

## Aspiration Cytology of Musculo-Skeletal Lesions

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### Abstract

**Back Ground:** Fine Needle Aspiration Cytology more commonly known as FNAC is a simple procedure to diagnose easily palpable masses in the body. Its efficiency is almost as accurate as that of histo-pathological diagnosis. This technique is extended to the bony and other skeletal swellings as a preliminary diagnostic tool before confirming by biopsy. Fine Needle Aspiration Cytology (FNAC) can be done, in most cases, as an OPD procedure and the slide is ready for reporting within 1-2 hours. The procedure can be mastered very easily and the equipment required is readily available even in the peripheral hospitals.

**Materials & Methods:** 48 patients with musculoskeletal swellings were chosen who attended the Orthopedic Department of Osmania Medical College, Hyderabad during October 2014- September 2015. After taking appropriate consent FNAC was done and the slides were processed and histological diagnosis was obtained.

**Results:** The period of study was one year, from October 2014 to September 2015.

50 patients with musculoskeletal swellings were chosen who attended the Orthopedic Department of Osmania Medical College, Hyderabad. In only 2 patients the specimen did not yield any cells probably due to faulty technique. In rest of the 48 patients diagnosis could be done accurately and confirmed by histo-pathological examination.

**Conclusion:** FNAC is an effective, simple and quick diagnostic tool for preliminary diagnosis of musculo-skeletal tumors before stating treatment. In some clear-cut cases it may be used by itself without resorting to histo-pathological confirmation.

**Keywords :** FNAC, Musculo-skeletal tumors, Cytological diagnosis.

### I. Introduction

Tumors of the Musculo-Skeletal System prove to be a challenge to the diagnostic as well as therapeutic skills of the treating surgeon. The average time between attendance to an Orthopaedic outpatient department and preoperative preparation for a conventional open biopsy is usually 3-4 weeks. Further processing and diagnosis of the specimen take up another 1-2 weeks time. The prevalent over-crowding in the teaching hospitals and incompletely equipped peripheral centers further compound the problem. Since some of the tumors require immediate attention our study was done with the idea of evaluating a method which can diagnose the condition with reasonable accuracy so as to prevent the wasting of precious time. Hence the aim of this study was to evaluate FNAC, a simple procedure which appears to be tailor made for the purpose. Routinely it is used for diagnosis of Thyroid, Breast and Prostate masses. It is also an effective method for bone neoplasms<sup>1</sup>.

Most importantly the procedure is economical, easy to perform, needs simple and readily available equipment and minimal expertise. Also it can be used as a preliminary diagnostic aid to complement histo-pathological findings. One of the advantages of the needle aspiration is its ability to reach deep seated areas with minimal tissue trauma. However it should be avoided in cases where the final result of biopsy will not change the treatment modality and patients with bleeding disorders.

### II. Material And Methods

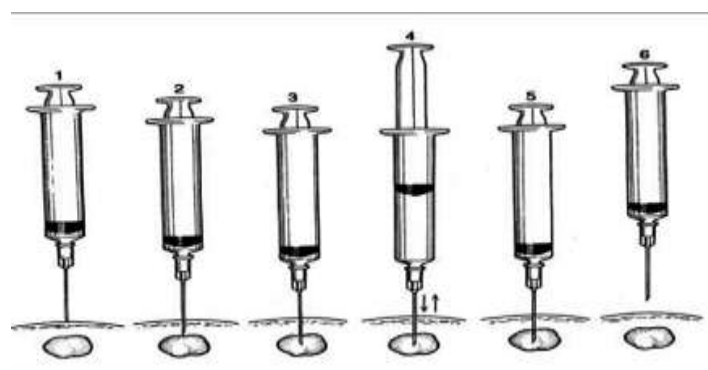
The period of study was one year, from October 2014 to September 2015. 50 patients with musculoskeletal swellings were chosen who attended the Orthopedic Department of Osmania Medical College, Hyderabad. After taking appropriate consent FNAC was done and the slides were processed and histological diagnosis was obtained. In two patients the sample did not yield any cells probably due to faulty technique and hence smear could not be interpreted. In this series, evaluation of the accuracy of the procedure was done, by subjecting all the lesions aspirated, to histo-pathological study in order to correlate with the cyto-diagnosis. Equipment included needles, syringes, slides and syringe holders. Standard disposable needles of 23-22 G (0.6-0.7 mm) bore and 30-50 mm length were used mostly. Longer needles were used for deep seated lesions. Larger bore needles were avoided as they tend to produce more hemorrhage and become blocked by a

plug of tissue. 10 cc glass syringes with a Leur-Mount were used as they produced good negative pressure<sup>2</sup>. Thoroughly cleaned and grease free standard glass slides of 75 mm x 25mmx1.3mm dimensions were used for preparing smears. Syringe holders were specifically used as they allow the negative pressure to be maintained while simultaneously moving the syringe up and down. Also the syringe can be operated single handedly while the lesion is stabilized with the other hand and for better placement of the needle in the exactly desired site.



#### **Fnac procedure:**

The skin was prepared with disinfectants like savlon and spirit for most of the superficial and palpable deep lesions. For trans-pleural and vertebral aspirations surgical draping of the local area was preferred.



2%. Lignocaine infiltration of the skin for inducing local anaesthesia was done. Only in-patients were subjected to sedation before the procedure. One case of trans-pleural aspiration had to be given atropine to prevent vaso-vagal reflex. The mass was located with the finger and palpated for any soft zones. Radiographs were examined to see that no thick bone was present immediately beneath the site chosen. Then the needle was pushed in to the mass till the tip was within it. Prior wetting of the lumen with a solution of normal saline containing 10 units of Heparin per ml. was used to prevent cell loss by adherence to the lumen wall. (Duguid et al)<sup>3</sup>. The plunger was then withdrawn to create negative pressure and the needle was rotated, pushed in and out about 5 times whilst the negative pressure sucked the cells into the lumen. If the specially designed Pistol-grip holders are not available the negative pressure in the syringes can be maintained by Brace-Thumb technique where the pull on the plunger is released and the needle is drawn out. Although invisible, cells would have collected in the needle. If the pressure is not released the cells shoot upwards in to the barrel and are lost. Then the needle was detached from the syringe, filled with air and reconnected. The tip of the needle was held over a slide and the cells gently expressed.

Common causes of a poor yield like the following were avoided by doing the procedure with utmost care and concentration.

- i) Needle has missed the lesion tangentially
- ii) Lesion with a central cystic; necrotic or haemorrhagic area devoid of diagnostic cells
- iii) Small malignant lesion adjacent to a dominant benign mass
- iv) Fibro sclerotic target tissue poor in cells.
- v) The predictability of a positive yield increases with experience as the procedure is a blind one.

### **Preparation of a smear:**

After ensuring that a perfectly dry aspirate (consisting of numerous cells suspended in a small amount of tissue fluid with a creamy consistency) was obtained, it was smeared with flat of a 0.4mm cover slip, exerting light pressure to achieve a reasonably thin even spread. In a few cases wet aspirates consisting of smaller number of cells suspended in fluid or blood was obtained. They were smeared by moving the cover slip to the middle of the slide while holding it in a blunt angle which leaves most of the fluid behind while cells follow cover slip. Good cell preservation was ensured by rapid drying. If the aspirate contained a large quantity of blood it was expressed on to and quickly spread over a watch-glass before coagulation occurred so that minimal tissue particles if present became visible and could be picked up for direct smearing or be placed with a drop of blood to form a clot suitable for histological processing.

**Fixation Of Smear :** Out of the two types of fixation (wet and dry), we chose the former as it ensured maximum resemblance between aspirated cells and those in tissue sections. The smears were immediately dipped in a coping jar containing 95% Methyl alcohol or 50% Isopropyl alcohol in ethanol for 10-30 minutes. The vascular elements in a haemorrhagic aspirate were destroyed by using CARNOYS liquid for fixation, (containing Absolute alcohol, Chloroform, Glacial acetic acid.). This was followed by air drying of the smear and staining with Haemotoxylene & Eosine. Papaniculou stains, and stains like Reticulin, Pass & Sudan II were used when necessary.

### **How to send a cytology request:**

A positive out-come from a cytological procedure depends on the amalgamation of facts at the disposal of the Clinician, Radiologist and Cyto-pathologist. In many centers this number is brought down to two people as the cytology procedures are performed by Radiologist and sent a Pathologist. Ideally best results can be obtained where the Cytopathologist is the person performing the aspiration, interpreting the X-ray, and reporting the slide. Hence during the study we tried to provide as much information as possible to the Cytologist. A standardized proforma was created and sent to the Cytopathologist.

## **III. Results**

The total number of cases studied was forty eight, out of the total of 50 pts chosen, in 2 patients we could not obtain material for cytological examination. Hence in this study only 48 cases were analysed. Of these 25 cases (55%) were male and 23 (45%) females. ( table 1 & graph 1 ) The youngest patient who underwent aspiration was 2 years old and the oldest 70 years. The largest group of patients were found between 11 – 30 years (Young adults) accounting for 60% of the aspirations. ( table 2 & graph 2 ) Since thin, disposable needles (23G) were employed no difficulty was encountered in obtaining samples from young children. The following is the site distribution of various lesions; there were 8 lesions from the axial skeleton ( table 3 & graph 3 ). In the appendicular skeleton 11 lesions from the upper limb and 30 from the lower limb ( table 4 ) Depending upon the pathology the lesions were first divided into benign and malignant growths. The malignant lesions were further subdivided into primary and secondary tumors. Among the secondary (6 cases ) squamous cell carcinoma and adenocarcinoma were diagnosed in equal number (3 each). Histopathological confirmation was done in 5 cases.

One of the advantages of the needle aspiration is its ability to reach deep seated areas with minimal tissue trauma. In this series aspiration were done from the pubis, sacrum and from a lumbar vertebra, the last under fluoroscopic control. In a case of multiple myeloma repeat aspirations, to assess the response to chemotherapy, could be performed easily with a 23 Gauge needle.

## **IV. Discussion**

The study of Vertebral biopsies was first published by BALL & ROBERTSON<sup>4</sup> in 1932, but the technique became established only in 1941(VALLS et al)<sup>5</sup>. As recently as 1979 FNAC has been termed a SCANDINAVIAN CURIOSITY (Cecil H. Fox) because of unfamiliarity with this procedure in the English speaking world.<sup>6</sup> The use of needle aspiration biopsy in the diagnosis of skeletal lesions was first introduced in 1945( CILEY and HAJDU)<sup>7</sup> and the accuracy was stated to be 72% and 81% in primary lesions respectively. Positive diagnosis based on thin-walled needle aspiration biopsy was 67% according to STORMBY. The cytological smears are very useful in studying finer details of tumours of the haemopoetic system<sup>8</sup>

Primary bone tumours represent only 2.2% of all clinical neoplasm and bone sarcomas comprise 0.68% of all malignant tumours. Despite their rarity they are frequently a clinical dilemma. Although their radiographic findings are well known there is sufficient overlap in the radiographic presentation to be frequently non-diagnostic. Confirmation by other methods is mandatory prior to treatment. Recent development in the chemotherapeutic and surgical approach of bone neoplasms require more specific information before final therapy is started. Cytological studies compared with histopathological examination several primary bone

lesions show that specific cyto- diagnosis can be obtained in 66% of cases and differentiation between benign and malignant growth can be made out **LAYFELD et al**<sup>9,10</sup>.

Secondary bone lesions could also be diagnosed with reasonable certainty. Small round cell tumours of bone comprise a histologic group of lesions including Ewings, Myeloma, Lymphoma and secondaries from Neuroblastoma, Rhabdomyosarcoma and Retinoblastoma. These are characterized radiographically by the presence of destructive preemptive radiographic pattern with a frequently associated soft tissue component adjacent to the bone lesion. The need of tissue diagnosis is mandatory since the treatment varies significantly with different cell origin. Our diagnostic accuracy in differentiating benign from malignant growths 96% while specific diagnosis was possible in 92% of cases. Failure due to faulty technique and inability to interpret the smear accounted for 4%. Our findings correspond with the results of the several studies done in this field.

**The advantages of needle biopsy over open biopsy in these tumors are:**

- 1) Adequate specimen obviates need for surgery.
- 2) Absence of surgical scar and early institution of radiotherapy since no healing time is needed.
- 3) Less distortion of host bone and smaller biopsy specimen reducing possibility of post radiotherapy bone weakening and fracture.
- 4) Rapid differentiation of primary from secondary lesions.

Lytic lesions of pelvis are difficult to approach surgically. Differential diagnosis for isolated lytic lesions in pelvis include Giant Cell Tumour (GCT), Myeloma, Anerysmal Bone Cyst (ABC), Fibrosarcoma and Secondaries from kidney and thyroid.

Needle biopsy is useful in these lesions since the tumour can be reached without the need for a complex operation and can easily be repeated if more material is needed.

Needle aspiration and core biopsy of bone can easily be accomplished with the help of fluoroscopic control in the X-ray department. The technic requires only moderate amount of experience and is done as an OPD procedure in majority of cases.

Needle biopsies however should not be performed indiscriminately.

**The indications for needle biopsy in the patient with bone neoplasm are:**

- 1) Differentiation of primary from metastatic lesion
- 2) Evaluation of small round cell tumours as the first approach to diagnosis
- 3) Suspected infection with aggressive radiographic features simulating malignancy.
- 4) Radiographically typical lesion in an unusual age presentation
- 5) When open biopsy is not possible or indicated for medical reasons.
- 6) As an alternative to open biopsy in deep areas that require long and complicated surgical approach.
- 7) When the integrity of overlapping tissues is required for final surgical therapy.

Generally no complaint is encountered with the exception of local discomfort and moderate pain when marrow tissue is aspirated. The chances of tumour spread through the needle tract are minimal.

**V. Conclusion**

- 1) Multiple punctures and multiple strokes give high percentage of cell yield.
- 2) Cornoys liquid is the optimal fixative, and spray fixation is a good and convenient method.
- 3) Osteosarcoma and Ewings were the most accurately diagnosed tumours
- 4) Secondary lesions showed a specific diagnostic rate of 80%
- 5) Benign lesions were commonly responsible for scanty yield because of their higher tissue cohesion.
- 6) Fibromatous lesions were found to be most difficult to diagnose in our series.

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**Tables:**

**Table: 1** Gender Distribution in the Study:

MALE	%	FEMALE	%
25	55	23	45

**Table: 2** Age Distribution in the Study:

Age Distribution	Number of patients	Percentage
1to10yrs	3	6.25
11to20yrs	14	29.5
21to30yrs	12	25
31to40yrs	6	12.5
41to50yrs	5	10.4
51to60yrs	5	10.4
61to70yrs	3	6.25

**Table: 3** Distribution of tumor along axial skeleton – 8

Clavicle	2
Scapula	2
Vertebra	1
Pubis	1
Iliac creast	1
Sacrum	1

**Table: 4** Distribution of tumors along appendicular skeleton – 40

Upper Limb	11
Humerus	5
Radius	4
Elbow	1
Finger	1

Lower Limbs	29
Femur	16
Knee	3
Tibia	5
Fibula	1
Ankle	1
Foot	1
Tendon sheath	1
Calcaneum	1

**Table: 5** Distribution of tumor types among patients

Total No. of Cases ----- 48			
Benign	%	Malignant	%
16	34%	32	66%

Total No. Malignant lesions -----32			
Primary	%	Secondary	%
26	54	6	12

**Table:6** Distribution of tumor types among total number of cases

Total No. of CASES : 48	
Type of Malignant Lesions	No of Cases
Osteosarcoma	8
Secondaries	6
Ewings	5
Osteoclastoma	4
Synovial Sarcoma	2
Malignant fibrous Histiocytoma	2
Multiple Myeloma	1

Reticulum cell sarcoma	1
Chondro sarcoma	1
Fibrosarcoma	1
Lipo sarcoma	1
Malignant mesenchymoma	1

Type of Benign Lesions	No of Cases
Infection	6
Neurofibroma	4
Osteochondroma	2
Hemangio-pericytoma	1
Chondroblastoma	1
Anerysmal Bone Cyst	1

CHART:I

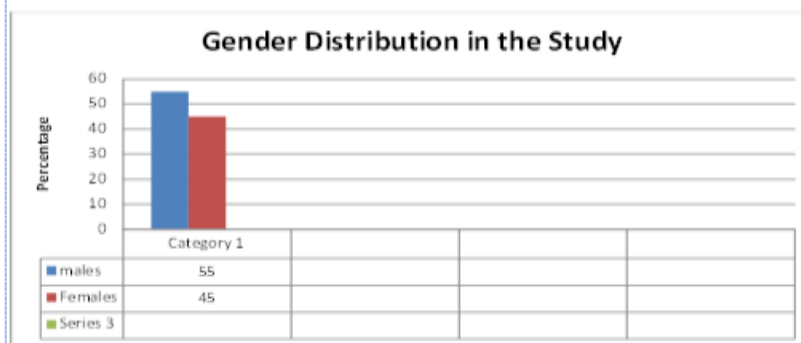


CHART:II

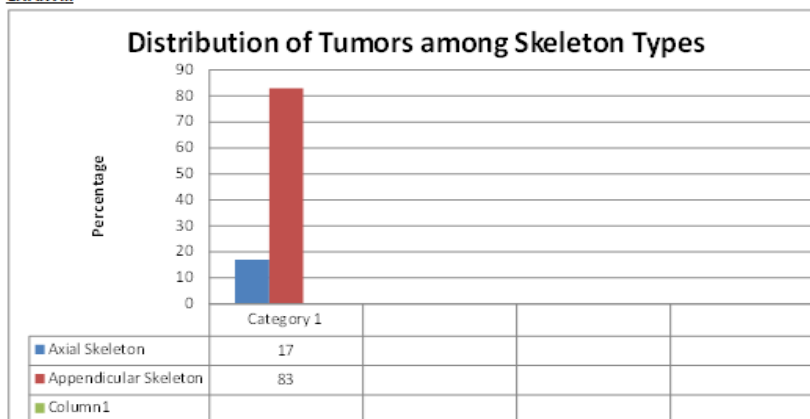


Chart III:

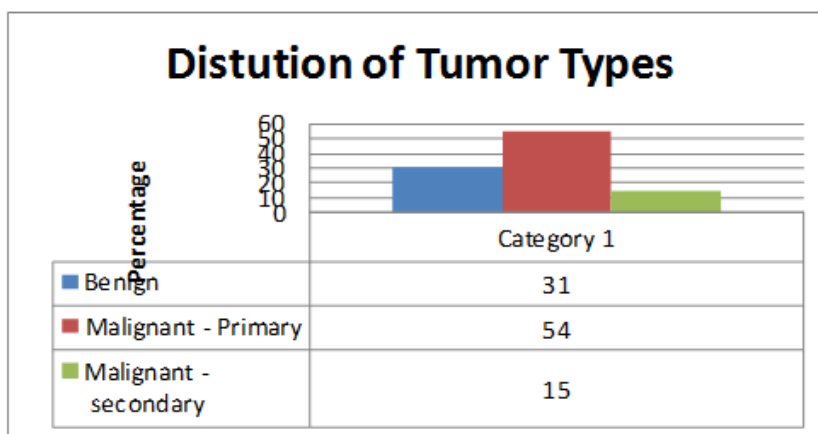


Chart: IV

