ECRONICON OPEN ACCESS

EC PULMONOLOGY AND RESPIRATORY MEDICINE

Research Article

Analysis of the Sensitivity of Ultrasound-Guided Percutaneous Pleural Biopsies in the Diagnosis of Pleural Carcinomatosis and the Association between Parietal Pleural Thickness at Ultrasonography and Positive Result for Cancer. (Preliminary Results)

Fernanda Ayumi Fukuya[1], Patrícia Mie Uwada[1], Giovana Jatobá Guida[1], Tamires Daiana da Silva Oliveira Virginio[1], Igor Renato Louro Bruno de Abreu[2]* and Fernando Conrado Abrão[3]

[1]Undergraduate Medical Student, Universidade de Mogi das Cruzes, Mogi das Cruzes - SP, Brazil

[2]Assistant Physician, Thoracic Surgery Service, Hospital Santa Marcelina de Itaquera, São Paulo – SP, Brazil

[3]Physician, Coordinator of the Thoracic Surgery Service, Hospital Santa Marcelina de Itaquera, São Paulo – SP, Brazil

***Corresponding Author**: Igor Renato Louro Bruno de Abreu, Assistant Physician, Thoracic Surgery Service, Hospital Santa Marcelina de Itaquera, São Paulo – SP, Brazil.

Received: June 21, 2018; **Published:** July 16, 2018

Abstract

Introduction: Pleural biopsies performed through blind percutaneous punctures have low sensitivity in relation to surgical biopsies. In this context, a question is raised on how the association of imaging methods with the percutaneous puncture might increase the sensitivity of pleural needle biopsies in cases of carcinomatous pleuritis. To answer this question, the researchers developed a research protocol that compares ultrasound-guided pleural biopsies with pleural biopsies carried out by video-assisted thoracoscopy.

Objective: To present the partial results of the study aiming to evaluate the efficiency of ultrasound-guided pleural biopsy compared to the efficiency of pleural biopsy performed by video-assisted thoracoscopy, association between pleural thickness at the ultrasonography and the anatomopathological diagnosis of cancer infiltrating the parietal pleura.

Methods: The aim of the study is to evaluate 60 patients with pleural biopsy indication by video-assisted thoracoscopy. Participants will undergo a chest ultrasound examination to verify the maximum pleural thickness and ultrasound-guided. After, will undergo a second biopsy by video-assisted thoracoscopy. Both results will be compared, and a comparative analysis will be performed between a positive result for cancer and maximum pleural thickness measured by ultrasonography using the VassarStat online software.

Results: To date, 12 patients, 9 females, 3 males, have been assessed. In the analysis of positive result for neoplasia, when comparing the ultrasound-guided biopsy with the video-assisted biopsy, the odds ratio (OR) value was 0.4667, disclosing a greater chance of a positive diagnosis for cancer in surgical biopsies. However, a value of p = 0. Regarding pleural thickness, it was observed there was a greater chance of a cancer diagnosis in the group with greater pleural thickness, with an OR = 2 (95% CI: 0.082 to 2.6564); however, the sample size was not sufficient to guarantee statistical significance with p = 1.

Conclusion: The study shows there is a gain in sensitivity when ultrasound is associated with pleural puncture biopsy in comparison to a blind biopsy, but the method shows inferior results when compared to the surgical biopsy methods. There is a tendency for patients with greater parietal pleural thickness at the ultrasonography to show positive pleural biopsy results for cancer.

Keywords: *Pleural Biopsy; Neoplastic Pleural Effusion; Pleural Neoplasia*

Introduction

Pleural biopsies have been an important tool for the investigation of several diseases with pleural involvement. In some cases, when analyzing the pleural effusion, the fluid is sufficient to define the etiology of the present disease, which may be neoplastic, inflammatory or infectious. However, when that is not possible, a pleural biopsy is required. This procedure can be performed through surgery (open surgery or video-assisted thoracoscopy) or through a puncture with a cutting needle (Cope or Abrams techniques), traditionally a blind procedure [1-3]. According to current literature, surgical biopsy techniques have superior sensitivity and specificity when compared to techniques that employ blind puncture, especially in the presence of neoplastic diseases, with surgery being the gold standard for the diagnosis of pleural diseases. However, performing a pleural biopsy through a surgical procedure has a high cost, requiring at least one day of hospital stay, while needle biopsies can be performed on an outpatient basis [4,5].

With the technological evolution of resources for diagnostic imaging, such as computed tomography and ultrasonography, it became possible to perform imaging-guided procedures. It is not known whether such procedures guided by imaging methods have sensitivity and specificity close to those obtained through surgical procedures. Thus, the investigators started a comparative study between pleural biopsies guided by ultrasonography (BX-USG) and biopsies performed by video-assisted thoracoscopy (BX-VATS).

Objectives of the Study

To present the partial results of the study aimed to evaluate the efficiency of ultrasound-guided pleural biopsy compared to that of pleural biopsy performed by video-assisted thoracoscopy, as well as and the association between pleural thickness at the ultrasonography and the anatomopathological diagnosis of cancer infiltrating the parietal pleura.

Materials and Methods

The study was approved by the Ethics Committee of Casa de Saúde Santa Marcelina and published on the Brazil Platform site under CAAE number: 53190116.7.0000.0066 and Opinion number: 1568975.

A total of 60 patients with an indication for pleural biopsy by video-assisted thoracoscopy, i.e. patients with pleural effusion with characteristics of lymphocytic exudate with adenosine deaminase < 40 U/dL and absence of neoplastic cells in the liquid analysis will be selected. Patients not fit to undergo a surgical procedure, patients younger than 18, and those unable to read, understand and sign the free and informed consent form will be excluded.

Study participants will be submitted to a chest ultrasonography (USG) examination with parietal pleura evaluation and maximum pleural thickness measurement. The area with maximum pleural thickness will be identified and 5 biopsy fragments from this area will be collected through a USG-guided puncture using a 18G x 10 cm tru-cut needle.

The material will be separated and characterized as Pleura 1. Immediately after this procedure, the patient will undergo a pleuroscopy with pleural fragment collection under endoscopic view. The material collected through video-assisted thoracoscopy will be characterized as Pleura 2.

The results of the biopsies of Pleura 1 and 2, as well as the maximum thicknesses of the participants' parietal pleura in millimeters evaluated by USG will be collected and recorded in a spreadsheet using the software Microsoft Excel, version 2011 (Microsoft). Other data such as age, gender, and the Performance Status of patients represented on the ECOG scale and the surgical risk as assessed by the American Society of Anesthesiology (ASA) will also be recorded to characterize the assessed participant sample.

The categorical variables will be represented by absolute numbers and percentages, whereas the continuous variables will be represented by medians, with maximum and minimum values. The occurrence of biopsies with positive results for cancer in the group of anatomopathological analysis of Pleura 1 and 2 (BX-USG and BX-VATS respectively) will be evaluated through Odds Ratio. The same method will be used to evaluate whether there is an association between the parietal pleural thickness and positive result for cancer in the BX-USG.

The acceptance or rejection of the null hypothesis that there is no difference between the use of the BX-USG and BX-VATS methods will be assessed through Fisher's exact test with a two-tailed p-value. The online software VassarStats will be used in the statistical analysis (www.vassartats.net).

Results

To date, 12 participants have been enrolled, totaling 24 biopsies, of which 12 were carried out using BX-USG and 12 Bx-VATS. The median age of participants is 61.5 years (range 34 - 82 years), of which 9 are females (75%) and 3 males (25%). The performance status evaluation showed a median ECOG score of 2 (range 0-4). Regarding the surgical risk assessed according to the ASA scale, it showed a median score of 2.5 (range 2 - 3), as disclosed in table 1. Regarding the results of the anatomopathological analysis (AP), of Pleura 1 and Pleura 2, it was observed that 3 patients (25%) had a benign pleural alteration, while 9 (75%) had a positive result for neoplastic disease; in 66.6% (8 participants) of the cases, the results of the anatomopathological analysis of Pleura 1 and Pleura 2 were coincident, as shown in table 2.

Participant	Gender	Age (years)	ASA	ECOG
1	Male	82	3	4
2	Male	34	3	2
3	Female	62	2	0
4	Female	63	3	2
5	Female	51	2	2
6	Female	44	3	2
7	Female	61	2	1
8	Male	49	3	3
9	Female	64	3	3
10	Female	68	2	1
11	Female	54	2	0
12	Female	66	2	2

***Table 1**: General characteristics of the participants.*

Participant	Pleura 1	Pleura 2
1	Oat cell lung cancer	Oat cell lung cancer
2	Pleuritis	Pleuritis
3	Fibrous pleuritis	Fibrous pleuritis
4	Oat cell lung cancer	Oat cell lung cancer
5	Did not have enough pleural tissue available	Pleuritis
6	Did not have enough pleural tissue available	Lung adenocarcinoma
7	Colon adenocarcinoma	Colon adenocarcinoma
8	Sarcoma	Sarcoma
9	Lymphoma	Lymphoma
10	Lung Adenocarcinoma	Lung Adenocarcinoma
11	Did not have enough pleural tissue available	Breast ductal carcinoma
12	Fibrous tissue	Breast ductal carcinoma

***Table 2:** Results of the anatomopathological examinations of pleura 1 and pleura 2.*

To evaluate the likelihood of a positive result for neoplasia in the pleural 1 pathological examination results compared to pleura 2, an odds ratio (OR) analysis was carried out, of which result was 0.4667 (95%CI: 0.082 to 2.6564). The investigators used as the null hypothesis the fact that there are no differences between the odds of positive results for cancer in the AP exams for the pleura 1 and pleura 2 groups; based on that, Fisher's exact probability test was performed, of which p-value was 0.66684, thus not allowing the rejection of the null hypothesis.

To evaluate whether there is a correlation between the parietal pleural thickness and cancer diagnosis, the median of the maximum parietal pleural thickness of the participants was calculated, as measured by ultrasonography (Table 3), with a median of 6.5 millimeters (range 2 - 13 mm).

Participant	Pleural Thickness (millimeters)	Diagnosis
1	9	Neoplasm
2	8	Benign
3	8	Benign
4	13	Neoplasm
5	3	Benign
6	3	Neoplasm
7	3	Neoplasm
8	8	Neoplasm
9	8	Neoplasm
10	4	Neoplasm
11	5	Neoplasm
12	2	Neoplasm

Table 3: *Pleural thickness of the participants associated with the presence or absence of neoplasia in the last anatomopathological examination.*

The investigators used this median value of pleural thickness as a reference for the division of the participants into 2 groups, with the first group including participants with pleural thickness < 6.5 mm and the second group including participants with pleural thickness ≥ 6.5 mm. Based on that, the odds ratio was calculated to determine the probability of neoplastic positivity in the group with the greater pleural thickness, when compared to the lower thickness group, resulting in a value = 2 (95%CI: 0.194 to 20.6149).

When performing Fisher's exact test to test the null hypothesis that there is no statistically significant difference between the values of neoplastic positivity in both groups, the value of p = 1 was obtained.

Discussion

Currently, the use of ultrasound is an important ally in the treatment and diagnosis of pleural diseases, being a powerful tool used in several procedures, such as collection diagnosis, pleural drainage, and transcutaneous biopsy [6].

In the past, when we wanted to perform pleural biopsies by puncture, Cope needles or tru-cut needles were used, but the sensitivity for diagnosis of neoplasias carried out through blind punctures was very low, being around 50% for Cope needle and 57% for the tru-cut needle [7].

However, the investigators did not find studies in the current literature that specifically addressed the possibility of gain of sensitivity by associating the use of ultrasonography to guide pleural biopsies through tru-cut puncture. According to the results obtained in the present study evaluating BX-USG with BX-VATS as a control, it was verified that in 66.6% of cases there was an agreement between the results obtained for pleura 1 and pleura 2 exams. Therefore, we can affirm there was a 10% gain in sensitivity in relation to blind tru-cut biopsies; however, the odds ratio analysis showed that the odds of having a positive diagnosis for neoplasia in the BX-VATS group is almost two-fold higher than that of having the same result in the BX-USG group, with a p = 0.666, that is, still a low statistical significance.

Regarding pleural thickness, the investigators did not find studies in the literature that specifically established an association between the ultrasound measurement of the maximum parietal pleura thickness and an increase in the chances of positivity for neoplasia in pleural biopsies. However, when performing the odds ratio analysis in the present study data, they observed that the chance of positivity for neoplasia is practically two-fold higher in the group of patients with pleural thickness above the median, with a p = 1, which is probably due to the fact that the sample is still small.

Nevertheless, the information that there is a tendency for neoplasia to occur in patients with greater parietal pleura thickness at the ultrasonography should be considered.

Conclusion

Despite the restricted number of participants, the study shows there is a gain in sensitivity when ultrasound is associated with pleural puncture biopsy in comparison to a blind biopsy, but the method shows inferior results when compared to the surgical biopsy methods. There is a tendency for patients with greater parietal pleural thickness at the ultrasonography to show positive pleural biopsy results for neoplasia.

For these trends to be actually considered a certainty, it is necessary for the study to be concluded with the inclusion of the previously established total number of participants.

Bibliography

1. Stigt JA and Groen HJ. "Percutaneous ultrasonography as imaging modality and sampling guide for pulmonologists". *Respiration* 87.6 (2014): 441-451.

2. Solooki M and Miri M. "Approach to undiagnosed exudative pleural effusion: the diagnostic yield of blind pleural biopsy". *Caspian Journal of Internal Medicine* 4.2 (2013): 642-647.

3. Wiwanitkit V. "Percutaneous closed-needle pleural biopsy and undiagnosed exudative pleural effusion". *Lung India* 28.4 (2011): 322.

4. Hira HS and Ranjan R. "Role of percutaneous closed needle pleural biopsy among patients of undiagnosed exudative pleural effusion". *Lung India* 28.2 (2011): 101-104.

5. Lee P and Colt HG. "State of the art: pleuroscopy". *Journal of Thoracic Oncology* 2.7 (2007): 663-670.

6. Marchetti G., *et al*. "New insights in the use of pleural ultrasonography for diagnosis and treatment of pleural disease". *Clinical Respiratory Journal* (2018).

7. Valdez-López HG., *et al*. "[Diagnostic rentability of close pleural biopsy: Tru-cut vs. Cope]". *Revista Médica del Instituto Mexicano del Seguro Social* 56.1 (2018): 12-17.

Volume 7 Issue 8 August 2018