Nat. Volatiles & Essent. Oils, 2021; 8(5): 4124 - 4129

A study to ascertain the diagnostic accuracy of bone cytology by fine needle aspiration's precision

Xingmei Li [1], Ravikumar Katta [2], Selvaraj Antoniraj [3]

[1] *Research Scholar of Lincoln University College Malaysia*
[2] *Hod of Lincoln University College Malaysia*
[3] *Lecturer of Lincoln University College Malaysia*

Abstract

Tumors of the bones are quite rare. "Because many bone lesions are asymptomatic and not biopsied, it is impossible to determine the exact incidence of individual bone tumours. Athologist, surgeon, and radiologist correlation in bone lesion" diagnosis was highlighted by Jaffe in 1958. Skeletal system tumours present themselves in a predictable manner. Patients' ages, bone involvement, specific location "in the bone (epiphysis, metaphysis (or) diaphysis, cortex, medulla or periosteum), radiographic appearance, and microscopic appearance are all important considerations in this regard. Before attempting to examine the fifth, the" pathologist should be well-versed in the first four.

Bone tumours present with a wide range of nonspecific symptoms. Most patients come in with some combination of pain and edoema. Patients with pathological fractures do show up every now and then. Any one of these characteristics could point to a different diagnosis. Some bone abnormalities, on the other hand, are linked to specific symptoms. This condition can be marked by excruciating pain that can only be alleviated with analgesics. Fever and an elevated ESR in a patient with Ewing's sarcoma of the bone suggest an osteomyelitis diagnosis. This could result in ineffective treatment and a longer time to diagnose. As a result, symptoms have little usefulness in the diagnosing process..

Keywords: Bonetumours, osteoma, ESR, periosteum, epiphysis

Introduction

Patient age and tumour location are critical factors in treatment. Ewing's sarcoma and osteosarcoma are two of the most deadly types of childhood sarcoma. Adults can develop sarcomas of a lower degree, such as chondrosarcoma. The location and size of the lesion are very important factors to take into consideration. The epiphyseal end of a bone is commonly affected by giant cell tumours. Having "a large number of giant cells in a metaphysis (or) diaphysis lesion should raise suspicions of additional conditions, such as hyperparathyroidism, osteosarcoma, or an aneurysmal" bone cyst.

Half of all osteosarcomas occur in the distal femur or proximal tibia metaphyses. Chondrosarcoma is a tumour of the flat bone that is cartilaginous in nature. The x-ray image's look is critical. The roentgenogram is the greatest imaging tool for pinpointing the exact location of the tumour. When determining whether a lesion is benign or malignant, radiological findings can be helpful. The rim of benign tumours is often sclerotic and well-defined. Tumors that are malignant are frequently ill-defined. The majority of spindle cell sarcomas manifest as localised damage. To say that there has been geographic destruction would be an understatement. Malignancies of the small cell type, like Ewings sarcoma, often exhibit a permeative destructive process, which refers to the look of bones that have been moth-eaten, with numerous small holes and intervening residual bone.

It's critical to pay attention to the way your body reacts to the periosteal infection. Bone growth is dense and regular in benign diseases like Langerhan cell histiocytosis. It is not uncommon for malignant tumours like Ewing's sarcoma to produce numerous layers of disorganised new bone in the surrounding tissue.

However, current estimates indicate "that benign tumours affect men more frequently. Bone sarcoma statistics are more complete and show that men and women are affected at a 1:0.7 ratio.

Primary tumours can grow in any area of the skeleton, although they tend to favour the long, tubular bones more than the shorter ones. The appendicular skeleton is the most common site for benign tumours to grow, with the femur and tibia accounting for almost half of those cases. The pelvic and axial skeleton are the most commonly affected areas of the body by bone sarcomas, while the tiny bones of the hands and feet are the least likely to be" affected.

Literature Review

Bone tumours and neoplasms are quite rare. Bone tumours commonly strike children and adolescents in their adolescent years. A sarcoma diagnosis "necessitates considerable surgery and, in most cases, chemotherapy, with or without radiotherapy, for the surgical pathologist dealing with a bone tumour because" of these considerations. Historically, a sarcoma diagnosis required amputation surgery and had a dismal outlook for the patient.

The use of an "integrated strategy that evaluates and correlates the clinical, radiographic, morphologic, and biologic behaviour of these lesions" is critical to their proper detection.

The American College of Surgeons' registry of bone sarcoma established the first comprehensive classification of primary bone tumours in 1920. The Registry's classification was officially revised by Ewing and published. Other people have modified this revision, but it still represents the care for many later revisions.

Etiology:

Mesenchymal stem cells with chromosomal abnormalities undergo neoplastic transformation, proliferate, and eventually develop bone tumours. Mutations in "the DNA that are specific to a particular form of bone tumour are extremely rare. Although benign and malignant bone tumours can occur on their own, they can also be found as part of a wide range of genetic syndromes such as olliers disease, Maffuci syndrome, multiple hereditary osteochondromas, bilateral retinoblastoma, Li -Fraumeni syndrome, Gardner syndrome, Mazbraud syndrome, and McCune - Albright syndrome.. Diaphyseal medullary stenosis" with neurofibromatosis.

Diseases affecting the bones can produce favourable conditions for the growth of malignant tumours, such as sarcomas. Radiation injury, "Paget's disease, bone infarction, and chronic osteomyelitis are the most" serious.

Pre-existing bone tumours seldom become malignant, and the most common ones to do so are enchordroma and osteochondroma; fibrous dysplasia or a simple bone cyst are uncommon exceptions.

Sarcomas developing around orthopaedic implants have been recorded recently, according to reports. However, the likelihood of this dreadful side effect appears to be quite low, and scientists believe that the chemical components of the implants have negligible carcinogenic potential in humans.

The classification that was first proposed by Lichtenstein is the one that is almost generally accepted. Bone tumours are often characterized by the normal cell and tissue types they mimic.

It is advised by WHO's"international reference center for bone tumour histological definition and classification to" use the following terminologies and classification schemes: 1. Most tumours are either benign or malignant according to WHO classification. GCT and well-differentiated cartilaginous tumours are examples of tumours that have borderline (or) intermediate features. The majority of malignant bone tumours develop on their own, however a tiny percentage of benign bone lesions predispose patients to skeletal malignancies in the future. Pages disease, chondromatoses, osteochondromatoses and fibrous displasias are some of the conditions that fall within this category.

Research Gap

Bone tumours can be diagnosed using FNAC. 76.2% of tumours can be correctly diagnosed using this easy outpatient treatment, which provides ample tissue materials. Cytological evaluations must agree with clinical and radiological results just like open biopsies do. Even while our findings are promising, FNAC cannot fully substitute open biopsy in all cases.

For bone lesions assumed to be benign, the diagnosis accuracy of GCT was 83%, according to Dollahite et al. in 1989. GCT has a diagnostic accuracy of 90%.

Diagnostic issues were not the primary cause of the experiment's failure, but rather insufficient sampling.

Agarwal and Wahal (1983) found 83% diagnostic concordance between cytology and histology in a comparative investigation of 67 bone tumours.

Insufficient cytological material was the root cause of each and every failure. It's important to make an effort to enhance the technique for gathering enough data.

There are numerous ways to "direct the needle. Since cortical bone has been pierced, the device can be implanted at various locations in the cortical bone without causing the patient any undue pain. This is critical, because a bone tumor's histology might" vary widely, necessitating tissue from several locations within the same lesion.

The differentiation "between benign and malignant bone tumours, lymphomas, myelomas, and metastatic lesions is sufficient for accurate care of the" majority of bone tumours.

For illnesses requiring "preoperative chemotherapy, such as osteosarcoma and Ewing's sarcoma, it is critical to identify" the precise histogenictumour type and grade.

Our findings on primary malignant bone tumours suggest that chondrosarcoma and periosteal osteosarcoma present the most diagnostic challenges.

They found that in 14 cases of the cancer, the cells had distinctive morphology and that FNAC could be used to make the main diagnosis as well as to look for the typical 11: 22 translocation found in Ewing's tumours, which they reported in Akerman and Angervell's (1986) paper. In comparison to Ewing's sarcoma, osteosarcoma presents additional diagnostic challenges, but not as many as chondrosarcoma8.

There are 3 inaccurate diagnoses and inadequate in one case of telengiectatic osteosarcoma in our analysis of 9 cytologically diagnosed patients with osteosarcoma. "GCT with secondary ABC alterations, chondrosarcoma and adenocarcinoma deposits were all found in the same patient. Two of the four cytologically diagnosed cases of chondrosarcoma" are correct: the other two are false.

Research Objective & Methodology

Analyze the diagnostic accuracy of bone aspirates obtained by fine needle aspiration. It was determined how accurate various methods were by comparing the accuracy of each method according to anatomical position, size, and histology. Core needle biopsy's diagnostic accuracy will be evaluated. investigate whether Fine Needle aspiration and core needle biopsy have comparable diagnostic accuracy.

Procedure of FNAC:

"To evaluate the diagnostic accuracy of bone aspirates taken using tiny needles. The study examined the accuracy based on anatomical location, lesion size and type, and histology. Core needle biopsy's diagnostic accuracy must be evaluated. To evaluate the diagnostic accuracy of Fine Needle aspiration against Core Needle" Biopsy.

Requirements

1. "Syringe 5-10 ml disposable"
2. "Needle 23-18 guage with 2.54 to 3.8cm length"
3. "Glass slides : clean, dry, free of grease and dirt"
4. "Isopropyl alcohol fixation"
5. "Gloves"
6. "Skin disinfectants, cotton swabs, sterile dressing"
7. "Culture bottle – if required"

Aspiration technique:

The biopsy needle is inserted into the extra osseous compartment along the long axis of the lesion after the patient has been properly prepared and an X-ray has been carefully examined. The syringe's plunger is retracted to generate a vacuum, and the aspirate is acquired by gently rotating the needle back and forth while applying suction, sucking tissue into the needle. The needle is removed from the lesion after the suction is released, which takes a few seconds.

Aspirates were put on slides, smears were made, and the slides were then fixed in isopropyl alcohol. Hematoxylin and eosin was used to stain them on a regular basis. Bone lesions were examined, analysed, and classified according to their cytomorphological characteristics.

Data Analysis & Findings

FNAC was performed on 67 of 110 individuals with bone tumours. A comparison was made between the cytological and histological diagnoses in 47 patients following needle biopsy and open biopsy. A cytological examination in conjunction with radiological "and clinical evidence was used to make the diagnosis in 20 of the cases where there was no" histological confirmation.

There was a little male predominance, which was discovered during the study (1.3.1) Ages ranged from 2 to 70 years old at the time of the initial presentation (median age 16 years). In the early stages of the disease, 36.4% of patients were between the ages of 40 and 49.

"Femur and proximal tibia were the most common sites of bone tumour presentation, accounting for 50 and 16 instances, respectively, of the 110 cases studied. The humerus, radius, pelvis, ileum, and vertebrae were among the other locations where the virus was" found. A cytological examination along with radiological and clinical features was used to diagnose 20 out of 67 FNA patients where there was no histological evidence.

Decalcification was not used in the treatment of the majority of soft tissue bone tumours. There were a few types of tumours that were mineralized and required decalcification, like osteoid osteoma and parasteal osteosarcoma. Decalcification was carried out by using 5% nitric acid in 10% formalin if "the resected specimens obtained had both soft and hard fragments. This method is particularly useful in cases when the soft tissue has tiny cell" neoplasm.

Most of the soft tissue is routinely removed from bone tumour resection specimens, leaving only the affected bone and any soft tissue extension caused by the tumour.

We cut the tumor-bearing bone into two halves with a bone saw. The bone saw is capable of preparing even very thin slices of bone for decalcification.

Experiments on amputation samples followed the same protocol as those on resection samples.

Hematoxylin and eosin staining procedure:

- "Dewax the section, dehydrate through graded alcohol to water"
- "Remove fixation pigments if necessary"
- "stain in hematoxylin for 5 minutes"
- "Wash well in running tap water"
- "Differentiate in 1 percent acid alcohol for 2-4 seconds"
- "Wash well in running tap water until sections are again blue for 15 to 20 minutes"
- "Stain in eosin for one minute"
- "Wash in water for 5 minutes"
- "Dry and mount the slide. "

Conclusion

In a study of 110 patients, we compare the diagnostic accuracy of FNAC and CNB. Participants had to show signs of local recurrence of a primary bone tumour or a metastasis from another cancer diagnosis.

The age range 11-20 years had the greatest number of cases (36.4%). "Males accounted for 62.8% of the cases, while females accounted for 37.2% of the total. We found benign lesions in 44 of the patients (41.9 percent) and malignant lesions" to be present in 61 of the patients. The femur (50 instances) and tibia were the most commonly affected body parts in our research (16 cases). GCT is the most prevalent benign lesion, while osteosarcoma is the most common malignancy.

As determined by histological testing and clinical, radiological aspects "we compared the cytological diagnosis with the final diagnosis. A total of 110 patients had samples that might be used to make a definitive cytological" diagnosis. Only 47 patients had a biopsy specimen to use as a point of reference. Of the 42 instances with sufficient cytological material, 32 (76.2 percent) had the right diagnosis. There were two erroneously malignant diagnoses (4.8 percent).

Core needle biopsy diagnosis was compared to cytology in this study. Thirty instances of CNB were collected for testing. For 17 of the patients, autopsies revealed resected tissue. Ninety-seven per cent of the time, a single core needle biopsy was acceptable; only three per cent of the time, it was inadequate, and the diagnostic accuracy was 76 per cent. "According to our findings, FNAC is the most effective method for detecting bone cancers. It is a simple outpatient procedure. It gives sufficient cytological materials for the correct diagnosis of cases.FNAC can be effectively used in the screening of various bone lesions and their management.Low cost and lack of complications have made FNA cytology the most preferred and initial test in the evaluation of a mass lesion, compared to CNB.Tumor dissemination is minimal. Ancillary methods can be" applied

In contrast to diagnostic issues, poor sampling was the primary cause of failure in our research. The aspirate can be repeated to fix the error.

Open biopsy is the gold standard for the diagnosis of malignant bone tumours, but because open biopsy necessitates hospitalization, traumatic procedures, and the spread of the tumour, FNAC is the best pre-operative diagnostic tool.

References

1. Christopher D.M. Flatcher. Diagnostic Histopathology of tumors second edition 1541 – 1606, 2005.
2. Steven G. Silverberg. Silver berg's principle and practice of surgical pathology and cytopathology 4th edition 2006 701 – 705.
3. Juan Rosai. Rosai and Ackerman's surgical pathology, Ninth edition 2137 – 2236, 2004.
4. Cotrankumar and Collins. Robbins pathologic basis of disease 7th edition 1273 – 1315, 2004.
5. Kilpatrick and Bommer. Principles of Musculo skeletal tumor diagnosis and management third edition 1986 - 1 – 6.
6. Virginia A white. Osteosarcoma and the Role of FNA – A study of 51 cases cancer 62 :1238 – 1246, 1988.
7. Luis Alonso Desantds. The value of percutaneous needle biopsy in the management of primary bone tumours. Cancer 43 : 735 – 744, 1979.
8. AndrisKreicbergs. Cytological Diagnosis of bone tumours J Bone Joint Surg (Br) 1996 ; 78 – B ; 258 – 263.
9. Gita Ashok Raj, Arti Bhatia. Fine needle aspiration cytology in the diagnosis of bone tumours. Indian Journal of cancer, Dec, 89 260 – 263
10. Donald Resnick. Diagnosis of bone and Joint disorder 4th edition 2002 425 – 437.
11. Henry L Jaffee. Tumours and Tumorous conditions of the bone and Joints 1st edition 9 – 17.
12. Svante R. Orell. Manual and atlas of FNAC 3rd edition 402 – 403 - 1999.
13. Stacey E. Mills Sternbergs. Diagnostic surgical pathology 4th edition 265 – 268.
14. William P. Thorpe. Prognostic significance of Alkaline phosphatase measurements in patients with osteogenic sarcoma receiving chemo therapy cancer 43 : 2178 – 2171, 1979.
15. James A. Welker D.O. The percutaneous needle biopsy is safe and recommended in the diagnosis of musculoskeletal masses –cancer 2000; 89: 3677–3686.
16. Michael a. Simon. Current concepts Review. Biopsy of muscular skeletal tumours. The journal of Bone and Joint surgery 64 – A, No. 8, 1982 1253 – 1257.
17. Zuher M. Naib. Exfoliative Cytopathology. Third edition 553 – 554, 1985.
18. Fritz schajowicz. Tumours and Tumour like lesions of bone 2nd edition
19. Vincent J. Vigoritus – orthopaedic pathology (1999) 315 – 385.
20. Grace T. Mckel. Diagnostic cytopathology 2nd edition 2004, 881 – 882.