Egyptian Journal of Chest Diseases and Tuberculosis (2014) **63**, 625–628

The Egyptian Society of Chest Diseases and Tuberculosis

Egyptian Journal of Chest Diseases and Tuberculosis

www.elsevier.com/locate/ejcdt
www.sciencedirect.com

ORIGINAL ARTICLE

Exudative pleural effusions: Comparative study of image assisted Abram needle pleural biopsy and medical thoracoscopy

Ahmed Sh. Mohamed [a,*], Dina M. Abo-Sheisha [b], Maha Mostafa Shamloula [c]

[a] *Chest Department, Faculty of Medicine, Tanta University, Egypt*
[b] *Radiology Department, Faculty of Medicine, Tanta University, Egypt*
[c] *Pathology Department, Faculty of Medicine, Tanta University, Egypt*

Received 13 November 2013; accepted 20 February 2014
Available online 24 March 2014

KEYWORDS

Pleural effusion;
Closed pleural biopsy;
Thoracoscopy

Abstract *Background:* Pleural tissue can be harvested either by means of closed biopsies, thoracoscopy or open surgical biopsies. Access to thoracoscopy and open surgical biopsies is limited in many parts of the world and closed biopsies are therefore the preferred initial investigation (Diacon et al., 2003) [6].

Aim of the study: This study aimed to compare the diagnostic efficiency of image-assisted ANPB with that of medical thoracoscopy in patients with exudative pleural effusion.

Patients and methods: Forty patients with non-diagnosed exudative pleural effusions were recruited. All had a contrast-enhanced thoracic CT scan to assess pleural thickening. Patients were randomly stratified by baseline pleural thickening, to either image-assisted Abrams' pleural biopsy ($n = 20$) or medical thoracoscopy biopsy ($n = 20$).

Results: Diagnostic sensitivity of image-assisted ANPB for 20 patients (group I) was 75% (15/20), for group Ia was 60% (6/10), and for group Ib was 90% (9/10). Diagnostic sensitivity of thoracoscopy for 20 patients (group II) was 85% (17/20), for group IIa was 80% (8/10), and for group IIb was 90% (9/10).

Conclusions: Image-assisted Abram-needle pleural biopsy is a primary alternative to thoracoscopy in exudative pleural effusions associated with pleural thickening.

* Corresponding author. Tel.: +20 1005587644.
E-mail address: ashawky_72@yahoo.com (A.Sh. Mohamed).

Peer review under responsibility of The Egyptian Society of Chest Diseases and Tuberculosis.

ELSEVIER Production and hosting by Elsevier

Introduction

Exudative pleural effusions are frequently encountered in pulmonary practice. Determination of a specific diagnosis can represent a major challenge [1]. Barring a few exceptions, virtually all patients presenting with pleural effusions should therefore undergo pleural aspiration to categorize effusions

0422-7638 © 2014 The Egyptian Society of Chest Diseases and Tuberculosis. Production and hosting by Elsevier B.V.
Open access under CC BY-NC-ND license. http://dx.doi.org/10.1016/j.ejcdt.2014.02.014

into transudates and exudates. This not only narrows the differential diagnosis, but also directs subsequent investigations and management [2].

Pleural biopsy is indicated to improve the diagnostic yield of unexplained pleural effusion, particularly when pleural carcinomatosis or tuberculosis is suspected [3].

Medical thoracoscopy for cases of exudative pleural effusion not having any diagnosis by either clinical, radiologic, laboratory, or cytologic investigation is the method that has been performed routinely in many clinics [4]. In fact, 2010 British Thoracic Society (BTS) pleural disease guideline state that thoracoscopy is the investigation of choice in exudative pleural effusions where a diagnostic pleural aspiration is inconclusive and malignancy is suspected [3]. However, despite a higher diagnostic yield, there are several limitations including need for expertise, cost, invasiveness and lack of availability in some regions that restrict its widespread use [5,6].

The Abram's and Cope needles began the era of closed pleural biopsy providing a safe and easy bedside procedure to evaluate suspected pleural effusion [7,8]. The standard method of using the Abrams pleural biopsy "punch" is to take one biopsy during a single aspiration and if this is negative to repeat the procedure later at a different site [7]. The modified Abrams pleural biopsy technique consisted of suctioning each tissue sample into a syringe without removing the needle completely from the chest until the completion of the entire procedure [9]. Recent studies have proposed that image guidance may significantly increase the yield of closed pleural biopsy while decreasing the risk for complications. Both transthoracic US and CT scanning have been utilized [2,10].

Aim of the study

The present research was done to evaluate and compare the image-assisted Abram's needle efficacy versus medical thoracoscopy in exudative pleural effusions.

Patients and methods

This work was carried out on 40 patients attended to in the Chest Department, Tanta University Hospital during the period from May 2012 to August 2013. The patients presented with exudative pleural effusions based on Light's criteria [11], which a specific diagnosis could not be determined by either clinical, radiologic, laboratory, or cytologic investigations.

This study was performed in compliance with ethical rules at our locality. Written informed consent was taken from each patient after the detailed procedure and purpose of the study was explained. Prothrombin time, activated partial thromboplastin time (APTT), and platelet count were confirmed to be normal before biopsy. Patients with respiratory failure, empyema, acute cardiac event, who had taken oral anticoagulants were excluded from this work.

All patients underwent initial contrast-enhanced CT of the Thorax, using Toshiba CT medical system with overlapping 5-mm sections from the apex of the lungs to the costophrenic recess. We measured the amount of parietal pleural thickening, and participants were divided into those with maximum thickening of less than 10 mm or 10 mm or more (Fig. 1).

The patients were randomized (using closed envelopes), divided into two groups and they underwent pleural biopsy with either; CT guided Abram's needle (group I), or medical thoracoscopy (group II). Each group was divided into two subgroups according to the parietal pleural thickening.

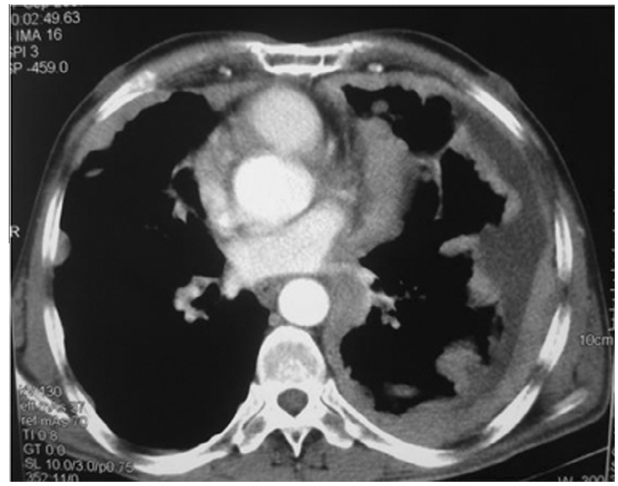

Figure 1 (A) Lt. sided circumferential pleural thickening (> 1 cm) with pleural effusion.

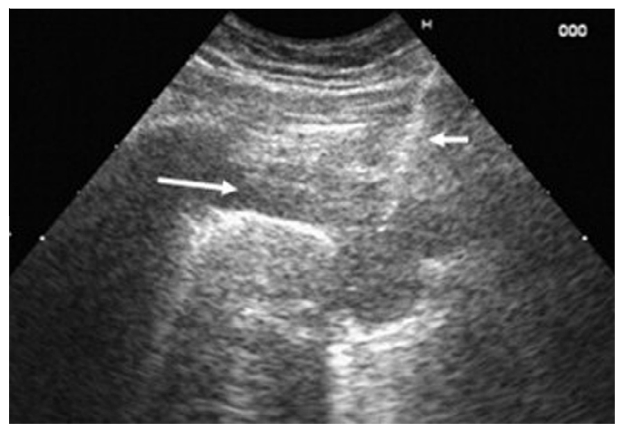

Figure 1 (B) US guided Abram needle pleural biopsy.

Combined image-assisted Abram needle pleural biopsy

Entry site

The entry site was selected as the most accessible part of the lesion by looking at the mediastinal copy of the CT scans. According to the scale located on CT scans, the entry point was determined in two dimensions. Then, the entry site for Abrams needle was marked on the skin of the patient.

US-guidance

After identification of the entry site, local anesthetic was given, with about 10 mL of 2% lidocaine infiltrated into the skin, intercostal space, and parietal pleura. With the patient in a sitting (preferred), prone or a supine position and under direct US guidance (using sonoline-Antares machine (Siemens), with probe C5), an Abram needle was inserted into the patient at the entry site, to be advanced along the inner aspect of the thoracic wall and away from the lung, enabling successful biopsy from the area of maximum pleural thickening.

Only one biopsy pass (Four to six biopsy specimens were taken from the upper surface of the rib below the entry site) was needed, but a second pass was done if the initial sample was macroscopically unsatisfactory. No more than two biopsy passes were made in any patient. A chest radiograph was done 2–4 h after the procedure to detect any pneumothorax.

Medical thoracoscopy

Medical thoracoscopy was done with a rigid thoracoscope (Karl Storz, Germany) under mild sedation and local anesthesia. Four to six biopsy specimens were taken.

The biopsy specimens (at least three macroscopically satisfactory specimens) were immediately fixed in formalin for histopathological examination, to identify malignant from benign tissue. A biopsy specimen in an isotonic saline solution for microbiological investigations was taken.

Statistical analysis

SPSS version 20 software was used for statistical analysis. Sensitivities were compared using the χ^2 test (Chi Square test) with $p < 0.05$ accepted as significant.

Results

Image-assisted Abram needle, using the modified technique was performed on 20 patients (group I), 13 male (65%) and 7 female (35%); the mean age was 49.25 ± 10.3 years. Thoracoscopy was performed on 20 patients (group II), 11 (55%) male and 9 (45%) female; the mean age was 47.1 ± 7.4 years. There were no significant differences as regards sex and age between the two studied groups.

Each group was divided into two subgroups according to the parietal pleural thickening on enhanced CT. So, group Ia; included 10 patients with pleural thickening less than 1 cm, and group Ib; included 10 patients with pleural thickening 1 cm or more. On the other line of the study, group IIa; included 10 patients with pleural thickening less than 1 cm, and group IIb; included 10 patients with pleural thickening 1 cm or more.

Diagnostic sensitivity of image-assisted ANPB for 20 patients (group I) was 75% (15/20), and of thoracoscopy for 20 patients (group II) was 85% (17/20) (P = 0.27) (Table 1).

Diagnostic sensitivity of group Ia was 60% (6/10), and of group IIa was 80% (8/10) (P = 0.35). Diagnostic sensitivity of group Ib was 90% (9/10), and of group IIb was 90% (9/10) (P = 1.00).

Table 1 Distribution of diagnosed benign and malignant lesions in the studied groups.

		Benign lesion		Malignant lesion	
Assisted-ANPB		7		8	
Pl. thickening					
< 1 cm	> 1 cm	3	4	3	5
M. thoracoscopy		8		9	
Pl. thickening					
< 1 cm	> 1 cm	5	3	3	6

Table 2 Non-diagnostic yield of both Abram's and medical thoracoscopy.

		Assisted-ANPB		M. thoracoscopy	
		5		3	
Pl. Thickening					
< 1 cm	> 1 cm	3	2	2	1

Moreover, there were non-significant differences between subgroups Ia and Ib (P = 0.348) and IIa and IIb (P = 1.00).

The number of non-diagnosed cases in group I was 7 patients; 5 patients with pleural thickening less than 1 cm, and 2 patients with pleural thickening more than 1 cm. Three patients in group II were not diagnosed; 2 patients with pleural thickening less than 1 cm, and one patient with pleural thickening more than 1 cm. There was significant difference in non-diagnostic yield between groups I and II, that was increased in group I (Table 2).

Discussion

During the past decade, thoracoscopic biopsy has become a widely accepted means of diagnosis if findings from pleural fluid cytologic examination and blind pleural biopsy are nondiagnostic. The advantages are its sensitivity of 91–98% for the diagnosis of pleural malignancy and its potential therapeutic benefit, such as enabling talc pleurodesis. Thoracoscopy has the disadvantage of requiring general anesthesia or sedation, requiring chest tube drainage and inpatient stay, having the potential of failure due to adhesions preventing pneumothorax, being substantially more expensive than image-guided biopsy, and having a higher complication rate [12,13]. Image-assisted biopsy is more likely to be diagnostic in the presence of pleural thickening > 10 mm, pleural nodularity, pleural based mass lesions of > 20 cm and solid pleural tumors [14,15].

This study is the first one worldwide that used combined chest enhanced CT and transthoracic US-guided Abram needle pleural biopsy, in two consecutive steps, getting the benefit of the higher CT sensitivity with the demonstration of pleural thickening and focal diseases [16], and of the advantage of US including; less expensive, less radiation, and short examination time [17].

In our study, out of 20 patients who underwent image-assisted ANPB, 15 patients were diagnosed; 7 patients diagnosed with benign disease and 8 patients diagnosed with malignant disease, with an overall diagnostic sensitivity of 75%. Also, out of 20 patients who underwent medical thoracoscopy, 17 patients were diagnosed; 8 patients diagnosed with a benign disease and 9 patients diagnosed with malignant disease, with overall diagnostic sensitivity of 85%. The increased sensitivity of the image-assisted Abram needle biopsy technique used in this study had been attributed to its use in a pleural thickening of 1 cm or more, and by using a tangential approach, to achieve adequate diagnostic samples, in patients with thin pleural thickening less than 1 cm. Moreover, patients that showed no pleural thickening on the CT scan, were not included in our study.

Metintas and co-workers [18], randomly assigned 124 patients with effusions not diagnosed by cytology to undergo either Abrams needle biopsy guided by CT findings or medical thoracoscopy. In the CT-guided pleural biopsy group, the diagnostic sensitivity was 87.5%, compared with 94.1% in the thoracoscopy group ($P = 0.252$).

A study by Maskell et al. [19], found that CT guidance significantly increases the diagnostic yield in the setting of pleural thickening. In their study CT-guided CNB had a sensitivity of 87%, compared with unaided Abrams needle biopsy that had a sensitivity of only 44% ($P = 0.02$).

Conclusion

Blind pleural biopsy should no longer be conducted for the study of malignant pleural disease if facilities for other techniques are available. Image-assisted Abram needle and thoracoscopic biopsies have similarly high diagnostic rates, and are complementary techniques used in different clinical situations. Hence, an image-assisted Abram needle is effective for specific diagnosis in patients with undiagnosed exudative pleural effusion, with medical thoracoscopy being reserved for the small number of cases who are not diagnosed with closed biopsies.

Conflict of interest

None declared.

References

[1] R.W. Light, Thoracocentesis (diagnostic and therapeutic) and pleural biopsy, in: R.W. Light (Ed.), Pleural Disease, Lee & Febiger, Philadelphia, 1995.

[2] J.E. Heffner, L.K. Brown, C.A. Barbieri, Diagnostic value of tests that discriminate between exudative and transudative pleural effusions. Primary Study Investigators, Chest 111 (1996) 970–980.

[3] C. Hooper, Y.C. Lee, N. Maskell, Investigation of a unilateral pleural effusion in adults: British Thoracic Society pleural disease guideline 2010, Thorax 65 (Suppl. 2) (2010) ii4–ii17.

[4] H.G. Colt, Thoracoscopy: window to the pleural space, Chest 116 (5) (1999) 1409–1415.

[5] P. Lee, A. Hsu, C. Lo, et al, Prospective evaluation of flex-rigid pleuroscopy for indeterminate pleural effusion: accuracy, safety and outcome, Respirology 12 (2007) 881–886.

[6] A.H. Diacon, B.W. Van de Wal, C. Wyser, et al, Diagnostic tools in tuberculous pleurisy: a direct comparative study, Eur. Respir. J. 22 (2003) 589–591.

[7] L.D. Abrams, A pleural-biopsy punch, Lancet 1 (1958) 30–31.

[8] C. Cope, New pleural biopsy needle, JAMA 167 (1958) 1107–1108.

[9] O.G. Raja, A.J. Lalor, Modification to the technique of percutaneous pleural biopsy using Abram's needle, Br. J. Dis. Chest 74 (1980) 285–286.

[10] C.F.N. Koegelenberg, C.T. Bolliger, A.H. Diacon, Pleural ultrasound, in: R.W. Light, Y.C. Lee (Eds.), Textbook of Pleural Disease, second ed., Hodder & Stoughton, London, 2008, pp. 275–283.

[11] R.W. Light, M.I. MacGregor, P.C. Luchsinger, et al, Pleural effusions: the diagnostic separation of transudates and exudates, Ann. Intern. Med. 77 (1972) 507–513.

[12] R. Menzies, M. Charbonneau, Thoracoscopy for the diagnosis of pleural disease, Ann. Intern. Med. 114 (1991) 271–276.

[13] R.J. Harris, M.S. Kavuru, A.C. Mehta, et al, The impact of thoracoscopy on the management of pleural disease, Chest 107 (1995) 845–852.

[14] N.R. Qureshi, N.M. Rahman, F.V. Gleeson, Thoracic ultrasound in the diagnosis of malignant pleural effusion, Thorax 64 (2009) 139–143.

[15] A.H. Diacon, M.M. Schuurmans, J. Theron, et al, Safety and yield of ultrasound assisted transthoracic biopsy performed by pulmonologists, Respiration 71 (2004) 519–522.

[16] E.M. Scott, T.J. Marshall, C.D.R. Flower, S. Stewart, Diffuse pleural thickening: percutaneous CT-guided cutting needle biopsy, Radiology 194 (1995) 867–870.

[17] C.F.N. Koegelenberg, A.H. Diacon, C.T. Bolliger, Transthoracic ultrasound of the chest wall, pleura, and the peripheral lung, in: C.T. Bollger, F.J.F. Herth, P.H. Mayo, et al. (Eds.), Progress in Respiratory Research. Clinical Chest Ultrasound, Karger, Basel, 2009, pp. 22–33.

[18] M. Metintas, G. Ak, E. Dundar, et al, Medical thoracoscopy vs CT scan-guided Abrams pleural needle biopsy for diagnosis of patients with pleural effusions: a randomized, controlled trial, Chest 137 (2010) 1362–1368.

[19] N.A. Maskell, F.V. Gleeson, R.J. Davies, Standard pleural biopsy versus CT-guided cutting-needle biopsy for diagnosis of malignant disease in pleural effusions: a randomised controlled trial, Lancet 361 (2003) 1326–1330.