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Original Research Article

Clinical Study of Pleural & Lung Diseases by using Radiodiagnosis and Sonography: A Retrospective Study

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Abstract:

Sonography is the best modality for very ill patients and it causes minimum discomfort and can be used at bed side. Based on these literature findings the present study was planned to assess the diagnosis of the pleural and lung diseases by using sonography in comparison with the sonography.

The 50 Patients referred to Department of Radiology were enrolled in the present study. The patients considered in this study are of all ages. All patients were undergone radiologically as well as sonography evaluation. All the patients were informed consent. The aim and the objective of the study are conveyed to all patients.

The data generated from the present study and the reported literature suggests that the Ultrasonic examination is simple method. This can be performed at bed side of the patient. The outcomes of inspection are known instantly to the doctor and they are easy to interpret. Also as like radiology, the ultrasonic examination is a non-invasive technique, more comfortable for a sick patient. It is generally accepted that the ultrasonic intensity used for diagnostic purpose is entirely harmless to the patient.

Keywords: Pleural & Lung Diseases, Sonography,

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Introduction

The chest (thoracic or pleural) cavity is a space that is enclosed by the spine, ribs, and sternum (breast bone) and is separated from the abdomen by the diaphragm. The chest cavity contains the heart, the thoracic aorta, lungs and esophagus (swallowing passage) among other important organs. The wall of the chest cavity is made up of the rib cage and diaphragm. The chest cavity is lined by a thin shiny membrane called the pleura, which covers the inside surface of the rib cage and spreads over the lungs as well. Normally, the pleura produce a small amount of fluid which serves as a lubricant to the lungs as they move back and forth against the chest wall during respiration. A variety of conditions involve the pleura and pleural cavity, each with different causes, symptoms, and treatments.

Hemothorax: Accumulation of blood in the pleural cavity.

- Causes: Most chest trauma; other causes include lung/pleural cancer and chest/heart surgery.
- Symptoms: Chest pain, shortness of breath, anxiety/restlessness, increased heart rate, respiratory failure if large.

Pleural effusion: Accumulation of excess fluid in the pleural cavity; this accumulation pushes against the lung and prevents full expansion with breathing. This is one of the most common problems associated with the pleura.

- Causes: Congestive heart failure, lung cancer, pneumonia, tuberculosis, liver disease, pulmonary embolism, lupus, adverse reaction to specific medications.
- Symptoms: May be asymptomatic (no symptoms), or produce shortness of breath and cough

Empyema: The accumulation of pus in the pleural cavity. This is a type of pleural effusion that is usually associated with pneumonia (an infection in the adjacent lung). The symptoms are those of the pneumonia (cough, fever) in addition to shortness of breath and impaired breathing.
Pleural tumors: Malignant tumors arising from the pleura (e.g. mesothelioma) or spreading to the

pleura (metastatic) from another site, and benign tumors arising from the pleura.

- Symptoms: Shortness of breath, chest pain, cough, unexpected weight loss.

Pleurisy: Inflammation of the pleura

- Causes: Infection of the respiratory system by a virus or bacteria, leak of air into pleural cavity from a punctured lung, chest injury, tuberculosis or other infection, tumor in the pleural cavity, rheumatoid arthritis, lupus, sickle cell crisis, pulmonary embolism, pancreatitis, complications from heart surgery.
- Symptoms: Chest pain on taking a deep breath, shortness of breath, fever and/or chills, joint swelling and/or soreness, unexpected weight loss.

Pneumothorax: Accumulation of air within the pleural cavity between the outside of the lung and the inside of the rib cage.

- Causes: Injury to the lung causing a leak of air, chronic obstructive pulmonary disease or other lung disease, tuberculosis, ruptured air blisters (blebs), mechanical ventilation.
- Symptoms: Shortness of breath, rapid breathing, chest pain when taking a deep breath (pleurisy), cyanosis (bluish discoloration of the skin), respiratory distress if large.

Pleural disease may be suspected on the basis of a medical history and findings on a physical examination. It is confirmed with a chest x-ray, which shows the interior of the chest cavity, and a CT scan—a series of images of the inside of the body, taken from different angles and depths, to reveal a high level of detail. To ensure that the blood vessels and organs show up clearly in these scans, dye may be swallowed or injected into a vein during performance of the scan. Certain blood tests may also be useful in determining the cause and severity of the pleural disease. [1]

A chest ultrasound is a noninvasive diagnostic exam that produces images, which used to assess the organs and structures within the chest, such as the lungs, mediastinum (area in the chest containing the heart, aorta, trachea, esophagus, thymus, and lymph nodes), and pleural space (space between the lungs and the interior wall of the chest). Ultrasound technology allows quick visualization of the chest organs and structures from outside the body. Ultrasound may also be used to assess blood flow to chest organs. Ultrasound uses a transducer that sends out ultrasound waves at a frequency too high to be heard. The ultrasound transducer is placed on the skin, and the ultrasound waves move through the body to the organs and structures within. The sound waves bounce off the organs like an echo and return to the transducer. The transducer processes the reflected waves, which are then converted by a computer into an image of the organs or tissues being examined.

The sound waves travel at different speeds depending on the type of tissue encountered - fastest through bone tissue and slowest through air. The speed at which the sound waves are returned to the transducer, as well as how much of the sound wave returns, is translated by the transducer as different types of tissue. An ultrasound gel is placed on the transducer and the skin to allow for smooth movement of the transducer over the skin and to eliminate air between the skin and the transducer for the best sound conduction. Another type of ultrasound is Doppler ultrasound, sometimes called a duplex study, used to show the speed and direction of blood flow within the chest. Unlike a standard ultrasound, some sound waves during the Doppler exam are audible. Ultrasound may be safely used during pregnancy or in the presence of allergies to contrast dye, because no radiation or contrast dyes are used.

A chest ultrasound may used to assess the presence of excess fluid in the pleural space or other areas of the chest, especially when the amount of fluid is small. If excess fluid is present, ultrasound may be useful to determine the type of fluid, exudate (seen in inflammatory, cancerous, or infectious conditions) or transudate (fluid that has leaked from blood or lymph vessels for various reasons). It can also be used to evaluate the heart and its valves. When used for this purpose, the procedure is called an echocardiogram. Chest ultrasound may be performed to guide a needle during thoracentesis (puncture of the chest wall for the removal of fluids) or biopsy. Another use of chest ultrasound is to assess the movement of the diaphragm. Chest ultrasound may be used along with other types of diagnostic methods, such as CT scanning, X-rays, or magnetic resonance imaging (MRI) for evaluation and diagnosis of conditions of the chest. [2]

Sonography has a very high accuracy in the diagnosis of pleural and peripheral lung diseases. It has a much higher sensitivity than conventional radiology in the diagnosis of pleural effusion and its effect on underlying lung. It can easily differentiate solid from cystic lesion. It has a high efficacy in differentiating tapable and non-tapable pleural effusions. It is ideal for site selection on skin to target measurements, wherever needle puncture is to be undertaken. Sonography is the best modality for very ill patients and it causes minimum discomfort and can be used at bed side. Based on these literature findings the present study was planned to assess the diagnosis of the pleural

and lung diseases by using sonography in comparison with the sonography.

Methodology

The 50 patients referred to Department of Radiology, Lord Buddha koshi medical college & Hospital, Saharsa, Bihar, India were enrolled in the present study. The patients considered in this study are of all ages. All patients were undergone radiologically as well as sonography evaluation.All the patients were informed consent. The aim and the objective of the study are conveyed to all patients.

Results & Discussion

The data from the 50 patients were collected and discussed with the already reported literature. Ultrasound (US) has received increased interest from chest physicians in recent years. Modern US devices are user friendly, inexpensive, lightweight and portable, which makes them suitable for outpatient settings, as well as for bedside investigations of the severely ill. However, the view during bronchoscopy is limited to the inner surface in the case of parabronchial lesions. Therefore, endobronchial ultrasound (EBUS) systems were developed. In trials, it has been shown that, with the help of EBUS, the diagnosis and staging of lung cancer and other pathologies can be improved. EBUS is a safe technique and, so far, has proved extremely useful during diagnostic and interventional procedures. US is set to become a practical and essential tool for the pulmonologist in the near future. This review aims to assess the most important and interesting articles in the field and to encourage the pulmonologist to learn ultrasonic techniques, particularly with regard to transthoracic US. [3]

Table 1 : Observation in Radiology & Sonography of patients having pleural infusion

Observation	Radiology	Sonography
Fluid Suspected	18	26
False Positive	10	4
Not Determined	22	20
Total	50	50

Table 1 shows the comparison of the Radiology & Sonography study of the study group patients. The Sonography showed the better observation as compared to the Radiology.

Table 2 : Pathological Comparison in the Radiology & Sonography

Pathological Findings	Radiology	Sonography
Parenchymal tumour	28	28
Hydatid cyst	8	4
Sub diaphragmatic pathology	4	4
Consolidation	2	2
Pleural fibrosis	2	4
Lung abcess	2	4
Pleural Tumour	2	2
Pericardial effusion	2	2
Total	**50**	**50**

Gryminski et al [4] in a study of 100 patients compared ultrasonography with radiology and obtained 93% of effusion by radiology. In another study of 41 patients, pleural effusion was diagnosed in 93% by ultrasonography. In our study of 50 cases ultrasound could diagnose effusion in 96.9% cases.Emphasizing the superiority of sonography over radiology, Doust et al[5] also observed an accurate sonodiagnosis in 25 out of 27 cases of pleural effusion. Similar results are reported by others. [5-6] Sonography showed doubtful results in 13% cases [4] . The possible cause postulated by them were obscuring of pleural fluid by reverberation from ribs and organization of pleural fluid.

Traditional indications for ultrasound, such as the diagnosis of chest wall diseases and pleural effusion, are widely known and used. Without having to move the patient, bedside ultrasound can detect even a few milliliters of fluid in the pleural space. The characteristic echographic pattern of the pleural fluid is anechoic (without echoes) with a posterior band of hyperechoic reflection, while solid lesions are echogenic to a greater or lesser extent. [7] Pleural transudate is generally anechoic whereas pleural exudate, with its greater protein content (>3 g/100 mL), has echogenic septa and may even be homogeneously echogenic.6 However, certain solid tumors located in the pleura, especially lymphomas and some neurogenic tumors, appear as anechoic masses because they transmit ultrasonic waves, possibly leading to diagnostic error. On the other hand, some pleural exudates and empyema appear as echoic lesions and may even appear hyperechoic at times. This is why the specificity of ultrasound in differentiating solids from liquids is not 100%. [8]

Ultrasound has other indications in the thorax that are less widely known and applied; this does not, however, make them any less valid. Thoracic trauma affecting soft tissues and bony structures, as well as pneumothorax of any origin, can be diagnosed by ultrasound. Several studies have shown that ultrasound can even improve on the results of conventional radiography in fractures of the sternum and ribs. [9-10] Rowan et al, [11] in a recent study of 27 patients suspected of having traumatic pneumothorax, showed that ultrasound was more sensitive than supine chest radiography and as sensitive as computed tomography. Moreover, ultrasound, whether percutaneous or endoscopic, is effective for examining problems of the diaphragm, heart, pericardium, and the large arteries and veins of the thorax. [12] Considering these indications, the benefits of ultrasound for emergency assessment of chest injury in the polytraumatized patient are evident, particularly when patient mobility is compromised or computed tomography is unavailable. [13]

The purpose of undertaking the present study was to evaluate the role of sonography in detection and characterization of the lesions which were pleural and peripheral lung based and could be studied by ultrasound as there was no normal lung intervening between the chest wall and lesion. Routinely, conventional radiography is the method of investigation in the pleural and peripheral lung based lesions. However, many times when the whole of the hemithorax is opaque or the fluid is encysted it is not possible with the conventional radiology to make a confident diagnosis. In these circumstances sonography can be very helpful.

Conclusion

The data generated from the present study and the reported literature suggest that the Ultrasonic examination is simple method. This can be performed at bed side of the patient. The outcomes of inspection are known instantly to the doctor and they are easy to interpret. Also as like radiology, the ultrasonic examination is a non-invasive technique, more comfortable for a sick patient. It is generally accepted that the ultrasonic intensity used for diagnostic purpose is entirely harmless to the patient.

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