Fine Needle Aspiration Cytology- A Rapid Diagnostic Test for Articular and Periarticular Lesions

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ABSTRACT

BACKGROUND

The diagnosis of articular pathology has been dependent on imaging techniques. But many lesions may require early aspiration cytology for a definitive diagnosis. These include lesions of the joint, joint space and periarticular soft tissues that have a propensity to produce mass lesions. Fine needle aspiration cytology can provide a rapid and reliable diagnosis, often at considerably less cost. We wanted to study cytomorphology of articular and periarticular lesions by fine needle aspiration cytology (FNAC).

METHODS

The present study is a retrospective study done over a period of 1 year from July 2018 to July 2019 in Cytology section of Upgraded Department of Pathology, Osmania General Hospital, a tertiary care hospital. A total of 89 cases were evaluated during this period from different articular and periarticular sites.

RESULTS

In the present study out of 89 cases, there were 50 (56.1%) cases of ganglion cysts, 10 (11.2%) cases of bursal cysts, 9 (10.1%) cases of synovial cysts, 8 (8.9%) cases of giant cell tumors of tendon sheath, 6 (6.7%) cases of spindle cell lesions, 5 (5.6%) cases of acute suppurative lesions and 1 (1.1%) case of gouty arthropathy. The male to female ratio (M: F) was 1.2:1 and were predominantly found in third decade of life (21-30 years). Most of the lesions occurred around wrist joint followed by around knee joint and interphalangeal joints of fingers.

CONCLUSIONS

FNAC, being a low-cost outpatient procedure, is of great diagnostic utility in articular and periarticular lesions. It is minimally invasive and helpful in rapid diagnosis.

KEYWORDS

Articular, FNAC, Ganglion Cyst, Giant Cell Tumour of Tendon Sheath, Periarticular

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BACKGROUND

A number of inflammatory conditions, benign and malignant mass-producing lesions affect the joint and periarticular structures. Cysts and cyst-like lesions are common finding in articular and periarticular spaces. Most of these lesions can be diagnosed successfully with fine needle aspiration cytology (FNAC) which helps in proper management. FNAC represents an excellent alternative to exfoliative cytology or histological methods for diagnosis of joint pathology.[1] Radiographic and clinical data must be incorporated when interpreting FNAC materials from such articular and peri-articular lesions.

The diagnostic utility of FNAC in early diagnosis and treatment with minimal invasive means for cystic lesions around joints is implicated. There are various cystic lesions around joints such as ganglion cysts (GC), synovial cysts (SC), bursal cysts, inflammatory lesions, hematoma around joints and cystic tumours. The common presenting symptoms are pain, swelling, weakness, joint movement restrictions and compression of surrounding structures like blood vessels and nerves. Ganglion cysts are degenerative lesions, most often of the fibrous joint tissue or synovium. They occur commonly in the wrist, foot or knee and present as firm, circumscribed masses of soft tissue. FNAC of ganglia serves as a preoperative diagnostic and in some instances, a therapeutic procedure. They may affect any age group; more common in the twenties to forties.[2-7] The aspirated material is thick, colourless jelly like. Microscopically, smears from the aspirated material show a small number of single histiocyte-like cells with abundant cytoplasm and small oval nuclei over a background of abundant myxoid material which shows a peculiar drying artefact.[8] Bursae are cystic lesions containing synovial fluid that reduces friction between moving structures such as tendons, ligaments, bone and skin.[9] Bursae are often not visible on imaging unless irritated or inflamed due to trauma, infection, or arthritis. They do not connect to the joint space, which distinguishes them from synovial cysts and normal joint recesses.[10,11]

Synovial cysts are juxta-articular fluid- filled collections that are lined by synovial cells. They are a focal extension of joint fluid due to herniation of synovial tissue into the surrounding soft tissue that can communicate withjoint cavity. Synovial cysts around knee joint are of two types on the basis of location: popliteal (Baker's cyst) and proximal tibiofibular cysts.[12,13] Giant cell tumor of tendon sheath is seen as small firm nodules commonly around fingers and wrist. It is still uncertain whether it represents a true neoplasm or a reactive proliferation in response to trauma. Classical location and radiological demonstration of the lack of bone involvement helps in diagnosis. Aspirates show multinucleated giant cells of osteoclastic cell type and two kinds of stromal cells: spindle-shaped cells and polygonal cells with pale cytoplasm.[14,15] Gouty arthropathy is a disorder of uric acid metabolism with deposition of monosodium urate crystals in joint spaces and elicits an acute inflammatory reaction. Gouty tophi will form in the soft tissues in and around joint spaces with either untreated hyperuricemia or longstanding gout with multiple episodic bouts of arthritis. Aspirate shows small flecks of whitish material visible macroscopically. On microscopic examination, aggregates of the crystalline material, occasional histiocytes and multinucleated giant cells are seen. Background reveals slender, rod-shaped crystals or aggregates.[1,16,17]

Other articular or periarticular lesions include benign lesions like meniscal cysts, bursitis, hematoma, abscess, spindle cell lesions like fibromatosis, schwannoma and malignant lesions like synovial sarcoma.

Objective

To study cytomorphology of articular and periarticular lesions by fine needle aspiration cytology (FNAC).

METHODS

The present study is a one-year retrospective study done from July 2018 to July 2019 in Cytology section of Upgraded Department of Pathology, Osmania General Hospital, a tertiary care center in Hyderabad. After taking proper consent and clinical details of patients, FNAC was performed from the lesional sites mentioned on requisition forms and OPD slips. Skin overlying the lesions was cleaned by betadine, alcohol swab and aspiration was done using a 22-23 gauge needle attached to a 10 ml syringe. The aspirated material was collected on to a clean glass slides. The smears were wet fixed and stained with Haematoxylin and Eosin stain. Radiographic data was incorporated wherever necessary. Smears were evaluated by two cytopathologist.

Inclusion Criteria

All the cystic lesions around various synovial joints of upper and lower extremities in males and females of all age groups were included in the study.

Exclusion Criteria

Bony lesions and clinically and radiologically malignant lesions were not included in the study.

RESULTS

In the present study, total 89 patients with articular and periarticular cystic swellings were examined of which 49 (55%) patients were males and 40 (45%) were females with slight male predominance. Age group ranged between 9 years to 68 years. Majority of cases occurred in third decade of life contributing to 29 cases (32.5%).Most of the lesions occurred around wrist joint (48%) followed by knee joint and interphalangeal joints of fingers.

Age Range (Years)	Males	Females
0-10	03	04
11-20	09	07
21-30	15	14
31-40	08	07
41-50	07	06
51-60	06	02
61-70	01	-
Total	49	40

Table 1. Age and Gender-Wise Distribution of Cases

Around Joint	No. of Cases	%
Wrist	43	48.3
Knee	14	15.7
Inter phalangeal	14	15.7
Ankle	12	13.4
Elbow	04	4.4
Toe Web space	02	2.2

Table 2. Site Distribution of Cases

Cytologic Diagnosis	No. of Cases	%
Ganglion Cyst	50	56.1
Bursal Cyst	10	11.2
Synovial Cyst	09	10.1
Giant Cell Tumour Of Tendon sheath	08	8.9
Benign Spindle Cell Lesion	06	6.7
Acute Suppurative Lesion	05	5.6
Gouty Arthropathy	01	1.1

Table 3. Cytologic Diagnosis of Cases

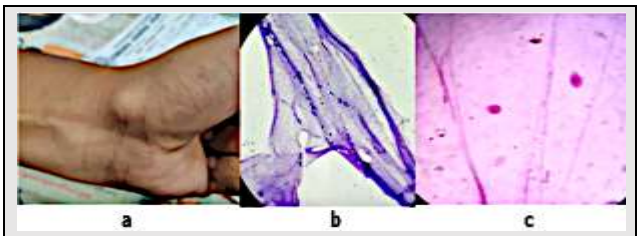

Figure 1. a) Wrist Joint-Ganglion Cyst, b) 10x H&E-Wrinkled Paper Artefact c) 40x H&E Histiocyte Like Cells

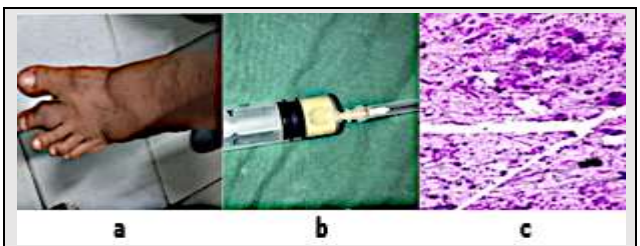

Figure 2. a) Gouty Arthropathy, b) Thick Chalky White Aspirate, c) H&E 40x Needle Shaped Crystals in Gout

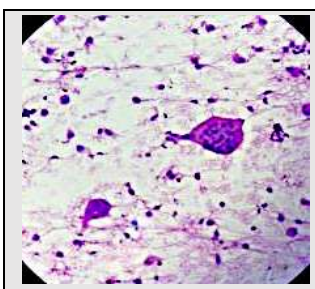

Figure 3. H&E 40X-Scattered Osteoclast Like Giant Cells in Giant Cell Tumour of Tendon Sheath

DISCUSSION

Articular and periarticular swellings occur due to joint and tendon related pathology with overlapping signs and symptoms. These lesions have non-specific laboratory findings and pose diagnostic challenge for both clinicians and pathologists. FNAC helps in categorizing the lesions as inflammatory, degenerative, benign or malignant and offers an early diagnosis. As FNAC is becoming a popular clinical practice, it is important for the pathologist to be aware of the microscopic findings and differential diagnosis of various periarticular nodular swellings.[18]

Present study was conducted in a tertiary care hospital over duration of one year and it included 89 cases of periarticular swellings around synovial joints of upper and lower limbs with the aim of categorizing the lesions based on their cytomorphology. The FNAC smears were evaluated by two cytologists. With slight male predominance (55%), majority of the swellings were located around wrist joint (48%), followed by knee (15%), interphalangeal joints of fingers (15%). (Figures 1 and 2). Majority of cases occurred in third decade of life contributing to 29 cases (32.5%). Similar observations were made by Meena S et al,[7] Vijay PM et al[8] and Sneha S et al.[19] Based on clinical examination, material aspirated from the swelling and cytomorphology, a possible cytologic diagnosis was given.

Ganglion Cysts

Degenerative lesions, most often of the fibrous joint tissue or synovium are the most common lesion diagnosed in the present study accounting for 50 cases (56.1%). Most common site is the dorsum of wrist and present as firm, circumscribed masses of soft tissue. Aspirate showed thick, colourless, gelatinous fluid that is so viscous and often difficult to expel from the needle. Microscopically, smears show scattered and tiny clusters of histiocyte-like cells with abundant cytoplasm and small oval nuclei over a background of abundant myxoid material which showed a peculiar drying artefact (Figure 3). Similar observations were made by Dodd et al[2] and Sneha S et al.[19] At times it is difficult to distinguish bursae from ganglion cyst which lacks a true connection to the joint but at times can communicate to joint space. FNAC can complement the diagnosis due to some differences in cytology.[19] Treatment of ganglion cysts is complete surgical excision.

Bursal cysts accounted to 10 cases (11.2%) and located around knee joint in the present study. Aspirate was gelatinous with hypocellular smears on cytology with scattered histiocyte like cells on a mucoid background. The prepatellar bursa is located anterior to the patella and deep to the subcutaneous soft tissues. Inflammation of the prepatellar bursa or housemaid's knee due to direct trauma or repetitive injury causes anterior knee pain and a palpable mass. Infrapatellar bursitis or clergyman's knee can occur in the superficial or deep bursae, caused by repetitive knee flexion from deep knee bends or jumping.[20]

Synovial cyst is a juxta-articular fluid-filled collection, lined by synovial cells with focal extension of joint fluid that may or may not communicate with the joint and fluid collection may extend in any anatomic direction.[12] Synovial cysts around knee joint are of two types based on location as popliteal (Baker's cyst) and proximal tibiofibular cysts. Aspirate can be thin or thick, straw coloured or transparent depending on the underlying intraarticular disease. Synovial cysts accounted to 9 cases (10.1%) in the present study. Cytologically, the smears are hypocellular with abundant

mucoid material with single histiocyte-like cells and distorted red blood cells. Similar findings were observed in study by Punia RS et al,[21] Meena S et al[7] and Dodd et al.[2] Synovial cysts are mostly associated with joint diseases which need to be treated first otherwise cyst can reoccur.

Giant cell tumour of tendon sheath present as small firm nodules commonly around fingers and wrist. These lesions accounted to 8 cases (8.9%). Classical location and radiological demonstration of the lack of bone involvement is useful in diagnosis. Aspirates show multinucleated giant cells of osteoclastic cell type and two kinds of stromal cells: spindle-shaped cells and polygonal cells with pale cytoplasm.[14,15] (Figure 4)

Benign spindle cell lesions in the present study included 6(6.7%)cases. Cytosmears showed variable cellularity showing spindle cells with pale cytoplasm and bland looking chromatin. Aspirates did not show the typical findings for subtyping. The main criteria of cellularity, nuclear pleomorphism, mitosis and necrosis are assessed. Acute suppurative lesions accounted to 5(5.6%) cases. Cytosmears showed plenty of acute inflammatory cells against a necrotic background. All cases occurred around interphalangeal joints.

A single case (1.1%) of crystal induced arthropathy was diagnosed on FNAC. Aspirate was thick whitish material (Figure 5). Cytosmears from elbow and toe swelling showed the presence of needle shaped crystals and giant cells in inflammatory background, which raised the suspicion of gouty tophus (Figure 6). Uric acid levels were also found raised after suspicion of gout on FNAC. So, the diagnosis of Gout was offered. The crystal demonstration in FNAC smears is superior to histopathology sections where crystals are more commonly lost during processing.[22]

CONCLUSIONS

FNAC being a minimally invasive, low cost and rapid diagnostic OPD procedure, offers a great diagnostic utility in articular and periarticular cystic lesions. Since differential diagnosis of swellings in periarticular location include spectrum of lesions such as degenerative, inflammatory and neoplastic, awareness about the cytomorphology of these lesions is essential in proper categorization and diagnosis.

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