INTRODUCTION

Although very used in interventional radiology, CT-guided percutaneous biopsy is much less performed in thoracic surgery in Romania. The first CT-guided transthoracic biopsies had been performed at Elias Hospital, Bucharest, then Tg. Mures was the next medical university center which used this diagnostic method and published a paper about it five years ago. Since then either the procedure has been abandoned or no report has been published.

In the western part of the country, the only clinic where CT-guided biopsy is performed for diagnosis clarification of mediastino-pulmonary diseases is the Clinic of Thoracic Surgery from Timisoara Municipal Hospital.

ABSTRACT

Aim: The aim of the study was to establish the role of CT-guided percutaneous transthoracic biopsy in diagnosis clarification of mediastino-pulmonary tumoral masses.

Material and Methods: The study recorded 167 cases who undergone this procedure. There were two categories of patients: patients where general condition, associated diseases and disease stage did not allow other procedures and patients who refused surgery although their clinical and biological status were suitable for operation.

Results: In 108 (88%) cases diagnosis of malignancy was obtained from first attempt, in the other 59 patients (35.4%) the results were either unclear or non-neoplastic. These 59 cases needed a second attempt; malignancy was found in 23 (13.8%) cases, while in 22 (13.2%) cases other diseases (tymoma, Pott's disease, pulmonary fibrosis, tuberculosis, inflammations) were demonstrated. In 14 patients (8.4%) diagnosis remained unclear even after repeated biopsy. There was two categories of complications: a) pneumothorax - 17 cases (10.1%), b) hemoptysis - 21 cases (12.6%), all of them too small to require any treatment.

Conclusions: CT-guided transthoracic biopsy is an invaluable procedure in diagnosis clarification of mediastino-pulmonary tumors; due to its low complication rate it may be considered a safe mini-invasive diagnostic method.

Key Words: CT-guided percutaneous transthoracic biopsy, mediastino-pulmonary tumoral masses, cytology
OBJECTIVES

Our study has aimed to establish the role of CT-guided percutaneous transthoracic biopsy in diagnosis clarification of malignancy and histologic pattern (where possible). Taking the features of the two categories of patients into account, we could verify the cytology only in 11 patients by histopathologic examination; in these cases we obtained a 100% match between histologic pattern of removed specimens and cytology.

MATERIAL AND METHODS

Since April 2002, we have performed this procedure in 167 patients, with age between 16 months and 78 years, either admitted in our clinic or as outpatients.

Indications
Most of mediastino-pulmonary tumors represent suitable targets for CT-guided biopsy. The first indication is represented by tumors in severely altered patients, with poor general condition and accompanying neoplasm or late stage. Those who refused diagnostic or curative surgery represent the other category of patients.

Contra-indications
Most contra-indications are relative and the risk-to-benefit ratio should be weighed in each individual case. Relative contra-indications are:

• coagulopathy (prothrombin time > 20 seconds, bleeding time > 10 minutes, platelet count < 50,000/mm³);
• high risk of vascular lesions (e.g., adjacent to pulmonary hilum, heart);
• immunodepression;
• uncooperative patient;
• severe respiratory dysfunction;
• pulmonary arterial hypertension.

Patient preparation
No special measures of preparation are required, but some basic rules ought to be considered:

• refrain from eating 4-6 hours before the procedure;
• intravenous line +/- I.V. general anesthesia of short duration (small children);
• antibiotic prophylaxis (selective cases);
• after biopsy, patients should be observed for 2-4 hours.

Choice of biopsy needle
Although various commercial brands exists, the types of biopsy needles available fall into three main groups by their gauge:

- a) fine needle - 22 G;
- b) medium needle - 20 G;
- c) microbiopsy needle - 18 G.

We were pleased by medium needle usage for pulmonary intra-parenchymal and mediastinal lesions and by microbiopsy needle for parietal or parietal-contact intraparenchymal lesions. Using these two gauges, post-biopsy complication rates have been very low and we have experienced only two types of complications from those quoted in literature.

CT guidance
To locate the skin entry point we used two methods:

a) lead radio-opaque markers (3-5 mm diameter) placed on skin by adhesive strips, related to tumoral mass topography (Fig. 1 and 2);
b) the light spot “target” of CT machine and blocking on the slice through which is going to perform the biopsy.

After skin entry point determination, the shortest route to the target and the needle path angle has to be found out.

**Biopsy maneuvers**

Skin entry point is graphically marked; local anesthesia, using a 1% solution of lidocaine, is given from surface to depth (the parietal pleura proximity); the biopsy needle is then stuck slowly into the tumoral mass, as was previously established; position of the needle and target concerning is tomographically checked (Fig. 3, 4).

![Figure 3.](image1)

![Figure 4.](image2)

The needle guide wire is pulled out and a syringe of 20 ml is attached; while applying suction, three deep motions of the needle are performed in three different planes; the suction is then released (to avoid aspiration of unwanted parasitic cells) and the needle withdrawn. The extracted material is then spread on microscopic slides. Biopsy place is verified by one or two tomographic slices to check any possible complications. After a 15-30 minutes dry, slides are colored with blue polychrome tannin - BPT- Dragán.9,10

**RESULTS**

From 167 cases who have undergone this procedure, in 108 (64.4%) diagnosis of malignancy was obtained from the first attempt, in the other 59 patients (35.4%) results were either unclear or non-neoplastic. These 59 cases needed a second attempt, in 23 (13.8%) diagnosis of malignancy being obtained, 22 (13.2%) cases revealed other diseases (tymoma, morbus Pott, pulmonary fibrosis, tuberculosis, unspecified inflammations), while in 14 patients (8.4%) diagnosis remained unclear even after repeated biopsy.

From all patients who have undergone this procedure, in 131 (78.4%) the diagnosis of malignancy has been established. Using CT-guided percutaneous biopsy we have obtained a certain diagnosis in 153 patients (91.5%).

**Complications.** There was two categories of complications from those quoted in literature 2,5,7:

a) pneumothorax - 17 cases (10.1%), but only 8 (4.8%) required chest drainage, the other 9 cases having minimum pneumothorax with spontaneous healing;

b) hemoptysis - 21 cases (12.6%) all of them too small to require any treatment.

From patients with pneumotorax, 5 cases were minimum pneumothorax, that disappeared completely in 1 - 3 days, without drainage, while 8 patients required a chest tube insertion (thoracostomy). From the patients who experienced hemoptysis immediately after biopsy, no one required any treatment, this symptom dissappeared spontaneously. One single case had a benefit because of the complication developed: the minimum pneumothorax showed no parietal invasion of the pulmonary parenchymal tumor.

**DISCUSSIONS**

We have performed this procedure for patients with age between 16 months and 78 years and have had no complications at extreme ages. Failure (biopsy had to be repeated) was only due to larger than 5 cm tumors, because their intratumoral necrosis.1,2,10-12

The special 20 G biopsy needle (Cook) was replaced by spinal anesthetchic needles, having the same
gauge and 90 mm long, with no impairment on technique or results. The 10 ml syringe was also replaced with a 20 ml one, so we could produce a higher suction pressure for an improvement in quality of obtained specimen.

For parietal-invading tumors we have used larger needles (18-G), actually performing a true microbiopsy, with a very low pneumotorax risk because of adhesions or neoplastic invasion of chest wall.

For tumors of peripheral lung parenchyma or pleural tumors, where bronchoscopy and sputum cytology are useless, CT-guided percutaneous biopsy remains the only diagnosis procedure if the patients are not suitable or refuses another kind of interventional diagnosis (open biopsy). It also proved its utility for some mediastinal masses where local topography represents a high risk for vascular injuries.

**CONCLUSIONS**

This procedure has proved to be invaluable in diagnosis clarification of mediastino-pulmonary diseases because:

- minor psychological stress (easy to undergo by the patient);
- it is a mini-invasive method (for some cases, the only way to establish the diagnosis);
- the diagnosis accuracy of 91.5% in our study is at least encouraging for our activity, although we had to repeat the procedure in several cases;
- because repeating maneuvers do not seem to imply a major risk, we recommend this without reserve any time when previous result is unclear or negative, despite clinic aspects and disease evolution suggesting a malignancy;
- low rate and easy to manage complications;
- low-cost procedure.

**REFERENCES**