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Original Article

Clinical Utility and Economic Impact of Conventional Transbronchial Needle Aspiration of Mediastinal Lymphadenopathies in Bronchogenic Carcinoma☆

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ABSTRACT

Objectives: To analyse the clinical utility and economic impact of conventional transbronchial needle aspiration (TBNA) in patients with diagnosis of bronchogenic carcinoma (BC) and mediastinal lymphadenopathies in thoracic computed tomography (CT). To assess the predictive factors of valid aspirations.
Patients and methods: Retrospective observational study between 2006 and 2011 of all TBNA performed in patients with final diagnosis of BC and accessible hilar or mediastinal lymphadenopathies on thoracic CT.
Results: We performed TBNA on 267 lymphadenopathies of 192 patients. In 34.9% of patients, two or more lymph nodes were biopsied. Valid aspirations were obtained in 153 patients (79.7%) that were diagnostic in 124 patients (64.6%). Multivariate analysis showed that factors associated with valid or diagnostic results are the diameter of the lymph node and the number of lymph nodes explored. TBNA was the only endoscopic technique that provided the diagnosis of BC in 54 patients (28.1%). Staging mediastinoscopy was avoided in 67.6% of patients. The prevalence of mediastinal lymph node involvement was 74.4%, sensitivity of TBNA was 86.2% and negative predictive value was 63.6%. Including mediastinoscopy and other avoided diagnostic techniques, TBNA saved 451.57 € per patient.
Conclusions: TBNA is a clinically useful, cost-effective technique in patients with BC and mediastinal or hilar lymphadenopathies. It should therefore be performed on a regular basis during diagnostic bronchoscopy of these patients.

Utilidad clínica e impacto económico de la punción transbronquial convencional de adenopatías mediastínicas en el carcinoma broncogénico

Palabras clave:
Punción transbronquial
Adenopatías mediastínicas
Carcinoma broncogénico
Estadificación
Utilidad clínica
Coste

RESUMEN

Objetivos: Analizar la utilidad clínica y el impacto económico de la punción transbronquial convencional (PTBC) en los pacientes con carcinoma broncogénico (CB) y adenopatías mediastínicas en la tomografía computarizada (TC) torácica. Analizar los factores predictores de punción válida.
Pacientes y métodos: Estudio observacional retrospectivo entre 2006 y 2011 de todas las PTBC realizadas a pacientes con CB y adenopatías mediastínicas o hiliares accesibles a la técnica en la TC torácica.
Resultados: Se realizó PTBC sobre 267 adenopatías de 192 pacientes. En el 34,9% de los pacientes se pinchó más de una adenopatía. Se obtuvo punción válida en 153 pacientes (79,7%) y diagnóstica en 124 (64,6%). El análisis multivariante mostró que los factores que se asocian a la obtención de punción válida y diagnóstica son el diámetro de la adenopatía y el número de adenopatías pinchadas. La PTBC fue la única técnica endoscópica que permitió el diagnóstico de CB en 54 pacientes (28,1%). La PTBC evitó el 67,6% de las mediastinoscopias de estadificación. La prevalencia de afectación tumoral mediastínica fue del 74,4%, la sensibilidad de la PTBC del 86,2% y el valor predictivo negativo del 63,6%. Entre mediastinoscopias y otras técnicas diagnósticas evitadas, la PTBC ha supuesto un ahorro de 451,57 € por paciente estudiado.

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Conclusiones: La PTBC es una técnica clínicamente útil y económicamente rentable en los pacientes con CB y adenopatías patológicas mediastínicas o hiliares, por lo que debería ser realizada como una técnica endoscópica más, de forma habitual, en estos pacientes.

Introduction

Transbronchial needle aspiration of mediastinal structures was described by Schiepatti[1] in 1949, but its use with flexible bronchoscopy was described and systematised by Wang[2] in 1978 Currently the usefulness of conventional trans-bronchial aspiration (TBNA) lies mainly in its effectiveness as a diagnostic tool and in the mediastinal staging of bronchial carcinoma (BC).[3–7] It is a simple technique to learn, with a short learning curve,[8] and has proven to be cost-effective,[9,10] despite which it has always been underused.[11,12] Although there are as yet no studies dealing with it, we have good reason to believe that its use has decreased since endobronchial ultrasound-guided fine-needle aspiration (EBUS-FNA), or endoscopic ultra-sound guided transoesophagal fine-needle aspiration (EUS-TOFNA), were introduced. Indeed, the SEPAR guidelines on Lung Cancer[13] staging identifies EBUS/EUS-FNA as the first choice for mediastinal staging, and refers to TBNA as a strategy which "would be acceptable in centres not equipped with PET, EBUS or EUS, despite the fact that other guidelines[14] and modifications of the SEPA guidelines[15] exist in which experts recommend that TBNA should always be carried out during bronchoscopic diagnosis whenever the thoracic CT scan reveals the presence of mediastinal or hilar pathology".

The main aim of this study is use of the thoracic CT scan to examine the clinical and economic utility of TBNA in patients with BC and mediastinal pathologies, and the secondary aim is to examine the factors which might influence the result of such needle aspiration.

Patients and Methods

A retrospective observational study of all patients on whom TBNA of mediastinal and hilar adenopathies was performed at the University Hospital of Guadalajara, and who were consequently diagnosed with BC, between June 2006 and June 2011. TBNA was performed on all patients for whom it was considered appropriate following a bronchoscopy, and in whom the thoracic CT scan revealed the presence of adenopathies. Our diagnostic protocol for BC includes the performance of a thoracoabdominal CT scan prior to the use of diagnostic bronchoscopy.

The University Hospital, which is the only public general hospital in the Guadalajara area, caters for a population of 238 000 and has 410 beds. An average of 500 bronchoscopies were carried out every year.

These bronchoscopies, all of which were on an out-patient basis, except when the patient had been hospitalised for some other reason, were performed using several different Olympus videobronchoscopies. Local anaesthetic, in the form of lidocaine at 2% and propofol sedation, was administered by the staff who carried out the bronchoscope. During bronchoscopy continuous ECG, blood pressure and pulse oximetry, oxygen saturation monitoring was carried out, with oxygen being administered at 4 l/min by means of a nasopharyngeal cannula. Aspiration location was chosen on the basis of a careful examination of the thoracic CT scan, in which the diameter of each adenopathy was measured at their minor axis. For TBNA, 21 gauge eXcelon needles were used (Boston Scientific, Natick, MA, USA). The TBNA was always the first endoscopic technique to be applied, following the transnasal insertion of the bronchoscope, care being taken to avoid, as far as possible, aspiration of any secretions which might contaminate the working channel As no cytologist was present in the bronchoscopy room, in order to achieve the best possible diagnostic performance, the TBNA was carried out on the largest possible number of adenopathies, always beginning with the lymph node station, where the No. value was higher. Between 2 and 4 aspirations were performed for each adenopathy, and the samples obtained were sent to Anatomical Pathologies for analysis on microscope slides and fixed in 96 alcohol (until November 2009), or suspended in liquid methanol (CytoLyt, Cytyc Corporation, Boxborough, MA, USA) (from November 2009 onwards). Those cases in which the bronchial mucous at location of the aspiration did not present a normal macroscopic appearance were excluded from the study. 98% of the bronchoscopies were carried out by the same endoscopist (JCN).

An aspiration was considered *valid* when a BC diagnostic sample was obtained, or when there was a sufficient number of lymphocytes were obtained to ensure that they came from the lymphatic gland, and *invalid* when only bronchial cells, blood, necrotic material or samples suspected of being malignant were obtained, *but which could not provide a clear basis for confident diagnosis*. The protocol was approved by the Ethical Committee of Clinical Research at the Centre.

For the analysis of the economic impact the following cost parameters were used, obtained from the Hospital's Economic Management Service, and from the literature from our research field[10,15–18]: aspiration needle: 80 EUR; anatomopathological study: 38 EUR; bronchoscopy: 120 EUR; CT guided transthoracic PAAF: 767 EUR; bronchoscopy: 3000 EUR.

Statistical Analysis

The results of the qualitative variable are expressed as percentages and absolute frequencies. For the qualitative variable the media and standard deviation are expressed. The comparison of discrete variables was carried out by means of the chi-square test, and that of independent means of quantitative variables using Student's *t*-test. $P<.05$ was considered statistically significant. For multivariate analysis a model of binary logistical regression with the Hosmer–Lemeshow goodness of fit test. In the multivariate analysis all those factors were included which produced a $P<.1$ result in the bivariate analysis. For the statistical analysis the software used was SPSS version 15.0 for Windows. The prevalence, sensitivity and specificity, predictive positive value and predictive negative value were determined using standard definitions.

Results

During the period of the study TBNA was performed on mediastinal adenopathies in 320 patients, who constituted the study population, with a final BC diagnosis in 192 cases. (Of the remaining 128, 25 presented malignant tumours, and 103 a range of non-tumoural conditions.) The average age was 67.2±11 years. 79.2% were men.

Diagnostic distribution was as follows: adenocarcinoma (63 cases, 32.8%), epidermoid (46 cases, 24%), microcytic (45 cases 23.4%), no small cells (34 cases, 17.1%), neuroendocrine (2 cases, 1%), low grade neuroendocrine (1 case, 0.5%), mucoepidermoid (1 case, 0.5%).

In 59 patients (30.7%) TBNA was carried out on 2 adenopathies, and in 8 patients (4.2%) on 3 adenopathies. In 160 patients (83.3%)