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The utility of Thoracic Ultrasound

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A B S T R A C T

Although thoracic ultrasonography is a relatively new tool in diagnostic tools, it has quickly become a highly effective tool with significant implications for patient treatment. It is useful in a broad range of medical specialties, including cardiology, emergency medicine, pulmonology, and critical care. With the use of this non-invasive imaging technique, physicians may view thoracic structures in real-time and evaluate pleural effusions, pneumothorax, and lung consolidations quickly and accurately. Thoracic ultrasound is a diagnostic tool, but it also has a unique bedside use that allows physicians to precisely guide treatments like thoracentesis and installation of chest tubes and to act quickly when necessary. Moreover, its mobility makes it invaluable in situations with limited resources and in times of emergency, when prompt evaluation can be crucial. Thoracic ultrasonography has the potential to completely change patient care perspectives by improving procedural safety and diagnostic accuracy in the rapidly changing field of modern medicine, provided that the medical profession keeps researching its potential and improving its methodologies.

Keywords: Ultrasound; Thoracic Ultrasound; Patient Care

Introduction

Medical imaging is essential in modern health care, assisting in the diagnosis, monitoring, and management of a variety of disorders.[1] Thoracic ultrasound has emerged as a helpful tool in assessing and diagnosing thoracic diseases among the different imaging modalities available.[2] It uses high-frequency sound waves to visualise and analyse structures in the chest, such as the lungs, pleura, diaphragm, and mediastinum. Its non-ionizing nature, portability, cost-effectiveness, and real-time imaging capabilities distinguish it from classic imaging modalities such as X-rays and computed tomography (CT) scans.[3]

Thoracic ultrasonography has proven to be a powerful diagnostic and monitoring technique for a variety of pulmonary diseases.[2] It helps detect pleural effusions, consolidation, pneumothorax, interstitial lung disorders and decompensated heart failure.[4,5] Its availability at the bedside enables prompt assessment and decision-making in emergency rooms and critical care settings.[6] Pleural illnesses, such as pleural effusions and pneumothorax, are common in clinical practice. It has demonstrated good results in identifying pneumothorax with sensitivity of 98.6% and specificity of 85.1%.[7] It can consistently detect even minor or subtle pneumothoraces that physical examination or traditional chest X-rays may miss.

Thoracic ultrasound enables accurate and real-time evaluation of pleural effusions, assisting in the diagnosis of their etiology, volume, and therapeutic management. According to several research studies and clinical evaluations, the sensitivity of thoracic ultrasonography in diagnosing pleural effusion can range from around 94% and specificity of 98%.[8] It allows for safe and efficient thoracentesis, lowering the risk of complications and length of hospital stay.

Patients in critical care settings frequently demand rapid and precise assessment[9]. Thoracic ultrasound is a useful addition to clinical examination since it allows for the evaluation of lung aeration, pleural diseases, and fluid collections. It improves patient safety and outcomes by assisting in the direction of invasive treatments such as central line installation and thoracic drainage.[9] Thoracic ultrasound can assist in the grading of COVID-19 pneumonia and ARDS secondary to other causes by identifying and characterising the amount and severity of pneumonia lesions. Thoracic ultrasound can stratify the severity of COVID-19 pneumonia by measuring lung involvement, such as the presence of consolidations, B-lines, pleural effusions, and subpleural abnormalities. It allows clinicians to distinguish between mild, moderate, and severe instances, allowing for appropriate triage, treatment options, and prognosis assessments.[10] This is extremely useful when examinations such as CT scans cannot be done in critically ill patients due to limited movement and a lack of resources.

Early identification and proper staging are critical for improving patient outcomes in Pakistan, where lung cancer is one of the main causes of cancer-related mortality. Thoracic ultrasonography is a low-cost imaging technique that can be used to evaluate lung nodules, guide biopsies, and measure mediastinal lymph nodes.[11] It can be used in conjunction with other imaging modalities to improve diagnosis accuracy. Moreover, thoracic ultrasonography has shown encouraging results in the diagnosis and treatment of pulmonary tuberculosis.[12] It detects distinctive features such pleural thickening, subpleural nodules, and enlarged lymph nodes, assisting in early diagnosis and directing treatment recommendations.

While the benefit of thoracic ultrasonography is obvious in Pakistan, various hurdles must be overcome before its widespread introduction and efficient utilisation. To fully utilise the capabilities of thoracic ultrasonography, healthcare workers must have proper training and knowledge. By incorporating thoracic ultrasound into medical curriculum, providing specialised training programmes, and organising workshops, the knowledge gap can be bridged and competent use of this modality ensured. The availability and accessibility of ultrasound machines in Pakistan's remote locations remains a challenge. Creating well-equipped ultrasound units, particularly in remote regions, as well as maintaining the maintenance and effective operation of existing machines, are critical steps towards increasing access to thoracic ultrasound services. Collaboration between researchers, physicians, and policymakers is critical for advancing thoracic ultrasound research. Thoracic ultrasound integration can be strengthened further by conducting local studies on its utility, developing clinical recommendations, and fostering evidence-based practise.

Thoracic ultrasonography has evolved as a valuable imaging modality with a wide range of applications in the diagnosis and management of respiratory illnesses. In Pakistan, where healthcare resources are often scarce, thoracic ultrasound provides a low-cost and easily accessible technique for improving diagnostic accuracy, guiding therapies, and improving patient outcomes. Pakistan can fully embrace the potential of thoracic ultrasonography and revolutionise the way thoracic disorders are identified and managed by solving training, infrastructure, and research challenges, eventually advancing healthcare for its population.

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