Ultrasound-guided Percutaneous Trucut Needle Biopsy for Musculoskeletal Tumours

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ABSTRACT

Purpose: To evaluate the usefulness of ultrasound guidance in percutaneous needle biopsy for musculoskeletal tumours.

Methods: Forty-five consecutive patients underwent ultrasound-guided needle biopsy. An additional group of 50 patients who underwent needle biopsy without ultrasound guidance was retrospectively selected as historical control. The sample was considered adequate when a diagnosis can be made, and diagnostic when the diagnosis is similar to the final report based on the excised tumour.

Results: Adequacy of the biopsy samples was 84% in ultrasound-guided group as compared 76% in the group with no ultrasound guidance. Diagnostic accuracy was 64% in the ultrasound-guided group and 52% in the group without ultrasound guidance. Both of these differences were not statistically significant.

Conclusions: Ultrasound guidance did not provide a significant advantage in the biopsy of musculoskeletal tumours. Diagnostic accuracy seems to improve with the use of larger 14 gauge biopsy needle but further evaluation is necessary.

Key Words:
Ultrasound, Core needle biopsy, Soft tissue neoplasm, Diagnosis

INTRODUCTION

Musculoskeletal tumour is relatively uncommon and an accurate ratio of benign to malignant lesions is difficult to determine. Definitive diagnosis of the tumour is generally dependent on histopathological interpretation. Open biopsy remains the gold standard because it provides more tissue sample for examination compared to the less invasive needle biopsy. Some clinicians attempt to improve the diagnostic outcome of needle biopsy with the use of imaging techniques like image intensifiers or computerized tomography (CT scan).

High-resolution real time ultrasound allows for visualization of tissues of varying echogenicity and may provide guidance for the placement of biopsy needle. We conducted this study to determine the efficacy of ultrasound-guided needle biopsy for musculoskeletal tumour.

MATERIALS AND METHODS

Patients older than 12 years old and diagnosed with musculoskeletal (soft tissue and/or bone) tumour between February 2005 and September 2006 were considered for the study. Forty-five study participants underwent percutaneous biopsy utilizing a Trucut needle under the guidance of ultrasound. Those with intramedullary tumours with intact cortical bone that required a trephine type of biopsy needle were excluded, as were patients with bleeding disorder or those who had previous biopsy of the same lesion. The ethical committee of the hospital approved the study and written consent was obtained from all patients.

Fifty consecutive cases of musculoskeletal tumours, (treated with percutaneous biopsy followed by definitive surgical resection) at the same institution between 1998 and 2000 were selected as historical controls. We traced the histopathological report of the first needle biopsy and the final pathological report following definitive surgical treatment.

The biopsy sample was considered adequate if a provisional diagnosis could be made from the first tissue sample. If a second needle biopsy or an open biopsy was required, the first sample was considered inadequate. The biopsy sample was considered diagnostic when the provisional diagnosis corresponds with diagnosis made following examination of the tumour tissue removed by definitive surgery.

Needle biopsy under ultrasound guidance

Colour Doppler ultrasound was used to evaluate the vascularity of the tumour and to locate major vessels located close to the biopsy site [10]. The ultrasound machine used was a LOGIQ 700MR (GE Medical Systems Milwaukee, WI) equipped with a MI12L 6-14 MHz and a 546L 3-6 MHz transducer.

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Table I: Final diagnosis for the ultrasound-guided group

Final Diagnosis	Number
Lipoma	7
Metastases	4
Fibromatoses	3
Osteosarcoma	3
Schwannoma	2
Neurofibroma	2
Malignant Fibrous Histiocytoma	2
Chondrosarcoma	2
PVNS (pigmented villonodular synovitis)	1
Hemangioma	1
Tuberculosis	1
Sebaceous Cyst	1
Synovial Chondromatosis	1
Epidermal Cyst	1
Chondroma	1
Atypical Myofibroblastic Tumour	1
Fibrous Dysplasia	1
Ewings Sarcoma	1
Synovial Sarcoma	1
Osteomyelitis	1
Myxoid Sarcoma	1
Non Hodgkins Lymphoma	1
Carbuncle	1
Pseudogout	1
Granular Cell Tumour	1
Spindle Cell Mesenchymal Tumour	1
Rhabdomyosarcoma	1
Infective Arthritis	1
TOTAL	**45**

Table II: Final diagnosis for the Nonultrasound-guide group

Final Diagnoses	No
Osteosarcoma	13
Giant Cell Tumour	12
Liposarcoma	5
Chondrosarcoma	2
Ewings Sarcoma	2
Fibrous Dysplasia	2
Angiosarcoma	1
Non Hodgkins Lymphoma	1
Fibrosarcoma	1
Chondromyxoid Fibroma	1
Osteochondroma	1
Lipoma	1
Osteoblastoma	1
Aneurysmal Bone Cyst	1
Malignant Fibrous Histiocytoma	1
Tuberculosis	1
P.N.E.T.	1
Rhabdomyosarcoma	1
Hemangioma	1
Chordoma	1
TOTAL	**50**

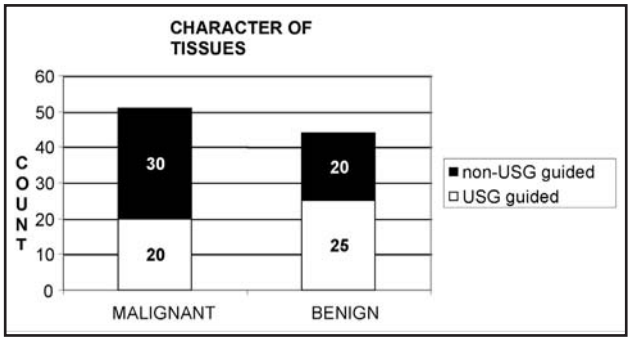

Fig. 1: Character of tissue between the ultrasound-guided and the nonultrasound-guided groups.

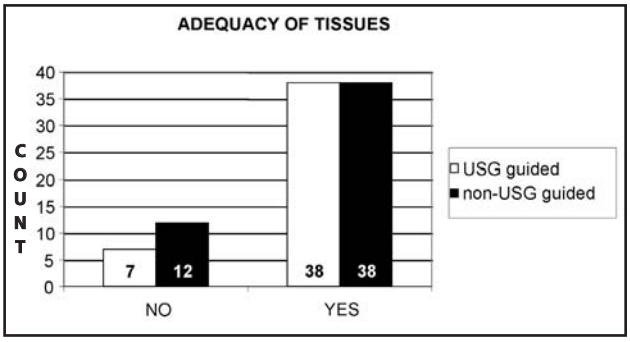

Fig. 2: Comparison of adequacy of tissue diagnosis between the ultrasound-guided and the nonultrasound-guided groups. p value 1.056 using the Pearson chi square test.

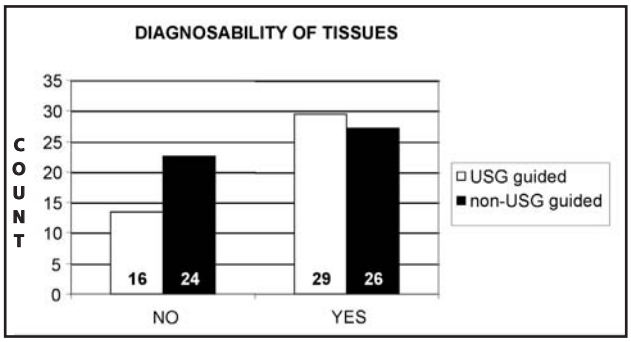

Fig. 3: Comparison of diagnosability between the Ultrasound-guided and the Nonultrasound-guided Groups.

The skin was sterilized with povidone iodine or hexachloride solution. About 5 to 10 ml of 1% lignocaine was infiltrated to provide local anaesthesia. The probe was enveloped in a sterile plastic bag and examination performed. The cutting needle was inserted under direct visualization so that areas of tissue necrosis were avoided. Tissue specimens were obtained from the interface area of the tumour. Sampling of various parts of the tumour was then performed using a 16 gauge Temno automated Trucut biopsy needle. Based on the results of the first 29 cases, a change was made for the last 16 cases in that larger 14 gauge needles was used. For each biopsy, 2 to 4 cores were obtained depending on the quality of the tissue obtained and the heterogeneity of the tumour on ultrasound examination.

RESULTS

In the ultrasound-guided biopsy group (45 cases), there were 20 (44.4%) patients with malignant lesions and 25 (55.6%) patients with benign lesions. The most common pathology was lipoma, followed by soft tissue metastasis, fibromatosis and osteosarcoma (Table I). In contrast, we found that for the historical control group (50 cases), the most common diagnosis was osteosarcoma, followed by giant cell tumour and liposarcoma (Table II); thirty (60%) patients had malignant lesions and 20 (40%) patients had benign lesions in this group (Figure 1).

In the ultrasound-guided group 38 out of 45 (84%) biopsy procedures provided adequate tissue for interpretation, while for the historical control group 38 out of 50 (76%) biopsy procedures provided adequate samples for interpretation. The difference was however not statistically significant (Figure 2).

In the ultrasound-guided group 29 out of 45 (64%) biopsy tissues were considered diagnostic compared to nonultrasound-guided group where 26 out of 50 (52%) biopsy samples were diagnostic, also not a statistically significant difference (Figure 3).

Decision to use a larger biopsy needle was made following early review of the results since there was not an obvious difference between the ultrasound-guided and nonultrasound-guided groups. For the last 16 cases where a 14 gauge needles were used, we managed to obtain adequate tissue for interpretation in all cases (100%) and the samples were diagnostic in 13 cases (81%). Due to the limited number of cases with the larger gauge needles, we were not able to conclude that these differences were significant.

DISCUSSION

We were not able to discern any advantage in the use of ultrasound for diagnosis of musculoskeletal tissue tumour. Ultrasound may not be able to provide useful guidance for diagnostic purposes where more diagnostic tissue can be obtained via other methods. On the other hand, the use of ultrasound guidance may improve the safety of the biopsy procedure. With the use of colour Doppler [15], location of major vessels adjacent to the tumour can be identified and injuries avoided.

Ahrar *et al* reported that most malignant primary bone lesions have a substantial extra osseous component that can be identified by ultrasound and then biopsied [14]. Sampling purely the osseous components of lesions can yield inconclusive diagnoses or limited samples of crushed bone fragments that might not be adequate for diagnosis. In

advanced cases these advantages of ultrasound-guided biopsy may not be obvious.

Larger biopsy needle used in the later stage of this study showed what appears to be a significant increase in the accuracy of the biopsy technique; however, the design of this study does not allow us to investigate whether it was the larger bore needle or the ultrasound guidance that contributed to this trend. This issue should be addressed in a follow-up study.

CONCLUSION

In the biopsy of musculoskeletal tumours, ultrasound guidance did not provide significant advantage in terms adequacy and diagnostic accuracy of the biopsy specimen. Further research is needed to investigate potential benefits of using ultrasound for biopsy with a larger gauge needle.

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