Volume : 5 | Issue : 10 | October 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Original Research Paper

CT-Guided Percutaneous Biopsy of Intrathoracic Lesions : 5 Years Experience

Medical Science

KEYWORDS : coaxial biopsy needle, pneumothorax, hemoptysis

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ABSTRACT

Aim: *Evaluate diagnostic yield and complications of percutaneous transthoracic biopsy using a coaxial system.*

Materials and methods: *Records of 200 patients who underwent percutaneous CT-guided coaxial cutting needle lung or mediastinal biopsy were retrospectively evaluated.*

Results: *From lesions biopsied in 200 patients, histopathology reports were achieved in192 patients (96%) of which 159 biopsy results (79.5%) demonstrated malignancy. Complications were observed in 45 patients (22.5%). Only those patients which required post procedure admission or any active intervention were considered in complication list.*

Conclusion: *Percutaneous lung and mediastinal biopsy using a coaxial system is a minimally invasive procedure with high diagnosis rate and an acceptable rate of complications.*

Introduction

Percutaneous lung and mediastinal needle biopsies are used for histopathologic diagnoses, obtaining specimen for culture and performing other microbiologic tests. For lung lesions, percutaneous CT guided biopsy has been accepted as an initial method (1). In comparison to fine needle aspiration, needle biopsy provides better diagnostic accuracy of benign and malignant lung lesions, with no need for an on-site cytology team (2). Diagnostic accuracy rates for CT guided lung biopsy have been reported as ranging from 76% to 93% (2). In this retrospective study, we tried to evaluate biopsy results and complication rates of CT guided percutaneous biopsies.

Materials and methods

From June 2011- July 2016 percutaneous transthoracic CT-guided coaxial cutting needle biopsy procedures using coaxial system were performed in 200 patients. All patients had focal lung lesions presenting as a nodule, mass, or a mass like consolidation.

Prior to procedure informed consent was obtained from the patient. Platelet counts and prothrombin time of all the patients were recorded, the risks, benefits, and alternatives were discussed. Anticoagulant medications were discontinued at least 4-5 days before the procedure (3, 4).

Patients were positioned on the CT table and slice images of 5 mm were obtained at the level of the lesion. Metallic marker was placed on the skin to define the exact puncture site. After appropriate cleaning and sterilization of the skin, local anaesthesia was injected, and a small incision made to facilitate passage of needle.

Coaxial biopsy set containing a 16 or 19-gauge guiding needle with an 18 or 20-gauge biopsy needle, respectively was used for obtaining tissue cores. (Quick core biopsy set, Cook, Bloomington, IN, USA)

At the end of the procedure and 1 h after the procedure, limited thoracic CT scans were obtained to look for any complication.

Specimens were put in formalin for histopathology and in culture bottles for microorganism isolation as required.

Management of complications

All patients were monitored with pulse, BP and oxygen saturation for next one hour. If a small pneumothorax was detected and patients had no symptoms and no increase in the pneumothorax on follow-up, no intervention was done. If there was a large or increasing pneumothorax, a small chest tube was placed into the pleural space. The tubes used were either Mallecot or pigtail catheters of 8 or 10 F which were connected to water seal drainage and kept for 24 h. Repeat Chest X-ray if showed resolved pneumothorax, the chest tube was removed and the patient discharged.

Results

Coaxial biopsy was performed on 200 patients in total. The mean age of the patients was 58.5 ± 10.7 years; 59 (29.5%) were female and 141(70.5%) were male. At the final diagnosis, the biopsy results were malignant in 159 patients (79.5%) and they were benign in 33 patients (16.5%). The pathology results were not diagnostic in 8 patients. Complications were observed in 45 (.5%) of 200 patients. Drainage tube for Pneumothorax was required in 6 patients (3%) and the pneumothorax resolved within 1-24hours. Catheter was removed by 24hours in all patients.

Patients with bleeding (10 patient) and hemoptysis (2 patient), both bleeding and hemoptysis (4 patient) were managed conservatively and no active intervention was needed.

The complications observed after transthoracic biopsy and therapy for these complications are summarized in Table 2. No differences were detected in complication rates between benign and malignant lesions.

Table 1. Histopathologic findings for 200 transthoracic biopsies: (A) Malignant, (B) Benign

(A)

	Number	%
Malignant lesions	159	79.5%
Lung primary	95	47.5
Lung secondary	19	9.5
Lymphoma	13	6.5
Thymic carcinoma	2	1
fibrous tumors	1	0.5

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(B)

	Number	%
Benign lesions	33	16.5
Tubercular	21	10.5
Sarcoid lymphnode	8	4
Non specific granulomatous	3	1.5
Aspergilloma	1	0.5

Table 2. Complications after transthoracic lung biopsy.

	Number	%
Pneumothorax	29	14.5
Only Hemorrhage	10	5
Only Hemoptysis	2	1
Hemorrhage and hemoptysis	4	2

Discussion

Although fine needle aspiration biopsy(FNAC) of lung lesion has a high accuracy for diagnosing malignancy, a biopsy obtained using a coaxial system has the advantage of defining the specific subtype of the lesion which becomes important in cases of lymphomas and benign lesions(5). Coaxial system consists of a larger outer needle placed at the edge or within the lesion and a thin inner biopsy needle through which specimens are obtained. It has advantages over the single needle technique including limiting the number of pleural punctures and the opportunity to obtain multiple specimens. Multiple pleural punctures increase the risk of pneumothorax. In our practice we took 2-6 specimens depending on the size of the obtained tissue. In necrotic masses number of attempts had to be increased due to poor tissue yield.

In 4 % of our subjects, biopsy specimens were nondiagnostic and it was presumed that this might have resulted from sampling errors like taking the sample from the necrotic portion or a peritumoral fibrotic area.

Percutaneous biopsy of mediastinal or hilar lymphnodes is less invasive than mediastinoscopy however, pneumothorax and bleeding are the two most frequently encountered complications. Usually a parasternal or paravertebral approach is employed for mediastinal lesion and a transpulmonary path is only used when a lesion could not be approached by the extrapleural route (14).

Pneumothorax, pulmonary hemorrhage, hemothorax and chest wall hematoma are the most commonly encountered complications (3, 4, 6, 7, 8). A review of the existing literature reveals variable rates of pneumothorax from 8% to 64% (9). This large range for pneumothorax is because some studies take minimal pneumothorax into account and others consider only those which require admission / chest tube placement. In our study we noted down all patients who developed pneumothorax and mentioned those requiring intervention separately. British Thoracic Society guidelines on managing pneumothorax suggest initial treatment by aspiration, with subsequent drainage if significant pneumothorax persists. A small gauge tube is usually adequate (10).

Study by Yeow(13) and associates reported that lesions with a diameter of < 2 cm had an 11-fold increased chances of leading to a pneumothorax and with respect to location, lesions located near the pleura had higher rates of pneumothorax. Perihilar biopsy also makes pneumothorax more likely (11).

Pulmonary hemorrhage may occur with or without hemoptysis. While hemorrhage has been recorded in 5.0-16.9% cases, it manifests as hemoptysis in only 1.2-5.0% patients (3). In most of cases, is self limiting and settles with conservative treatment. In vascular lesions and in patients with bleeding disorders, small caliber needles are used to reduce the risk of severe hemorrhage (12).

Massive hemoptysis requiring bronchoscopic tamponade, arterial embolization, or surgery has become extremely rare with small caliber needles. Lesion depth has been identified as the most important risk factor for hemorrhage, with an increased risk of bleeding in lesions deeper than 2 cm.

Hemorrhage was detected in 10 of our patients (5.0%). In 2 patients, hemoptysis was noted and in 4 patients both hemoptysis and hemorrhage seen. Both hemorrhage and hemoptysis were not massive. In all of these patients, the bleeding stopped spontaneously, so no intervention or blood transfusion was needed. There was no relationship between lesion location and bleeding.

The mortality rate of percutaneous lung mass biopsy has been estimated as being 0.002% of all patients, mainly due to pericardial tamponade, acute massive hemoptysis and systemic air embolism (3). No death occurred in our study.

In conclusion transthoracic biopsy using a coaxial system is a well tolerated, minimally invasive procedure, with a high rate of diagnosis, providing reliable differentiation of malign and benign lesions, with acceptable complication rates and high diagnosis rate. It is a feasible procedure for focal lung lesions.

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