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Pleural effusion in critically ill patients

Essay

Submitted for partial fulfillment of master degree in general intensive care

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2015

Acknowledgement

First of all, thanks to **"ALLAH"** the Most Merciful Who gave me the power to carry out this study.

No words can express my deep respect, gratitude and thanks to ***Prof.*** **Dr.Mohammed Abd-El-Khalek Mohammed** , ***Professor of anaesthesiology and intensive care medicine , Faculty of Medicine, Ain Shams University,*** for planning, supervising the current work, constant guidance and encouragement together with his valuable directions throughout this study.

I would like to express my respect and gratitude to ***Dr.*** **Amal Hamed Rabie** , ***lecturer of anaesthesiology and intensive care, Faculty of Medicine, Ain Shams University,*** for her unlimited valuable assistance, kindness, active cooperation and great help to bring this study to completion.

My deepest gratitude and thanks to **DR.Nevin Girgis Fahmy,** ***lecturer of anaesthesiology and intensive care, Faculty of Medicine, Ain Shams University,*** for her great support ,continuous encouragement and kind supervision till completing this study.

I would also like to express my thanks to all my colleagues and family .

Ahmed Mohammed Saleh

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List of Abbreviations

ARDS	Acute respiratory distress syndrome
BAPE	Benign asbestos pleural effusion
CXR	Chest radiography
CT	Computerized tomography
Cap	Capillaries
CABG	Coronary Artery Bypass Graft
ESR	Erythrocyte sedimentation rate
F	Fahrenheit
Fig	Figure
g	Gram
I	Input
Il	Interleukin
ISPP	International survey of pleurodesis practice
L	Left
LDH	Lactate dehydrogenase
mg	Milligram
ML	Milliliter
PA	Postero-anterior
PCIS	Post cardiac injury syndrome
PCWP	Pulmonary capillary wedge pressure
PFA	Pleural fluid acidosis
PF	Pleural fluid
PL	Pleural space
O	Out put
S	Serum/surface area
U	Ultrasonography

Introduction:

The pleural space is located between the parietal pleura covering the chest wall and the visceral pleura covering the lung, contains in a healthy person a few milliliters of fluid that acts as a lubricant between the surfaces. Pathological accumulation of fluid in this space is called pleural effusion ***(light and lee, 2003).***

There are two different types of pleural effusion:

- Transudative pleural effusion: are caused by fluid leaking into the pleural space , this is caused by increased pressure in the blood vessels or a low blood protein count. Congestive heart failure is the most common cause.
- Exudative effusion: are caused by blocked blood vessels or lymph vessels, inflammation, lung injury, and tumors. ***(Celli, 2011).***

The incidence of pleural effusion in the intensive care unit varies depending on the screening methods, from approximately 8% for physical examination to more than 60% for routine ultrasonography ***(Fartoukh et al., 2002).***

Several factors contribute to the occurrence of pleural effusion in intensive care unit patients e.g., administration of large amount of intravenous fluid, pneumonia,heart failure,atelectasis,hypoalbuminemia,Cardiac and abdominal surgery and hemothorax in traumatic patient ***(Fartoukh et al., 2002).***

Aim of the work:

The aim of this work is to provide a concise overview about pleural effusion; its risk factors,possible causes in ICU, its differential diagnosis, complications, management, in addition to the preventive measures.

Anatomy of Lung and Pleura

A-The lungs.

The lungs are the essential organs of respiration; they are two in number, placed one on either side within the thorax, and separated from each other by the heart and other contents of the mediastinum each lung is conical in shape, having an apex, base,twosurfaces,and three borders ,each lung is invested by an exceedingly delicate serous membrane, the pleura,which is arranged in the form of a closed invaginated sac**.**

a-The apex:(apex pulmonis) is rounded, and extends into the root of the neck, reaching from 2.5 to 4 cm. above the level of the sternal end of the first rib. A sulcus produced by the subclavian artery as it curves in front of the pleura runs upward and lateralward immediately below the apex ***(gray,2012)* .**

b-The base :(basis pulmonis) is broad, concave, and rests upon the convex surface of the diaphragm, which separates the right lung from the right lobe of the liver, and the left lung from the left lobe of the liver, the stomach, and the spleen. Since the diaphragm extends higher on the right than on the left side, the concavity on the base of the right lung is deeper than that on the left .

Laterally and behind, the base is bounded by a thin, sharp margin which project for some distance into the phrenicocostal sinus of the pleura, between the lower ribs and the costal attachment of the diaphragm. The base of the lung descends during inspiration and ascends during expiration***(Rahilly et al,.2008).***

c-Surfaces :

The costal surface (faciescostalis; external or thoracic surface) is smooth, convex, of considerable extent, and corresponds to the form of the cavity of the chest,withslight grooves corresponding with the overlying ribs and is deeper behind than in front.

The mediastinal surface (faciesmediastinalis; inner surface) is in contact with the mediastinal pleura. It presents a deep concavity,The cardiac impression, which accommodates the pericardium; this is larger and deeper on the left than on the right lung. Above and behind this concavity is a triangular depression named the hilum, (fig1) where the structures which form the root of the lung enter and leave the viscus. These structures are invested by pleura, which, below the hilus and behind the pericardial impression, forms the pulmonary ligament. On the right lung immediately above the hilus, is an arched furrow which accommodates the azygos vein; while running upward, and then arching lateralward some little distance below the apex, is a wide groove for the superior vena cava and right innominate vein; behind this, and nearer to the apex, is a furrow for the innominate artery. Behind the hilus and the attachment of the pulmonary ligament is a vertical groove for the esophagus; this groove becomes less distinct below, owing to the inclination of the lower part of the esophagus to the left of the middle line. In front and to the right of the lower part of the esophageal groove is a deep concavity for the extrapericardiac portion of the thoracic part of the inferior vena cava. On the left lung, immediately above the hilus, is a well-marked curved furrow produced by the aortic arch, and running upward from this toward the apex is a groove accommodating the left subclavian artery; (fig1) a slight impression in front of the latter and close to the margin of the lung lodges the left innominate vein. Behind the hilus and pulmonary ligament is avertical furrow produced by the descending aorta, and in front of this, near the base of the lung, the lower part of the esophagus causes a shallow impression ***(Gray,2012).***

d-Borders :

a-The inferior border (margo inferior) is thin and sharp where it separates the base from the costal surface and extends into the phrenicocostal sinus;medially where it divides the base from the mediastinal surface ,it is blunt and rounded.

b-The anterior border (margo anterior) is thin and sharp, and overlaps the front of the pericardium. The anterior border of the right lung is almost vertical, and projects into the costomediastinal sinus; that of the left presents, below, an angular notch, the cardiac notch, in which the pericardium is exposed.

c-The posterior border (margo posterior) is broad and rounded, and is received into the deep concavity on either side of the vertebral column. It is much longer than the anterior border, and projects, below, into the phrenicocostal sinus.

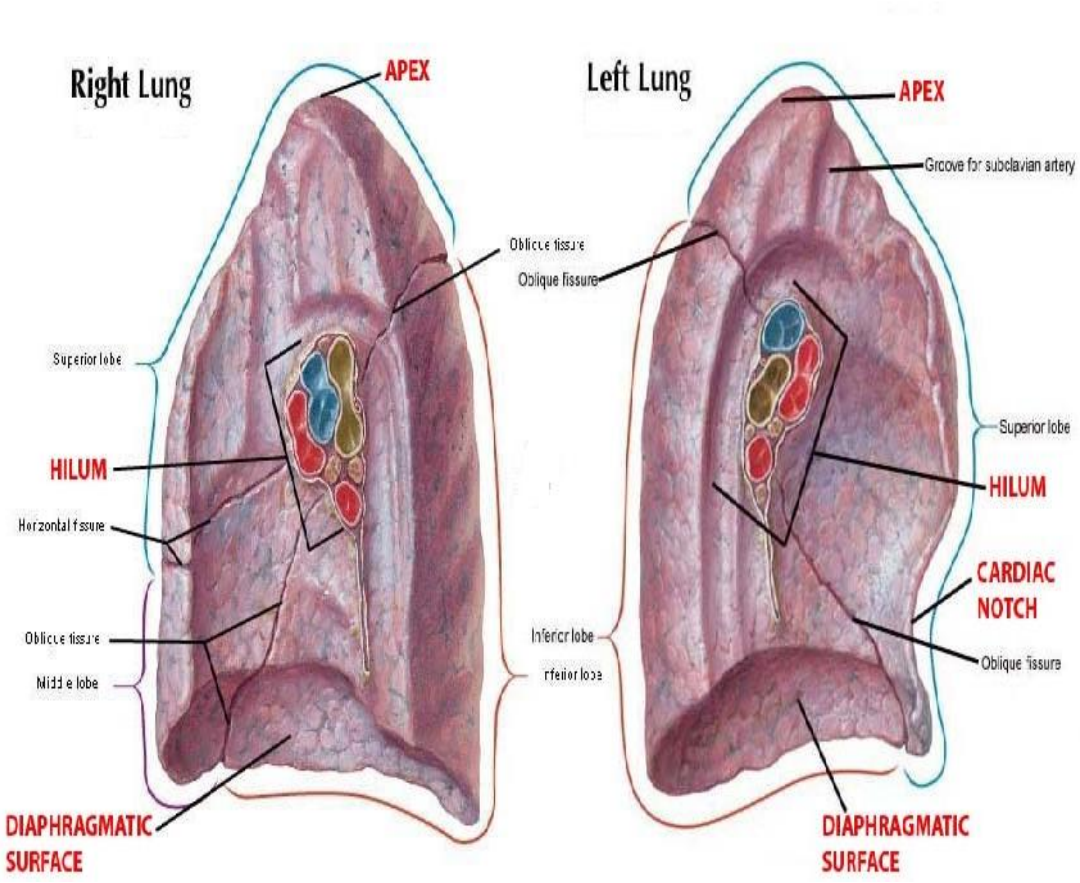

Fig 1: **Lung Border and Surface*(Netter,2014).***

***Fissures and Lobes of the Lungs.**

The left lung is divided into two lobes, an upper and a lower, by an interlobular fissure, which extends from the costal to the mediastinal surface of the lung both above and below the hilus. As seen on the surface, this fissure begins on the mediastinal surface of the lung at the upper and posterior part of the hilus, and runs backward and upward to the posterior border, which it crosses at a point about 6 cm. below the apex. It then extends downward and forward over the costal surface, and reaches the lower border a little behind its anterior extremity, and its further course can be followed upward and backward across the mediastinal surface as far as the lower part of the hilus. The superior lobe lies above and in front of this fissure, and includes the apex, the anterior border, and a considerable part of the costal surface and the greater part of the mediastinal surface of the lung. The inferior lobe, the larger of the two, is situated below and behind the fissure, and comprises almost the whole of the base, a large portion of the costal surface, and the greater part of the posterior border.

The right lung is divided into three lobes, superior, middle, and inferior, by two interlobular fissures(fig2). One of these separates the inferior from the middle and superior lobes, and corresponds closely with the fissure in the left lung. Its direction is, however, more vertical, and it cuts the lower border about 7.5 cm. behind its anterior extremity. The other fissure separates the superior from the middle lobe. It begins in the previous fissure near the posterior border of the lung, and, runninghorizontally forward, cuts the anterior border on a level with the sternal end of the fourth costal cartilage; on the mediastinal surface it may be traced backward to the hilus. The middle lobe, the smallest lobe of the right lung, is wedge-shaped, and includes the lower part of the anterior border and the anterior part of the base of the lung. The right lung, although shorter by 2.5 cm. than the left, in consequence of the diaphragm rising higher on the right side to accommodate the liver, is broader, owing

to the inclination of the heart to the left side; its total capacity is greater and it weighs more than the left lung(Gray,2012).

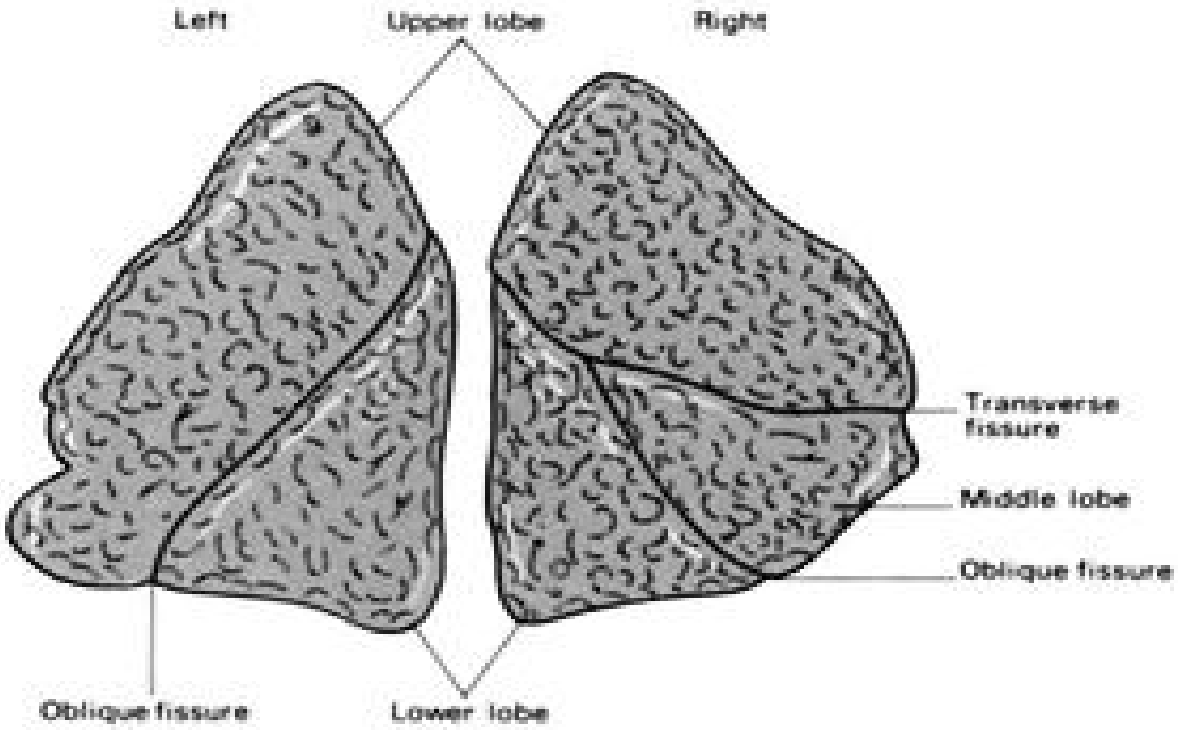

Fig. 18 The lungs, lateral aspects.

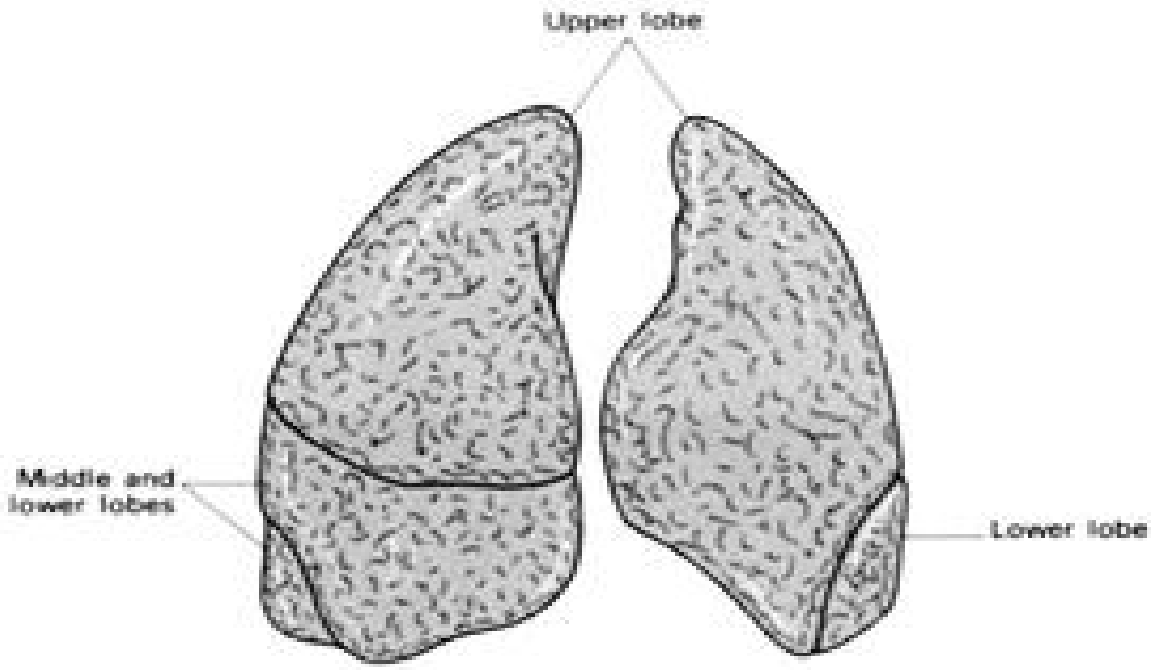

Fig 2:**Fissure and Lobes of lung*(Ellis,2006).***