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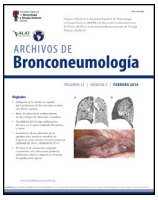

Original Article

Benefit of Chest Ultrasonography in the Diagnosis of Peripheral Thoracic Lesions in an Interventional Pulmonology Unit☆

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ABSTRACT

Introduction and objectives: The use of ultrasound in peripheral thoracic lesions offers advantages over other radiological guiding methods. This diagnostic procedure has been applied in most studies published by radiologists. Our aim was to determine the diagnostic efficacy of percutaneous ultrasound-guided punctures and biopsies of peripheral thoracic lesions performed by pulmonologists.
Methodology: A retrospective analysis of 58 patients who underwent real-time ultrasound-guided transthoracic punctures and biopsy of peripheral thoracic lesions between March 2011 and September 2014 in the pulmonology department of our hospital, was carried out. Cases were classified into the following diagnostic categories: malignant, benign and non-diagnostic (non-specific benign without evidence of malignancy and insufficient specimen).
Results: A conclusive diagnosis was obtained in 47 procedures (81%), of which 13 (22.4%) were specific benign lesions and 34 (58.6%) cancers. In the remaining 11 (19%) patients, a non-diagnostic result was obtained [non-specific benign in 5 cases (8.6%) and insufficient specimen in 6 (10.3%)]. Sensitivity was 75.6%, negative predictive value was 54.2%, specificity and positive predictive value were 100%, and diagnostic accuracy was 81%. Excluding procedures with insufficient specimens, the results were 87.2%, 72.3%, 100%, 100% and 90.4% respectively. There were no serious complications.
Conclusions: Percutaneous ultrasound-guided puncture and biopsy in the diagnosis of peripheral thoracic lesions performed by pulmonologists is a safe procedure with high diagnostic accuracy. We achieved similar results to those previously obtained by radiologists.

Utilidad de la ecografía en el diagnóstico de lesiones torácicas periféricas realizadas en una unidad de técnicas de neumología

Palabras clave:
Lesiones torácicas periféricas
Ecografía
Biopsia transtorácica
Rentabilidad diagnóstica
Cáncer de pulmón

RESUMEN

Introducción y objetivos: La ecografía como guía en la punción percutánea de lesiones torácicas periféricas (LTP) ofrece ventajas frente a otras técnicas de imagen. La mayoría de los estudios con esta técnica han sido comunicados por radiólogos intervencionistas. El objetivo de este estudio ha sido analizar la rentabilidad diagnóstica de la punción percutánea guiada por ecografía en una unidad de técnicas de neumología.
Metodología: Estudio retrospectivo de 58 pacientes con LTP puncionadas con visualización ecográfica en tiempo real, entre el 1 de marzo de 2011 y el 1 de septiembre de 2014. Los resultados fueron divididos en 3 categorías diagnósticas: maligna, benigna y no diagnóstica (ND); esta última incluye los resultados de benignidad no específica (SD) y los de muestra insuficiente para diagnóstico (MID).

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Resultados: Se obtuvo: resultado maligno en 34 (58,6%) de los procedimientos, resultado benigno en 13 (22,4%) y ND en 11 (19%) (SD en 5 [8,6%] y MID en 6 [10,3%]). En 5 de los casos ND el resultado final fue de malignidad y en 4 de ellos se tratada de una MID. La sensibilidad diagnóstica obtenida fue del 75,6%, el valor predictivo negativo del 54,2%, y la especificidad y el valor predictivo positivo del 100%, con una rentabilidad diagnóstica del 81%. Cuando se excluyeron los casos con MID los valores fueron del 87,2%, 72,3%, 100% y 100%, respectivamente, con una rentabilidad diagnóstica del 90,4%. No hubo complicaciones graves con la técnica.
Conclusiones: La punción percutánea bajo guía ecográfica en LTP realizada por neumólogos intervencionistas es una técnica segura y con una alta rentabilidad diagnóstica.

Introduction

Chest ultrasound (US) is a safe and effective method of evaluating lesions in the chest wall, pleural cavity, mediastinum and the lung periphery.[1,2] Using US to guide needle biopsy to obtain specimens for histocytology studies provides real-time imaging of the procedure.[3] Performing needle biopsy under US guidance has many advantages over other imaging techniques: it does not expose the patient to radiation, the equipment is easily transported, and the procedure is quick, inexpensive, and can be performed at the bedside.[4,5] US-guided techniques are particularly suitable for individuals that are more susceptible to injury from radiation, such as children and pregnant women, and for patients that are difficult to move, such as those admitted to intensive care units.[6]

Estimates suggest that 40% of pulmonary malignancies appear as masses in peripheral lung tissue, and are potentially accessible to US.[7] Despite these advantages, US is rarely used in Spain in the study of malignant chest lesions, and in most hospitals the technique of choice is computed tomography (CT)-guided needle biopsy.[4]

In our unit, we have routinely used US since 2010 to detect pleural effusion and to guide thoracocentesis. In 2011, we started to use real-time US imaging to guide needle biopsy in pleural, pulmonary and mediastinal lesions.

Most studies involving this technique have been authored by interventional radiologists, and there is scant reference in the literature to the experience of pulmonologists in this context.[2,8–10]

A review of the literature showed no published series from Spanish hospitals.

The aim of this study was to evaluate the cost-effectiveness and safety of US-guided puncture and/or biopsy in the diagnosis of peripheral chest lesions in an interventional pulmonology unit (IPU).

Materials and Methods

Patient Selection and Data Collection

This is a retrospective study of all patients undergoing US-guided needle biopsy with real-time imaging to diagnose peripheral thoracic lesions. The study was conducted from March 1, 2011 to September 1, 2014. Information on the procedure was obtained from records stored in the ENDOBASE® database (Olympus, Tokyo, Japan), and demographic, clinical, histopathological details, together with complications and patient outcomes, were obtained from electronic clinical records.

All patients, except 1, had undergone chest CT scan prior to the procedure. These images were used as a reference to determine the location and size of the thoracic lesion. In the patient with no previous CT scan, the size of the lesion was calculated using US imaging. Lesions were classified according to their maximum diameter as nodules (≤3 cm) or masses (>3 cm).

All patients were followed up clinically and radiologically for between 6 and 48 months. Serious complications associated with the procedure were defined as: pneumothorax, clinically relevant bleeding, need for transfusion, need for chest drainage, or emergency hospitalization.

The Procedure

As a prerequisite for the procedure, platelet count had to be higher than 100 000/μl and activated partial thromboplastin time had to be within reference limits.

The US examination and core biopsy or fine needle aspiration (FNA) were performed simultaneously by staff from the interventional unit of the pulmonology department using a General Electric LOGIQ P6 ultrasound system (Solingen, Germany).

Intrathoracic lesions were initially evaluated using a 4 MHz convex transducer. If the mass or nodule invaded the chest wall, a linear 7 MHz transducer was also used (Fig. 1). Patients were placed supine, prone or lateral decubitus, according to the position which gave greater US access with the best safety profile.

In 50 cases, puncture was performed using a 22G Chiba® biopsy needle (Gallini, Italy), and 16 and 18 gauge Acecut® (TSK, Japan), Trucut® (Biopsybell, Italy) or Surecut® (TSK, Japan) needles were used in 14, 8, and 5 needle biopsies, respectively.

Both techniques (core biopsy and FNA) were guided by real-time US imaging. A needle guide was attached to the transducer (Fig. 2) to ensure precision.

The pathologist was not present during sample collection. All core and needle biopsies were performed under local anesthesia (mepivacaine 2%) of the skin and underlying tissue.

Classification of Results

The results of the cytology and/or biopsy were divided into 3 diagnostic categories: (1) malignant; (2) benign; and (3) non-diagnostic (ND). The first 2 categories (malignant and benign) were considered conclusive results. The ND category included cases where the diagnosis was inconclusive: non-specific benign without evidence of malignancy (NS) (non-specific cellularity/inflammatory cells or necrosis), and cases where the size of the sample was insufficient for diagnosis (IS).

Results were classified as malignant when a diagnosis of malignant neoplasm was obtained, and as benign when a specific diagnosis of benign lesion was obtained and the clinical picture was consistent with the pathological diagnosis.

Patients in whom the specimen obtained was non-diagnostic (ND) underwent alternative diagnostic procedures: new cytohistologic biopsy or clinical and radiological follow-up.

New specimens were collected by various means: by interventional radiologists (CT-guided or US-guided FNA); by pulmonologists using thoracocentesis or bronchoscopy with transbronchial biopsy; or by resection performed by thoracic surgeons.