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Evaluation of the use of Tru-Cut Needle Biopsy in the Diagnosis of Chest Wall Tumors

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Abstract: *Introduction:* Chest wall tumors can be either primary, metastatic or radiation induced. Moreover, it can be due to involvement by lung or breast cancer. Although clinical and radiological assessments are important in evaluation of patients with chest wall tumors; the histo-pathological diagnosis remains the most important factor in determining the appropriate management. One of the methods to get tissue biopsy is tru-cut needle biopsy. *Aim:* This study aimed to determine the efficacy and complications of the use of tru-cut needle biopsy in diagnosis of chest wall tumors. *Patients and methods:* This is a retrospective study in which the files of patients who underwent tru-cut needle biopsy at cardiothoracic surgery department of Alexandria University were reviewed. *Results:* Twenty patients (13 males and 7 females) underwent tru-cut needle biopsy for chest wall tumors during the period between January 2003 and December 2008. Age ranged between 17 to 75 years (52.4 ± 13.7 years old). Ninety-five percent of patients were presented with chest wall swelling either alone or with pain. All patients except one had tru-cut needle biopsy without radiological assist. Tru-cut needle biopsy was performed with the aid of fluoroscopy in one patient. Pre-operative tissue diagnosis could be established with accuracy in 90% of patients. In 90% of patients, tru-cut needle biopsy was able to determine if the lesion is benign or malignant while in two patients it was inconclusive. No complications were encountered during or following the procedure. Moreover, no recurrence at the site of biopsy was detected during 3 years follow-up. *Conclusion:* Tru-cut needle biopsy; with or without radiological assist; is of utmost help in accurate pre-operative histo-pathological diagnosis with minimal complications. Accuracy in determination of diagnosis depends on the skills of the personnel who perform the biopsy and the pathologist. Recurrence at site of the biopsy is rare.

Keywords: Tru-Cut Biopsy, Needle Biopsy, Chest Wall Tumors

1. Introduction

Chest wall tumors can be either primary, metastatic or radiation induced. Moreover, it can be due to involvement by lung cancer or breast cancer or even thymic tumors. Diagnosis of neoplasm usually starts with radiological assessment. In most of instances, uncertainty could be encountered. While clinical evaluation and radiographic investigations are important in managing chest wall neoplasms, accurate histological analysis is the single most important factor in determining the appropriate treatment. There is controversy regarding the most appropriate method of obtaining tissue for histological analysis: needle biopsy, incisional biopsy, or excisional biopsy (1, 2). Biopsy technique selectin should be individualized. Incisional or excisional biopsies are appropriate for resectable chest wall neoplasms. Excisional biopsy is preferred for smaller primary chest wall tumors (benign or malignant). If malignancy is confirmed, formal wide resection is performed including en-bloc resection of the biopsy site, surrounding skin with subcutaneous tissue and muscles. For larger lesions; more than 4 cm in diameter; of primary chest wall tumors, incisional biopsy may be performed as a preliminary step to help in designing a therapeutic strategy. When circumstances exclude operation for cure, biopsy morbidity should be minimized (1) Hence, obtaining tissue for histological diagnosis through biopsy of the lesion is necessary in order to obtain a definitive diagnosis (3). Biopsy is essential in the management of oncology patients where distinction between benign and malignant tumors or

primary and metastatic diseases has important implications for management process (4-6). Incisional biopsy generally provides the correct diagnosis but is not curative. Tumor seeding at the biopsy site may also occur. Moreover, a misleading information could be obtained from large heterogeneous tumors. The incisional biopsy is very useful on dealing with lesions or tumors that are treated with pre-operative chemotherapy or radiotherapy (7). On the other hand, the Excisional biopsy is reserved for small lesions (less than 4 cm in diameter) that are superficial and the clinical impression is that of benign nature (2). Others reserve it only for lesions less than two centimeters in its largest diameter (8). It has the obvious advantage that it is curative for most of benign lesions and for some small malignancies (7). Needle biopsy from chest wall tumors; either fine needle or core needle biopsy; is less invasive than the other two previously mentioned procedures. The Tru-cut needle biopsy is a well-established procedure for diagnosis of lung, mediastinal, and chest wall tumors (9). It has the advantage over the fine needle biopsy that it provides tissue for histopathological examination. This study aimed at evaluation of our experience with the use of tru-cut needle biopsy in the diagnosis of chest wall tumors or intra-thoracic tumors invading chest wall.

2. Patients and Methods

This is a retrospective study in which the files of patients, who had chest wall tumors or intra-thoracic tumors invading chest wall underwent tru-cut needle biopsy at cardiothoracic surgery department of Alexandria University were reviewed. This study included the patients during the period of 2003 – 2008. The presenting symptoms and signs as well as pre-surgical resection and post- surgical resection pathology were searched for. In all patients, postero-anterior and lateral chest radiographs and chest CT scans were obtained as part of the routine work-up to localise the mass. Before performing the biopsy, the CT scans were reviewed to assess the anatomical extent and the depth of the mass in order to plan the biopsy route. Diameter of the mass and the tissue thickness of the tissue covering it were determined. Percutaneous core cutting needle biopsy were all, except one, oriented but not guided by CT-Chest. One patient had a small intra-thoracic tumor in contact with pleura but not invading musculoskeletal chest wall. In this patient, core-needle biopsy was performed with the help of fluoroscopy in order to guide the direction of the needle.

Technique:

A pre-biopsy coagulation profile was obtained in all patients. The skin of the chest was cleaned and draped. The proposed site of puncture was infiltrated with 5-10 ml of Xylocaine solution. If the covering skin was apparently normal, a 3-5 mm incision was performed to avoid puncturing it with the needle. On the other hand, if the overlaying skin was apparently infiltrated by the neoplasm, no incision was performed. Next, a Tru-cut biopsy needle, 15 cm long, 16 G with a 20 mm specimen notch through the overlaying tissue considering the thickness pre-determined on revision of CT scans. When, the needle tip reached the part of the mass to be biopsied, a core biopsy was obtained and the needle was withdrawn. Three to five passages were performed for each patient. The obtained specimen was preserved in formalin and sent for histo-pathological examination.

After the procedure, the patients were kept under observation and chest radiographs were obtained after 2 hours to exclude any complications. In addition, results of follow-up of patients were documented in this study.

3. Results

Twenty patients (13 males and 7 females) underwent tru-cut needle biopsy for chest wall tumors (n = 16) and intra-thoracic tumors invading chest wall (n = 4) during the period between January 2003 – December 2008. Age ranged between 17 to 75 years (52.4 ± 13.7 years old). Ninety-five percent of patients were presented with chest wall swelling either alone or with pain. All patients except one had oriented but not guided tru-cut needle biopsy. One patient had tru-cut needle biopsy performed with the aid of fluoroscopy as he had a small intra-thoracic mass reaching the pleura (Table 1). Core needle biopsy was able to establish pathological diagnosis in 90 % of patients while in two patients results were inconclusive. No complications were encountered during the procedure. Moreover, no recurrence at site of biopsy was detected during five years follow-up. Number of passages was ranging between 3-5 passages for each patient. In the two patients in whom the core biopsy was found to be inconclusive, number of passages was 3 in one patient and 4 in the other. On the other hand, the post-resection diagnosis was found to be tuberculosis infection of a rib in one patient and aneurismal bone cyst in the other (Table 2). The largest diameter of the lesion biopsied was 7 cm while the smallest diameter was 2 cm.

4. Discussion

Percutaneous thoracic biopsy includes both Fine Needle Aspiration Biopsy (FNAB) and Core Needle Biopsy (CNB) (10). FNAB provides aspirates for cytological analysis. Its disadvantages include its requirement of an on-site cytopathologist to evaluate the adequacy of the specimen. Furthermore, negativity for malignancy does not confirm that the lesion is a benign one. Moreover, the specific diagnosis of benign lesions usually requires histologic specimens (10, 11). In our center, we preferred to perform CNB instead of doing FNAB to be able to get histopathologic analysis. In all patients, it was able to get multiple cores of the lesions to be examined. We had performed CT oriented, not guided, CNB in all patient except one. In those nineteen patients, CT scans were revised before performing the biopsy. Those patients had marked or slight bulge on the thoracic wall. On the other

hand, CNB was performed under the fluoroscopy screen because it was small (2X3 cm) and just reaching the pleura. We preferred to use fluoroscopy scan to correctly approach the lesion with minimal complications.

We estimated the depth of the lesion from our revision of the CT scans; hence operators were able to get biopsy without getting through the lesion and passing its borders. In four patients with large intra-thoracic portions, no complications were encountered. The most frequent complications of CNB of intra-thoracic lesions included pneumothorax (19-62%) (10, 12, 13) or bleeding (10). We think that absence of complications in our series is due to law number of patients with intra-thoracic lesions and that all lesions are in contact or originating from chest wall.

CNB of chest wall and thoracic lesions with use of 18 G needle had a diagnostic yield of 90 %. In only two patients, the pathologist was unable to determine the pathology. One patient had tuberculosis infection of the rib while in the other the final pathology revealed aneurismal bone cyst. We attribute this high diagnostic yield to the superficial nature of the thoracic wall tumors and may be the higher number of passages to get more tissue samples. Loubeyer et al. (10) have reported 88% diagnostic yield.

Table 1. *Demographic data, presentation and procedure performed.*

No.	Sex	Age	Symptoms	Procedure
1	M	75	P + S	CT oriented CNB
2	M	65	C + D + S	CT oriented CNB
3	M	65	S	CT oriented CNB
4	M	60	S	CT oriented CNB
5	F	50	S	CT oriented CNB
6	M	60	P	Fluoroscopy guided CNB
7	F	22	P + S	CT oriented CNB
8	M	40	P + S	CT oriented CNB
9	F	53	P + S	CT oriented CNB
10	M	60	P + S	CT oriented CNB
11	M	17	S	CT oriented CNB
12	F	52	P + S	CT oriented CNB
13	M	55	P + S	CT oriented CNB
14	F	45	P + S	CT oriented CNB
15	M	50	P + S	CT oriented CNB
16	M	55	P + S	CT oriented CNB
17	F	60	P + S	CT oriented CNB
18	M	48	P + S	CT oriented CNB
19	F	55	P + S	CT oriented CNB
20	M	60	P + S	CT oriented CNB

M = Male, F = Female, S = Swelling, P = Pain, C = Cough, D = Dyepnea
CT = Computed Tomography, CNB = Core Needle Biopsy

Table 2. *Data regarding the largest diameter of the mass, number of passages, Core needle biopsy pathology, and post-resection biopsy pathology.*

No.	Largest Diameter in cm	Number of passages	CNB pathology	Post-resection biopsy
1	4	3	Metastatic adenocarcinoma	Metastatic adenocarcinoma
2	5	4	Squamous cell carcinoma	Squamous cell carcinoma
3	5	5	Chondrosarcoma	Chondrosarcoma
4	5	4	Osteosarcoma	Osteosarcoma
5	4	4	Myeloma	Myeloma
6	4	3	Soft tissue sarcoma	Soft tissue sarcoma
7	5	5	Fibroelastoma	Fibroelastoma
8	7	3	Chondrosarcoma	Chondrosarcoma
9	5	3	Myeloma	Myeloma
10	4	3	Metastatic adenocarcinoma	Metastatic adenocarcinoma
11	6	3	Metastatic adenocarcinoma	Metastatic adenocarcinoma
12	5	3	Osteosracoma	Osteosarcoma
13	4	4	Chondrosarcoma	Chondrosarcoma
14	3	4	Chondrosarcoma	Chondrosarcoma
15	3	3	Inconclusive	Tuberculosis
16	2	3	Squamous cell carcinoma	Squamous cell carcinoma
17	3	3	Squamous cell carcinoma	Squamous cell carcinoma
18	3	4	Inconclusive	Aneurysmal bone cyst
19	3	4	Osteosarcoma	Osteosarcoma
20	2	4	Osteosarcoma	Osteosarcoma

cm = centimeter, CNB = Core needle Biopsy

We did not study the correlation between the diagnostic yield and the number of passages. Meanwhile, we believe like Loubeyer et al. (10) and Jakanani et al. (3) that four passages could achieve a good diagnostic yield.

It should be noted that all patients with malignant lesions had a specific determined pathology on CNB specimens while in two of three patients with benign lesions CNB could not help to establish a pathological diagnosis. Low diagnostic yield of CNB in situations of benign lesions was documented in other published studies (3, 5, 14).

Follow-up for the patients who had CNB was completed for five years. Recurrence of the tumor at site of CNB was not found in any of our patients. Some authors documented seeding of the CNB tract with tumor cells and recurrence of the tumors at the site of puncture (7, 15)

5. Conclusion

In conclusion, we believe that CT oriented CNB has a high diagnostic yield in the hand of experienced physician.

Accuracy in determination of pathological diagnosis depends on the skills of both; the physician who performed the biopsy and the pathologist. Recurrence at site of the biopsy is rare.

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