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A STUDY TO ASSESS THE DIAGNOSTIC ACCURACY OF BONE FINE NEEDLE ASPIRATES

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Abstract

Bone tumours are a "very uncommon kind of tumour. Because many bone lesions are asymptomatic and thus not biopsied, it is impossible to determine the exact frequency of certain bone tumours. According to Jaffe (1958), it is critical to have a close working relationship between the surgical team, radiologists, and pathologists when diagnosing bone lesions. When it comes to their appearance, tumours of the skeletal system are very consistent. The age of the patient, the kind of bone involved, the precise location inside the bone (epiphysis, metaphysis (or) diaphysis, cortex, medulla, or periosteum), radiographic appearance, and microscopic appearance are the five fundamental factors to consider in this respect. Before attempting to analyze the fifth, the pathologist should be completely conversant with the first four. When it comes to bone tumours, the symptoms are most commonly non-specific. The majority of patients complain of pain, swelling, or a combination of the two. There are times when a patient will arrive with pathological fractures. None of these characteristics indicates a specific diagnosis. However, certain bone lesions are associated with particular symptomatology, and these are known as osseous lesions. An osteoid osteoma can cause excruciating pain, which can be alleviated with analgesics in some cases. In certain cases, a patient with Ewings sarcoma of the bone will come with fever and elevated ESR, which suggests the presence of osteomyelitis. This may result in incorrect treatment and a delay in the diagnosis of the patient. As a result, symptoms are only of limited relevance when it comes to making" a diagnosis.

Keywords: Bonetumours, Osteoma, ESR, Periosteum, Epiphysis, Pathological Fractures.

1. INTRODUCTION

Patients' ages and specific "locations of tumours are highly crucial factors in their treatment plans. The vast majority of extremely malignant sarcomas, such as Ewings sarcoma and osteosarcoma, occur in children and young adults, respectively. Adults can develop lower grade sarcomas, such as chondrosarcoma, which are less aggressive.The location and size of the lesion are extremely important factors to consider. Giant cell tumours are most commonly found at the epiphyseal end of the bones, where they grow rapidly.The presence of big cells in a lesion that occurs at a site such as the metaphysis (or) diaphysis should raise the suspicion of another process – such as hyperparathyroidism, osteosarcoma, or aneurysmal bone cyst – being present.

Approximately half of all osteosarcomas are found in the distal femoral (or) proximal tibial metaphysis, which is located around the knee. A chondrosarcoma is a cartilaginous tumour that affects the flat bone in the thigh.The look of the roentgenogram is quite

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important. The roentgenogram is the most accurate method of determining the location of the lesion. There are a number of radiographic characteristics that can help distinguish a benign from a malignant tumour. Benign tumours are usually well-circumscribed and may have a sclerotic ring around the edge. Malignant tumours are notoriously difficult to distinguish from benign tumours. The majority of spindle cell sarcomas are characterized by geographic regions of destruction. Geographic destruction refers to a big hole in the bone that is caused by a fracture. Tiny cell cancers, such as Ewings sarcoma, are characterized by a permeative destructive process, which is characterized by a moth eaten look in which there are many small holes in the bone with intervening residual bone, as in a moth eaten" appearance.

It is critical to "understand the nature of the periosteal response. Langerhan cell histiocytosis, for example, is a benign lesion that results in thick, regular periosteal new bone growth. It is common for malignant tumours such as Ewings sarcoma to grow in the periosteum, where they generate several layers of poorly structured new bone.Existing estimates, on the other hand, show that benign tumours are more common in men than in women. The data on bone sarcoma is more thorough, and it reveals that males and females are afflicted in a one-to-one ratio, with males being affected more frequently than females.Despite the fact that primary tumours can form in any area of the skeleton, the majority of them occur in the long tubular bones of the skeleton. Benign tumours are most commonly seen in the appendicular skeleton, with around 45 percent of all cases occurring in the femur and tibia, which generally form around the time of the knee. Bone sarcomas are more common in the pelvic and axial skeleton than benign"tumours, and they very rarely affect the tiny bones of the hands and feet, in compared to benign tumours.

2. LITERATURE REVIEW

When it comes to bone "tumours, osteosarcoma and fibrous cortical defect are the two most common types to see. After excluding the more frequent malignant neoplasms of the marrow (myeloma, lymphoma, and leukaemia), osteosarcoma is by far" the most common primary cancer of the bone, followed by chondrosarcoma and Ewings sarcoma.

Tumors of the bone that have spread

Skeletal "malignancies are the most prevalent type of cancer. Any malignancy has the potential to spread to the bone. The following are examples of transmission pathways:

1. Direct expansion of time.
2. Dissemination through lymphatic" (or vascular) channels, and
3. Seeding inside the spinal canal (Batson plexus of veins).

In adults, cancers of the "prostate, breast, kidney, and lung account for more than 75% of skeletal metastases.

Most soft tissue sarcomas do not metastasis to the skeletal system; however, one notable

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exception is embryonic RhabdoMyo Sarcoma (RMS), which occurs in youngsters and affects the soft tissue. It is believed that neuroblastoma is the cause of bone metastases in children. Wilmstumour, osteosarcoma, Ewings sarcoma, and RMS are all types of cancer. Metastases are found in the red bone marrow of all bones, with the exception" of the femur.

However, carcinomas "of the kidney and thyroid are infamous for generating isolated lesions, which is why they are often mistaken for metastases on the skeleton.

Despite the fact that metastases can occur in any bone, the majority of them occur in the axial skeleton (vertebral discs, pelvic floor muscles, ribs, skull, sternum, and humerus in descending order of frequency). Hand and foot metastatic disease is rare, and most often occurs in patients with cancer of the lung, kidney (or) colon, or other" organs.

Depending on the kind of "metastasis, the radiological presentation may be lytic only, blastic only, or a combination of lytic and blastic. In lytic lesions, the metastatic cells produce chemicals such as prostoglandins, interleukins (ILs), and parathyroid hormones – related proteins that induce osteoclastic bone resorption; however, the cancer cells themselves do not directly resorb bone in lytic lesions. This form of bone damage is caused by" lung cancer, kidney cancer, GIT cancer, and melanoma.

Stimulation of osteoblastic bone "production is the mechanism through which metastases, particularly prostate cancer, elicit a sclerotic response. The majority of metastases cause a mixed lytic and blastic response.

Predicting the location of the main neoplasm is made easier by knowing the bones implicated and the nature of the alterations detected on radiographs of the affected bones.

Most commonly, thyroid cancer spreads to the bones of the shoulder girdle, cranium, ribs, sternum, and flat bone of the pelvis, femur, and scapula, among other places. It is also possible to have exuberant new bone growth as a result of the pathological fracture associated with metastatic cancer. Any tumour that has spread to the bone has the potential to cause "hypercalcemia and an increase in blood acid phosphatase.

3. RESEARCH GAP

For the most majority of bone tumours, "however, the difference between benign bone tumours, malignant bone tumours, lymphomas, myelomas, and metastatic lesions is adequate for proper therapy to be carried out successfully.

It is extremely crucial to determine the proper histogenictumour type and grade when treating diseases such as osteosarcoma and Ewings sarcoma, which require preoperative chemotherapy, in order to optimise treatment outcomes.

According to our findings, the most difficult to diagnose primary malignant bone tumours are chondrosarcoma and periosteal osteosarcoma, which are both classified as primary malignant bone tumours.

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Akerman and Angervell (1986) found that the smears of 14 instances of Ewings sarcoma had a distinctive look and that FNAC could be utilised for primary diagnosis as well as for chromosomal analysis to identify the usual 11: 22 translocation of Ewings sarcoma. When it comes to cytodiagnostic challenges, osteosarcoma appears to be more difficult to diagnose than Ewings sarcoma but less difficult to diagnose than" chondrosarcoma8.

In our research of nine cases of cytologically "diagnosed osteosarcoma, we found that five cases were accurate (55 percent), three cases were wrong, and one case of telengiectactic variation of osteosarcoma had an unsatisfactory diagnosis. There have been three cases reported: one with GCT and secondary ABC alterations, one with chondrosarcoma, and one with adenocarcinoma deposits. In four examples of chondrosarcoma that have been cytologically identified, two cases are accurate (50 percent).

Walas and Kindflom (1990) investigated 20 high-grade osteosarcomas, all of which had cytological characteristics that suggested they were the result of primary bone cancer. On smears, however, it was difficult to distinguish between chondroblastic osteosarcoma and high grade osteosarcoma, as well as malignant fibrous histiocytoma.

23 malignant bone tumours, excluding secondary" metastatic deposits, were identified, with an overall 91 percent biopsy accuracy. There were also 25 benign bone tumours, with an overall biopsy accuracy of 80 percent, and metastatic bone "tumours, with an overall biopsy accuracy of 75 percent.

To increase the likelihood of obtaining definitive cytological material in the future, efforts should be concentrated on improving the biopsy method. This can be accomplished by improved instrument design that allows for multiple aspirations through cortical bone, as well as through the wider use of CT.

The employment of complementary procedures such as electron microscopy and immunohistochemistry can help to improve the accuracy of diagnostic tests.

Aspects of the study that are objective, such as DNA cytometry, proliferative rate evaluations, karyotyping, and molecular genetics, may also" be beneficial.

When these approaches are coupled with clinical expertise, it is expected that the necessity for open biopsy of bone tumours would be reduced.

4. RESEARCH OBJECTIVE & METHODOLOGY

In order to determine the diagnostic "accuracy of bone fine needle aspirates, a study was conducted. The accuracy of the analysis was compared according to the anatomical location, size of the lesion, type of lesion, and histology.

In order to evaluate the diagnostic accuracy of core needle biopsy, to assess the diagnostic accuracy of Fine Needle Aspiration against Core Needle Biopsy in the same patient. Evaluation of data from other authors in comparison to the results of" this paper.

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Tumors of "The Bone Reveal Cytological" Findings

FNA of bone lesions reveals the presence of normal structure.

1. Haematopoietic tissue is a kind of blood cell.
2. Osteoblasts - These cells are often seen in aspirates taken from a variety of bone pathologies.
3. Osteoclasts.
4. Chondrocytes.
5. Cartilage.

In smears "obtained from spinal aspiration, mesothelial cells can be observed. Neoplasms are cancerous tumours that develop in the body. - Bone tumours that are not malignant. Giant cell tumours (GCT) are a kind of cancer that affects the cells" of the immune system.

This image depicts a cellular smear "with large cells of the osteoclastic type and mononuclear spindle cells in the stroma of the bone. Giant cells are generally found near the perimeter of clusters of spindle cells, where they provide support. Chondroma: Chondroma is a kind of cancer that affects the bone.

It mostly consists of cartilaginous tissue fragments and cells in lacunar gaps between the shards of cartilage. The chordromyxloid ground compounds are often found in large quantities. Generally speaking, tumour cells are uniform and rounded, with" a well-defined cytoplasm, rounded nuclei, and one (or) two nucleoli, among other characteristics.

Chondroblastoma

The presence of fragments "of chondroid matrix and a double cell population serve as indicators of the diagnosis. They are mononuclear and spherical, with well-demarcated cytoplasm and rounded, lobulated (or) reniform nuclei, as well as a well-demarcated cytoplasmic rim. Another form of large cell is the multinucleated osteoclastic type, which has many nuclei. Chondromyxloid Fibroma is the fourth kind of fibroma. Chondroid fragments, spindle cells, and osteoclasts, all of which appear to be embedded in myxoid material, are visible on" smears of the bone.

Primary malignant tumours of the bone include the following:

1) Osteosarcoma

Both dissociated neoplastic cells and cell clusters can be found in smears of cancer. Osteoid material appears as clumps of amorphous, "slightly eosinophillic material in the background (or) between cells in clusters of cells under the microscope. There are two types of large cells that are often seen: benign osteoclastic giant cells and malignant giant cells with pleomorphic nucleus. It is possible to detect pleomorphic spindle and rounded cells, as well as tumour cells that resemble osteoblasts. On FNA, the distinctive gelatinous chondroid matrix of chondroblastic osteosarcoma may be seen. This is a hallmark of the disease.

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Chondrosarcoma (Chondrosarcoma):

Criteria for determining a diagnosis

When it comes to low-grade tumours, tissue fragments" prevail, but in high-grade sarcoma, single cells may predominate.

2) Vascuolated cytoplasm that is abundant in eonsinphillic cytoplasm.

Chondromyxoid material is the third kind of material.

Cancer cells have a well-defined "cytoplasm and spherical nuclei with one (or) two nucleoli; binucleate cells are present, and nuclear pleomorphism is present" to a modest extent in the tumour cells.

3) Chordoma

There is an extensive "backdrop of myxoid ground material and big, physaliphorous cells with abundant pale, vacuolated, buddly cytoplasm and well defined cell boundaries, which are the distinguishing features of this specimen. Clusters" of cells that are strongly pleomorphic and have rounded nuclei can be observed.

4) Ewing's sarcoma is a kind of cancer that develops in the bone.

Smears are extremely "cellular in nature and are made of both single cells and clusters of cells that are not tightly bound together. There is a distinct combination of two kinds of cells in this region. Among the characteristics are an abundance of pale cytoplasm with vacuoles (or) huge clear gaps, as well as spherical or oval nuclei with a thick" chromatin structure. The cytoplasmic vacuoles (or) clear gaps correspond to substantial glycogen stores within the cell.

5) Hodgkin's lymphoma (malignant lymphoma)

The cytologic criteria for diagnosis are as follows:

i. A population of tiny lymphoid cells that remains constant over time.

ii. Nuclei "that are mostly spherical and somewhat bigger than those of typical small lymphocytes.

iii. Nuclear chromatin that is characteristically" coarse granular.

6) Histiocytosis of the Langerhans cells: (Eosinophillic granuloma)

Histiocytes are distinguished by "their considerably bigger and whiter nuclei, as well as their uneven and folded shape. The chromatin is completely plain, and the nucleoli are very tiny. The cytoplasm is plentiful and pale, and its boundaries are pretty clearly defined. It is also frequently vacuolated.

Only blood is aspirated in this procedure. A few cells, such as strands of endothelial cells, hemosiderin-containing macrophages, osteoblasts, and" fibroblasts, may be found in the bloodstream.

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5. DATA ANALYSIS & FINDINGS

FNAC was performed "on 67 individuals with bone tumours out of a total of 110 patients who had bone tumours. In 47 instances, the cytological diagnosis was compared to the histological diagnosis obtained by needle biopsy and open biopsy, and the results were in agreement. Cytological examination in conjunction with radiological and clinical characteristics was used to make the diagnosis in 20 cases where there was no histological confirmation.

It was discovered that there was a little male predominance (1.3.1) The ages of the participants at the time of their initial presentation ranged from 2 to 70 years (median age 16 years). The vast majority of patients (36.4 percent) were in their second decade of life at the time of their initial diagnosis, which was in 2001.

A total of 110 instances were reviewed, with 5 cases being removed from the research due to insufficient documentation. Malignant tumours account for approximately 58.1 percent of the 105 instances, with benign tumours accounting for approximately 41.9 percent. Males are more likely than females to have both benign and malignant bone lesions, which are more prevalent in males than females.

The femur (50 instances) and the proximal tibia" (16 cases) were the most prevalent sites of presentation for bone tumours among the 110 cases studied, accounting for two-thirds of all cases. The humerus, radius, pelvis, ileum, and vertebrae were among the other locations visited. Twenty instances out of 67 FNA cases did not receive histological confirmation, and the diagnosis was made solely on the basis of cytological "examination in conjunction with radiological and clinical characteristics. In 91 percent of the instances, adequate material for examination could be collected. Hemarrhagic material, necrotic material, and a scarcity of material were all cited as reasons for insufficient material for diagnosis (2 cases in periosteal osteosarcoma).

It was discovered that GCT produced a significant amount of material. When it comes to this sort of tumour, aspiration cytology is quite successful. However, clinico-radiological data must be taken into account in order to distinguish this variation from other large cell variants. Round cell tumours, which are similar in appearance, also produced a large amount of material, making FNA the optimal diagnostic technique in this tumour type.

In the case of lytic bone lesions, the FNA method appears to be the most appropriate approach to use. One drawback of the method is the difficulty" of sampling a lesion that is completely covered by dense bone tissue.

6. CONCLUSION

In a study of 110 patients, "we evaluated the diagnostic accuracy of the FNAC and the CNB techniques. Patients with probable local recurrence of a primary bone tumour as well as metastasic lesions from a previously identified malignancy were included in the research.

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The age range of 11-20 years was found to have the greatest number of incidences (36.4 percent). Males accounted for 62.8 percent of the study's 110 cases, while females accounted for 37.2 percent of the cases. In the current investigation, benign lesions were found in 44 instances (41.9 percent) while malignant lesions were found in 61 cases (57.9 percent). The femur (50 instances) and tibia (50 cases) were the most frequently affected bones in our research (16 cases). GCT is the most frequent benign lesion, whereas osteosarcoma is the most common malignant lesion, according to the American Cancer Society.

It was decided to compare the results of the" cytological diagnosis with the final diagnosis, which was determined by histological investigation, clinical, and radiological findings.

A total of 67 instances out of 110 patients "provided material that was deemed conclusive for cytological diagnosis and confirmation. Only 47 instances had biopsy specimens available for comparison, indicating a lack of availability. A proper diagnosis was made in 32 cases (76.2 percent) out of the 42 cases that had sufficient cytological evidence. Falsely malignant diagnoses were made in two cases (4.8 percent).

We compared the diagnostic of core needle biopsy to that of cytology in this study. The CNB was collected from a total of 30 instances. For 17 of the cases, resected specimens were obtained. One core needle biopsy method was sufficient in 29 cases (96.7 percent) and deficient in just one case (3 percent) out of 30 cases, with diagnostic accuracy" of 76.5 percent in the single core biopsy process.

According to our findings, FNAC is "the most effective method for the diagnosis of bone cancers.

- It is a straightforward outpatient treatment.
- It provides sufficient cytological material for accurate diagnosis of patients.
- FNAC may be utilised successfully in the screening and therapy of different bone diseases, including osteoporosis.
- When compared to CNB, FNA cytology is the most favoured and initial test in the examination of a mass lesion because of the low cost and absence of problems it involves.
- Tumor propagation is kept to a bare minimum.
- Ancillary techniques can be used.

In our investigation, insufficient sample was shown to be the most common reason for failure, rather than diagnostic problems. This may be remedied simply repeating the aspirational phrase.

In spite of the fact that open biopsy is 100 percent accurate in the identification of malignant bone tumours, FNAC is the best technique of pre-operative" evaluation to arrive at a definitive diagnosis since open biopsy necessitates hospitalization, traumatic procedures, and the spread of the tumour.

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