Lung Cancer 81 (2013) 60–64

Contents lists available at SciVerse ScienceDirect

Lung Cancer

journal homepage: www.elsevier.com/locate/lungcan

Role of ultrasound-guided transbronchial biopsy in the diagnosis of peripheral pulmonary lesions☆,☆☆

Leonello Fuso[a], Francesco Varone[a], Daniele Magnini[a], Fabiana Baldi[a], Guido Rindi[b], Gabriella Pagliari[a], Riccardo Inchingolo[a,*], Andrea Smargiassi[a]

[a] Pulmonary Medicine Unit, Università Cattolica del Sacro Cuore, University Hospital "A. Gemelli", Rome, Italy
[b] Pathology Department, Università Cattolica del Sacro Cuore, University Hospital "A. Gemelli", Rome, Italy

ARTICLE INFO

Article history:
Received 16 January 2013
Received in revised form 7 March 2013
Accepted 3 April 2013

Keywords:
Bronchoscopy
Endobronchial ultrasound
Transbronchial biopsy
Peripheral pulmonary lesions
Lung cancer
Guide sheath

ABSTRACT

Introduction: Endobronchial ultrasound (EBUS) can be used as an alternative to fluoroscopy to visualize a peripheral pulmonary lesion (PPL) and to provide an image guidance for transbronchial biopsy (TBB). The aim of this study was to verify the accuracy of EBUS-guided TBB in the diagnosis of PPLs.
Methods: All the patients with CT-scan evidence of PPL who underwent bronchoscopy with EBUS in the period between 2008 and 2011 were retrospectively evaluated. EBUS was performed using a radial-type miniature ultrasound probe. Once obtained an EBUS image of the PPL, we measured the distance of the PPL from the outer orifice of the working channel of the bronchoscope in order to perform TBB at PPL site.
Results: A total of 662 patients were examined. The mean diameter of lesions was 36 ± 20 mm. PPLs were visualized in 494 patients (75%) and the TBB was performed in 479 patients. Thirty-two patients were lost in follow-up and data from 447 patients were analyzed. TBB results were 255 cancers and 192 non-malignant lesions. The final diagnosis reported was 359 cases of cancer and 88 of benign lesion. EBUS-guided TBB had a sensitivity of 71% for the diagnosis of cancer, a negative predictive value of 46% and an overall diagnostic accuracy of 77%.
Conclusions: These data obtained from a large series of patients and using an original method show that EBUS represents a valid support to bronchoscopy and that the EBUS-guided TBB has a high diagnostic yield in the diagnosis of PPLs.

1. Introduction

A peripheral pulmonary lesion (PPL) can represent a real diagnostic challenge. Solitary nodules are visualized in the lung parenchyma of asymptomatic subjects with increasing frequency because of a larger use of imaging procedures such as CT-scan. Although lung cancer might be suspected on some radiological features of the lesion, a histological diagnosis is often mandatory and needs invasive approaches [1]. In this setting, bronchoscopy is usually performed and endobronchial ultrasound (EBUS) can be used as a valid alternative to fluoroscopy in providing an image guidance for transbronchial biopsy (TBB) [2,3]. It is known that EBUS-guided TBB has a higher diagnostic accuracy than TBB without any guidance in the diagnosis of PPLs [4].

The diagnostic accuracy of the EBUS-guided TBB depends on several factors, such as the location of the lesion in the lung parenchyma and the position of the ultrasonic probe within or adjacent to the lesion [3,5,6]. Another factor which might positively influence the diagnostic accuracy of EBUS-guided TBB is the use of a guide sheath (GS) covering the ultrasonic probe [7]. GS facilitates the movement of the biopsy forceps into the lesion after the probe has been removed and increased the reliability of specimen collection [6]. However the ultrasonic probe covered by GS has a larger calibre and it is less flexible so making sometimes more difficult its insertion in a small angled branch of the peripheral bronchial tree.

A possible alternative to GS is to measure the distance between the orifice of the bronchus and the visualized lesion [8].

☆ Dr. Fuso is the guarantor of the paper; he had full access to all of the data in the study and takes responsibility for the integrity of the work and the accuracy of the data analysis.

☆☆ Ongoing early results of this work have been presented as poster at ERS congress, Amsterdam, 27th Septemper 2011.

* Corresponding author at: Unità di Pneumologia, Università Cattolica del Sacro Cuore, Largo A. Gemelli 8, 00168 Roma, Italy. Tel.: +390630154236; fax: +390630154304.

E-mail addresses: leofuso@rm.unicatt.it (L. Fuso), francescovarone@hotmail.com (F. Varone), daniele.magnini@hotmail.it (D. Magnini), fabianabaldi1980@yahoo.it (F. Baldi), guido.rindi@rm.unicatt.it (G. Rindi), gab.paglia@hotmail.it (G. Pagliari), r_inchingolo@virgilio.it (R. Inchingolo), smargiassi.a@gmail.com (A. Smargiassi).

0169-5002/$ – see front matter © 2013 Elsevier Ireland Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.lungcan.2013.04.004

The aim of this study was to verify the accuracy of EBUS-guided TBB in the diagnosis of PPLs using a similar technique. In order to validate our study, histological results derived from TBB have been compared with the final diagnosis obtained with other invasive procedures and/or a clinical/radiological follow-up of the patients.

2. Materials and methods

2.1. Patients

All the patients with CT-scan evidence of PPL who underwent bronchoscopy with EBUS in the period between 2008 and 2011 were retrospectively evaluated. A PPL was defined as a lesion surrounded by normal pulmonary parenchyma and not directly visible during the bronchoscopic examination of the bronchial tree.

We analyzed histological results of TBB and those patients with a TBB specimen negative for cancer or with non-diagnostic results were investigated whether they had been subjected to other invasive procedures such as a CT-guided trans-thoracic biopsy and/or a lung resection surgery to obtain a final diagnosis. Alternatively, using the same method already reported in literature by some authors [9,10], the patients were questioned to verify if a final diagnosis has been derived from a clinical/radiological follow-up of at least 12 months.

The local Ethical Committee judged that the study protocol was conformed to the Institution policy but did not need a formal discussion, considering that the study was retrospective. Each patient, who underwent bronchoscopy, gave written informed consent.

2.2. Bronchoscopy

After local anaesthesia of the upper respiratory tract with lidocaine 4% and mild sedation with midazolam 3 mg/iv, bronchoscopy was performed using flexible videobronchoscopes Olympus (models BF T160, Olympus, Tokyo, Japan) introduced through the nose or, alternatively, the mouth. During the procedure a continuous pulse oximetry was recorded and oxygen was administered by nasal cannula to maintain oxygen saturation above 90%.

After a careful inspection of both bronchial trees, the tip of the bronchoscope was inserted into the lobar bronchus in which the CT-scan had previously detected the PPL. Then each segmental bronchus of the lobe was examined to exclude the presence of endobronchial visible lesions.

2.3. EBUS

We used a radial-type miniature ultrasound 20 MHz probe (UM-S20-20R, Olympus, Tokyo, Japan) with an outer diameter of 1.7 mm.

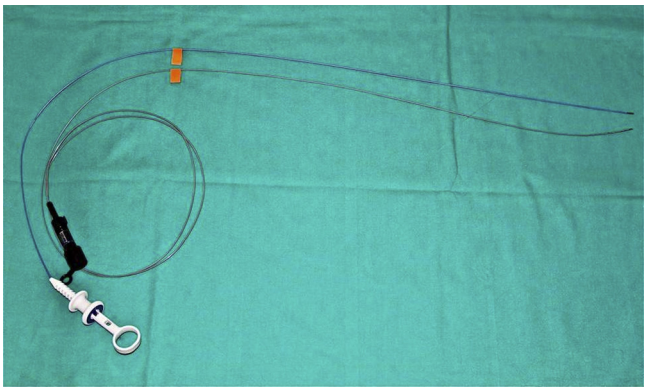

Fig. 1. Once the lesion was identified by EBUS, the distance measured on the probe was computed on the biopsy forceps.

The probe was connected to an endoscopic ultrasound system (EU-M30S, Olympus, Tokyo, Japan).

The EBUS probe was introduced through the working channel of the bronchoscope and, once obtained an EBUS image of the PPL, the probe was marked with a tape at the outer orifice of the working channel of the bronchoscope. Thus, it was possible to measure the distance between the transducer, positioned in the PPL, and the outer orifice of the working channel. Then the probe was withdrawn and the same distance measured on the probe was computed on the biopsy forceps and marked with another tape (Fig. 1).

The "marked forceps" was introduced into the target bronchus until the tape reached the outer orifice of the working channel of the bronchoscope. Then, forceps was opened to collect the specimen. At least five biopsy specimens were taken in each patient. During the entire procedure, the tip of the bronchoscope was kept close to the orifice of the target bronchus.

2.4. Statistical analysis

Data are presented as mean ± SD. Comparisons between groups were made using unpaired *t*-test. Sensitivity, negative predictive value and accuracy were calculated according to the standard definitions.

3. Results

The main results of the study are reported in the algorithm of the Fig. 2. A total of 662 patients with a CT-scan evidence of a PPL (Fig. 3) were examined. The mean diameter of the lesions was 36 ± 20 mm. PPL was visualized in 494 patients (75%) and TBB was performed

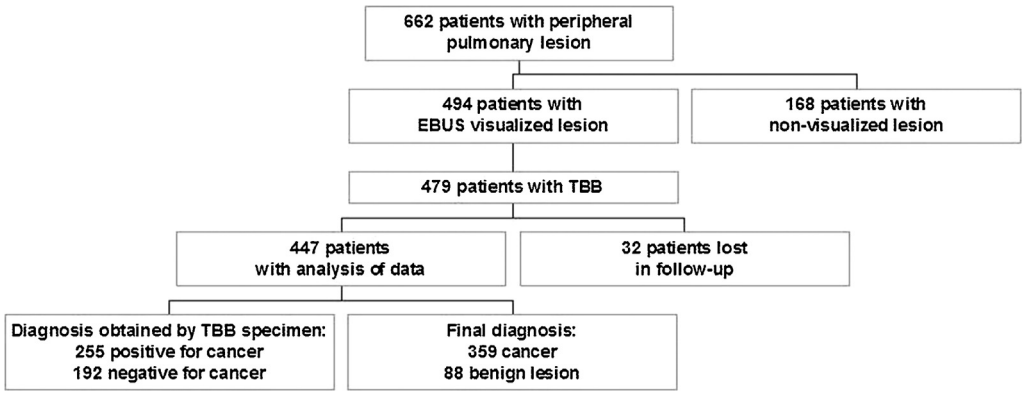

Fig. 2. Algorithm of the main results of the study (EBUS: endobronchial ultrasound; TBB: transbronchial biopsy).