Safety and Diagnostic Yield of Thoracic Ultrasound–Assisted Transthoracic Biopsy Performed by a Pulmonologist

Thesis

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By

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LIST OF ABBREVIATIONS

Abbreviation	Detail
ALI	Acute lung injury
ARDS	Acute respiratory distress syndrome
BLUE-protocol	Bedside Lung US in Emergency
C	Cyst
CAP	community-acquired pneumonia
Chest CT	Chest computerized tomography
CM	centimeter
CNB	cutting-needle biopsy
COPD	Chronic obstructive pulmonary disease
CW	Chest wall
CXR	Chest x ray
D	Dimensions
D	Diaphragm
DVT	Deep venous thrombosis
F	French
FALLS	Fluid Administration Limited by Lung Sonography
FNA	Fine needle aspiration
FOB	Fibro optic bronchoscope
ICU	Intensive care unite
INR	International Normalization Ratio
L	Loculations
L	Lung
M	Mass
M-mode	Motion- mode
MHz	Mega hertz
ML	Milliliter
MM	Millimeter
MMHg	Millimeter mercury
MRI	Magnetic Resonance Imaging
NS	Non significant
NSAIDs	Non-steroidal anti-inflammatory drugs
NSCLC	Non small cell lung cancer

P	Pleura
PAOP	pulmonary artery occlusion pressure
PE	Pleural effusion
PICC	Peripherally inserted central catheters
PLAPS-profile	Postero-Lateral Alveolar and/or Pleural Syndrome
pN3	Pathological staging of lymph node
PP	Parietal pleura
PT	Prothrombin time
PTT	Partial thromboplastin time
R	Reverberation artifact
S	Septa
S	Skin
S	Significant
SCLC	Small cell lung cancer
SD	Standard deviation
TB	Tuberculosis
TUS	Transthoracic ultrasound
US	Ultrasound
VP	Visceral pleura

LIST OF TABLES

LIST OF FIGURES

Figure (9)	Numerous comet-tail artifacts originating near from the diaphragmatic pleura	

Figure (10)	Malignant tumor, infiltrating the chest wall.	
Figure (11)	Supraclavicular lymph node from malignancy, which was not detected by palpation or CT scanning.	
Figure (12)	A pleural effusion gives rise to an anechoic space between the visceral and parietal pleura. Compressive atelectasis of the lung is seen on this high-frequency ultrasonogram.	
Figure (13)	A complex septate effusion (viewed with lowfrequency ultrasonography) with multiple septa and loculations.	
Figure (14)	Localized pleural thickening in a patient with post inflammatory pleural fibrosis showing negative color Doppler sign.	
Figure (15)	pleural tumors A. malignant B. benign.	
Figure (16)	A low-frequency US image of a densely consolidated lung abutting the chest wall. Note the multiple air (hyperdense– arrow) and fluid. (hypodense) bronchograms (best appreciated on real-time US)	

Figure (17)	High-frequency US image.	
Figure (18)	A high-frequency US of a patient with pulmonary oedema showing widespread pronounced B-lines (a reliable sign of interstitial pulmonary oedema).	
Figure (19)	Pulmonary infarction with small effusion.	
Figure (20)	This patient presented with a suspected hydatid cyst. An US-assisted fine-needle aspiration was safely performed. Note the reverberation artifact due to the high water content of the cyst.	
Figure (21)	Diaphragm in B- and M-mode in spontaneous breathing (A) and in forced respiration (B).	
Figure (22)	Measure of the diaphragmatic excursion in spontaneous breathing (A), on average 1.8 cm. Measure of the diaphragmatic excursion in forced respiration (B), on average 7.8 cm. ti, inspiratory time; te, expiratory time.	
Figure (23)	Ultrasound transducer with the resulting image.	
Figure (24)	The sonographic image shows the oblique trajectory of the Tru-Cut biopsy needle. The tip is oriented toward the solid component of the lesion.	

Figure (25)	Biopsy of a metastatic pleural lesion in a patient with a history a squamous-cell carcinoma. The ultrasound image shows an expanding lesion on the pleural side composed primarily of hypoechoic fluid with evidence of colliquative necrosis. The tip of the biopsy needle can be seen within the lesion.	
Figure (26)	Drainage of a pleural mesothelioma. The ultrasound image shows focal thickening of the pleura with solid and cystic components associated with a large pleural effusion. The drain is visualized within the fluid collection, which is adjacent to focal areas of solid thickening of the pleura representing neoplastic involvement.	
Figure (27)	Using the Seldinger technique, a pig tail catheter has been inserted through a right intercostal access to drain a pleural effusion	
Figure (28)	Aspiration of a fluid collection.	
Figure (29)	Mind ray DP 1100 ultrasound.	
Figure (30)	Sex distribution of cases studied	
Figure (31)	Smoking history among cases studied	
Figure (32)	diagnosed lesions by US according to site	
Figure (33)	Size difference by chest US of diagnosed and no diagnosed lesion	

Figure (34)	complications of Transthoracic ultrasound guided biopsy	

INTRODUCTION

Transthoracic ultrasonography (US) is a well established modality in the evaluation of respiratory disorders, but is still not utilized to its full potential by chest physicians, both in the developed and developing world[(1)]. Transthoracic US has many advantages that make it an ideal investigation in a health care system with limited resources, the most significant being its cost in terms of acquisition, maintenance and consumables. `Furthermore it is mobile, utilizes no radiation and has a short examination time. Moreover, US assisted biopsy can be performed by a single clinician with no sedation and minimal monitoring, even potentially outside of theatre [(2)].

Ultrasound (US) has found a firm place in chest medicine as an aid for assessing pleural effusions at the bed side. This development was facilitated by the advent of affordable, lightweight and mobile US units. Although less practiced by physicians, US can also visualize solid lesions arising from the pleura, chest wall and anterior mediastinum, and even lung tumors and consolidations are detected without difficulty provided they extend to the parietal pleura. US is an ideal tool to assist with biopsy procedures. It can frequently replace computed tomographic (CT) guidance at much lower cost [(3)].

US demonstrates pleural-based masses and lung tumors in the absence of a pleural effusion, provided that they are involving or abutting the pleura Such lesions are suitable for cutting-needle biopsy after identification of a puncture site with US, which has distinct potential advantages.

Firstly, large vessels and aerated lung parenchyma can easily be detected with US, which minimize the risk of pneumothorax and improve safety. Secondly, US can be performed at the bedside and in any body position allowing for swift procedures with minimal distress even in patients in poor general condition. And lastly, the integration of US into a ‘low-tech’ procedure by chest physicians can reduce the need for more expensive radiological or surgical biopsy [(4)].

The usefulness of thoracic ultrasonography rests with its immediate application. The ultrasound examination is integrated with the results of the physical examination and the clinical impression. The ultrasound examination of the chest extends the physical examination and allows the pulmonologist to better characterize disease processes. Thoracic ultrasonography is performed at the bedside of the patient by the pulmonologist who is aware of all aspects of the clinical situation. There is no time delay, which is inherent to standard radiographic techniques, and the pulmonologist applies the results with full clinical knowledge of the patient, unlike the radiologist. Chest radiography and chest CT scan are important imaging modalities for the pulmonologist and should be used in conjunction with ultrasound to make treatment decisions [(1)].

Aim of work

The aim of this work is to assess safety and diagnostic yield of thoracic ultrasound–assisted transthoracic biopsy performed by a pulmonologist.

Chest Ultrasonography Overview

Transthoracic ultrasonography is a well-established and validated imaging modality, despite being still not utilized to its full potential by respiratory physicians. Ultrasound- assisted procedures can be performed by a single clinician with no sedation and with minimal monitoring, even outside of theatre. It allows for an immediate and mobile assessment that can potentially augment the physical examination of the chest (***Coenraad et al., 2012).***

Field of use

The routine use of ultrasound is as a tool at the patient's bedside to aid and confirm the diagnosis of diseases suspected following and integrating the objective examination; it can be completed by the common techniques of chest imaging; as well it can help guide interventional procedures that the clinician may decide necessary***(Koenig et al.,2011) .***

The strong points of ultrasonography are as follows:

– It offers a practical tool to complete and expand the general objective examination, facilitating a rapid diagnosis even in critical conditions.

– The technique and its sonographic signs are simple to learn.

– It is useful as a "bedside" tool: for establishing the pharmacological treatment, monitoring its efficacy, and guiding diagnostic/therapeutic interventional procedures.

In the clinical practice of respiratory specialists thoracic ultrasound can be used to investigate: