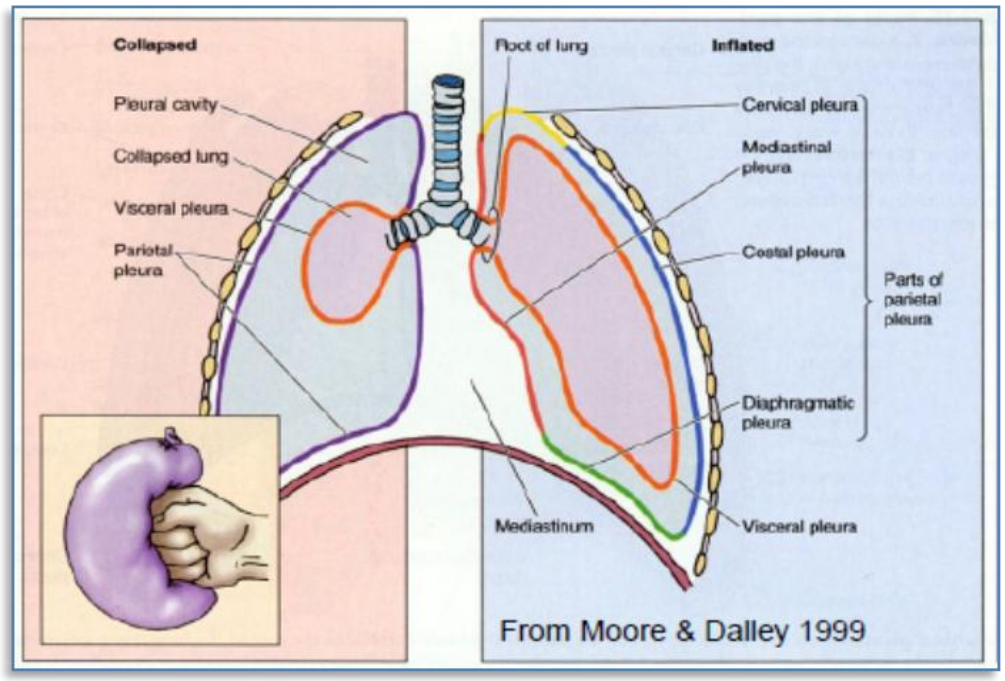

Figure (1): Anatomy of the pleura

(Haselton and Curry, 1996)

Surface Anatomy of the pleura

The cervical pleura can be marked out on the surface by a curved line drawn from the sterno-clavicular joint to the junction at the medial and the middle third of the clavicle, the apex of the pleura is about one inch above the clavicle. This fact is easily explained by the oblique slope of the first rib. The lines of the pleural reflections pass from behind the sternoclavicular joint on each side to meet in the midline at the s costal cartilage (the angle of Louis). The right pleural edge then passes vertically downwards to the sixth costal cartilage and then crosses:

•The eighth rib at the mid-clavicular line.

•The tenth rib at the mid-axillary line.

•The twelfth rib at the lateral border of the erector spinae muscle***(Edward et al., 2004).***

On the left side, the pleural edge arches laterally at the fourth costal cartilage and descends lateral to the border of the sternum, apart from this, its relationship are those of the right side. The pleura actually descend just below the twelfth rib margin at its medial extremity or even below the edge of the eleventh rib if the twelfth is unusually short***(Edward et al., 2004).***

Nerve supply

The visceral pleura is innervated by branches of vagus nerves and sympathetic nerve trunk i.e. autonomic nerve supply. While the parietal pleura is innervated by branches of the intercostal nerves i.e. spinal sources ***(McMinn, 1994).***

Only the parietal pleura contain sensory nerve fibers, supplied by the intercostal and phrenic nerves. The costal and peripheral diaphragmatic regions are innervated by the intercostal nerves, and pain from theseregions is referred to the adjacent chest wall.The central diaphragmatic region is innervated by thephrenic nerve, and pain from this region is referred to theipsilateral shoulder. The visceral pleura does not containsensory nerve fibers; therefore, pain, whether frominflammation, tumor, or catheters advanced far out in the lungduring bronchoscopy, indicates involvement of the adjacentparietal pleura***(Broaddus and Light, 2005).***

Blood supply of the pleura

The parietal pleura receive its blood supply from the systemic capillaries. Small branches of the intercostal arteries supply the costal pleura, whereas the mediastinal pleura is supplied principally by the pericardiaco-phrenic artery. The