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A randomised trial of endobronchial ultrasound guided sampling in peripheral lung lesions☆

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ABSTRACT

Aim: The aim of the study was to evaluate endobronchial ultrasound (EBUS) for peripheral lung lesions and to find the most cost effective combination of sampling techniques.
Materials: 264 patients with lesions suspicious of malignancy were recruited in Bergen and Aalesund, Norway from 2005 to 2008.
Methods: The study was a prospective randomised cohort study. EBUS was performed with a 1.7 mm rotating probe. X-ray fluoroscopy was used in both arms. The different sampling techniques were evaluated in a cost-effectiveness analysis.
Results: The detection rate for cancer was 36% in the EBUS group, 44% in the non-EBUS group (ns). Lesions below 3 cm and lesions assumed difficult to reach had significant lower detection rates in the EBUS group. Lesions visualised by EBUS had a higher detection rate for cancer than lesions not visualised by EBUS (62% vs. 19%, $p < 0.01$). The cost of one additional positive sample was 1211 euro when brushing was added to biopsy. It was not cost effective to add washing or TBNA.
Conclusion: EBUS did not increase the detection rate for cancer in peripheral lung lesions when bronchoscopy was performed by bronchoscopists at all levels of expertise. Biopsy and brushing was the most cost effective combination of sampling techniques.

1. Introduction

There is an ongoing discussion about the optimal diagnostic approach for obtaining a definite diagnosis from lesions in the peripheral areas of the lungs. In a previous study from our centre, endobronchial visibility and lesion size predicted a high detection rate [1], in line with other previous studies [2–8]. The detection rate for cancer by the initial bronchoscopy in our department was 16.7% for non-visible lesions, 4.8% without X-ray fluoroscopy, and 35.4% when X-ray fluoroscopy guided the samplings [1]. This was comparable to the results of a Scottish multicentre study [9], but lower than that reported in Schreiber's summary of published reports [10] and Rivera's clinical practice guideline [11].

Endobronchial ultrasound (EBUS) is a potentially valuable method to increase the detection rate, since one can use EBUS to visualise lesions that are too distal to be visible in the bronchoscopic camera. The first studies of EBUS showed a detection rate for cancer between 60% and 90% in diagnosing non-visible lesions [12–16]. However, these studies have been carried out in specialised centres by a limited number of highly experienced bronchoscopists. Also, patients were in some cases excluded based on low compliance in the screening bronchoscopy [17]. Herth et al. has shown high yields for EBUS in small lesions not visible by fluoroscopy (detection rate for cancer 47–71%) [18,19] In a randomised crossover study with 50 patients performed mostly under general anaesthesia, Herth did not find an increase in the detection rate compared to non-EBUS [20]. Paone et al. found, in a prospective randomised trial, a higher detection rate with EBUS. 799 patients with peripheral lung lesions were screened, only 293 patients included [17]. Subgroup analyses revealed that EBUS was significantly better for lesions smaller than 3 cm, but there was no difference in detection rates for lesions larger than 3 cm [17]. All procedures were performed by highly experienced pulmonologists in both studies. It is not clear as to whether less experienced bronchoscopists or low-volume centres will have any advantage of using EBUS compared to fluoroscopic guidance alone.

The aim of the current study was to evaluate the use of endobronchial ultrasound for peripheral lesions in a clinical practice

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where the bronchoscopies are performed by several pulmonologists with various levels of experience. The study was also designed to reveal the most cost-effective combination of sampling techniques for non-visible lesions.

2. Materials and methods

2.1. Study sample

The patients were examined at the Department of Thoracic Medicine, Haukeland University Hospital, Bergen and the Department of Medicine, Aalesund Hospital, both in Western Norway, between June 2005 and January 2008. All patients attending for investigation of lesions suspicious of malignancy in the lungs were eligible for inclusion. Patients were not included if a computer tomography (CT) scan indicated that the lesion was visible by bronchoscopy.

Diagnostic yield in the non-EBUS group was predicted to be 40% and in the EBUS group to be 60% [1,13–16,20]. Standard power calculation ($\alpha = 0.05$ and power = 0.9) required 120 in each study arm. A simple randomisation was performed without stratification. When inclusion was closed, 289 patients were randomised, though 25 patients were subsequently excluded due to finding of endobronchial visible lesions. Retrospectively all bronchoscopic procedures performed at the two labs in the study period were reviewed and 130 additional patients were found. These patients had lesions suspicious of malignancy and no obvious endobronchial findings (Fig. 1). The main reasons for non-inclusion were periods with equipment failure, patients not willing to participate, and an incorrect assumption that the lesion was visible based on the CT scan.

2.2. Study procedure

All physicians in the two bronchoscopy labs underwent a training session prior to participation for use of EBUS with guide sheath and curette. Following a theoretical training session including EBUS operation and image interpretation, a member of the study team was present during the first EBUS procedures for each bronchoscopist. The level of the bronchoscopists' previous experience varied from more than 30 years to less than one year. Few of the bronchoscopists had significant previous experience with EBUS.

Altogether, 29 physicians performed the bronchoscopies in the study. 25% of the physicians contributed with less than 3 bronchoscopies and 25% contributed with more than 14 (median = 8). The bronchoscopy was performed with Olympus BF 1T 160 broncho-

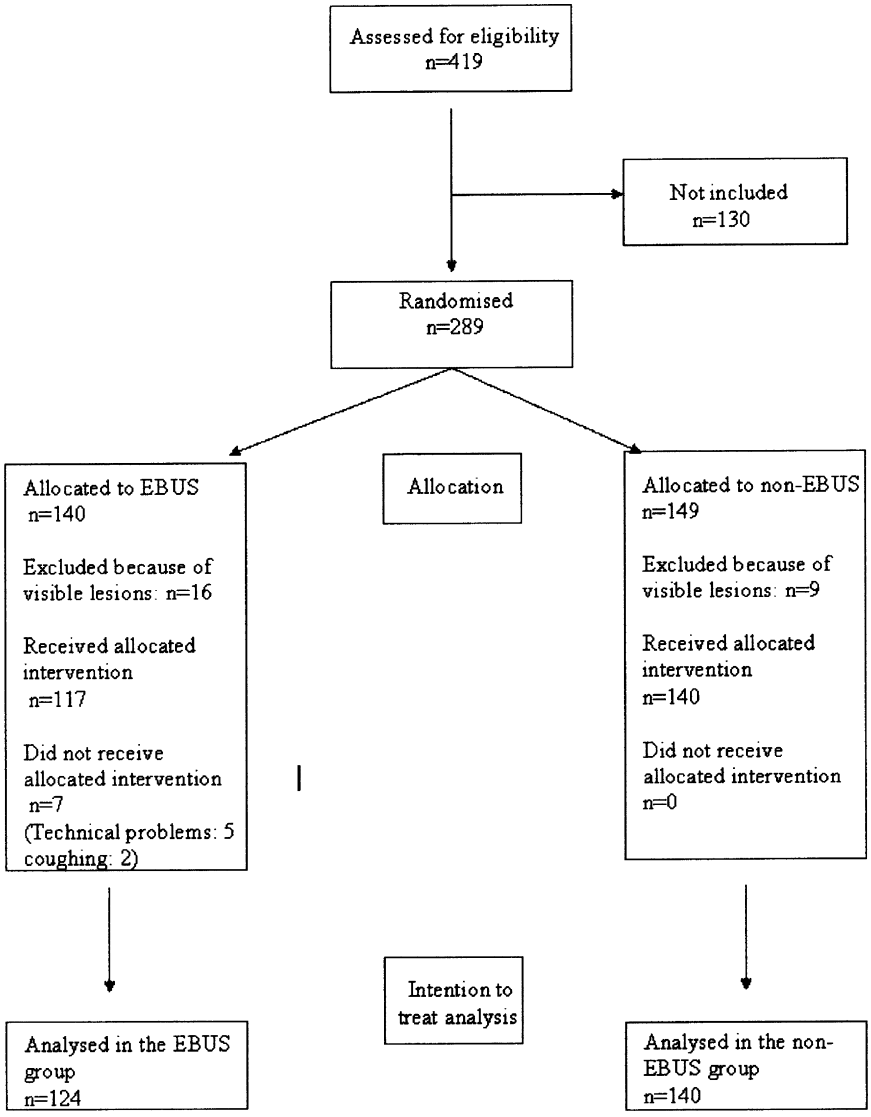

Fig. 1. Consort statement flow diagram.