Cytomorphological Evaluation of Synovial Lesions in a Tertiary Care Centre in North India: A Retrospective Study

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Abstract

Background: Numerous pathological processes involve synovium and periarticular tissues that are characteristic and in some cases specific to a particular disease. Synovial fluid is a thick, stringy fluid found in the cavity of synovial joint. Examination of the synovium plays a key role in the diagnosis of many joint diseases. Aims: The aim of this study was to study the spectrum of synovial lesions on fine needle aspiration cytology (FNAC) and to compare the cytological diagnosis with histopathological findings. Material and Methods: This retrospective diagnostic analytical study was carried out in the Department of Pathology. Sixty-six patients with suspected synovial lesions referred from other departments who underwent FNAC during 1 year from January 2017 to December 2017 were included in the study. The slides along with records of the patients were retrieved and findings recorded. Histopathological evaluation was performed wherever possible and compared with cytological diagnosis. Results: Non-neoplastic lesions accounted for 80.3% cases followed by benign tumors (15.2%). Ganglion cyst was the commonest non-neoplastic lesion (60.6%, 40/66), while tenosynovial giant cell tumor was the commonest neoplasm (12.1%, 8/66) observed in our study. Solitary case of synovial sarcoma was also observed. Histopathological evaluation was performed in 14 cases and FNAC had overall diagnostic accuracy of 85.7% in diagnosis of these lesions. Conclusions: FNAC is a useful tool with high diagnostic accuracy in the evaluation of synovial lesions.

Keywords: Fine needle aspiration cytology, ganglion cyst, histopathology, synovial lesions

Introduction

Fine needle aspiration cytology (FNAC) is a cytodiagnostic technique which was introduced in the 1920s and rapidly gained wide acceptance among clinicians due to ease of its performance and rapidity of diagnosis.[1] A wide spectrum of pathologies involves the synovial lining of joints and periarticular tissues in human body. Synovial lesions can be classified into inflammatory etiology, infectious etiology, degenerative joint disorders, crystal induced arthritis, benign tumors, and tumor-like conditions such as synovial lipomatosis, tenosynovial giant cell tumor (TSGCT), synovial chondromatosis, pigmented villonodular synovitis (PVNS) and malignant tumors such as synovial sarcoma.[2] Majority of these lesions can be easily diagnosed with FNAC and help in adequate management. FNAC provides an excellent alternative to exfoliative cytology or histological evaluation in diagnosis of joint pathology. The advantages over open biopsy and other surgical procedures have made FNAC an increasingly popular procedure in evaluation of joint pathology.[3] Besides diagnosis, FNAC also offers an opportunity in the management of some of the joint pathologies with minimal invasive means and may have therapeutic implications for some cystic lesions around joints.

Material and Methods

The present retrospective analytical study was conducted in the Department of pathology in a tertiary care institute. The study was approved by Institutional ethics committee. Sixty-six patients with suspected synovial lesions referred from other departments for FNAC in the Department of Pathology from...
January 2017 to December 2017 were included in the study. Noncooperative patients and recurrent lesions were excluded from the study.

The sociodemographic and clinical data pertaining to patient’s age, sex, and anatomical site and radiological findings were recorded from the requisition forms and data registers. Routine protocol followed in our Department for all the FNACs was also adopted for the present study. Informed consent from all the patients was obtained before undergoing FNAC. Skin overlying the lesions was cleaned with betadine and alcohol swab and aspiration was done using a 22-23G needle attached to a 10 mL syringe with holder. A maximum of two passes were performed. In complex lesions (solid and cystic), FNAC was done under ultrasound guidance. The aspirated material was collected onto clean glass slides. In case of cystic swellings, after complete evacuation, FNAC was performed on any residual solid area. The fluid so aspirated was subjected to centrifugation and sediment smears prepared. Air-dried smears were stained with MGG stain, and PAP smears were fixed in 95% ethyl alcohol. All the slides were examined by trained cytopathologists for cytomorphological findings and diagnosis. In case of any discrepancy, the diagnosis of senior cytopathologist was considered.

Surgical excision was performed in 14 cases and tissue sample sent for histopathological examination. Histological sections were routinely stained with H and E stain. Cytohistological correlation was done considering histopathology as gold standard.

Descriptive data was presented in the form of percentages and proportions and diagnostic accuracy was calculated.

**RESULTS**

Sixty-six patients formed the material of the study with age range of 12–64 years. Among them, 38 patients were males and 28 patients were females with male to female ratio of 1.4:1. Out of the total 66 cases, two aspirations were inadequate (3.0%). Most of the lesions were seen in upper limb with maximum lesions around wrist joint, followed by foot. On FNAC, lesions were characterized into non-neoplastic (80.3%) and neoplastic (16.7%) etiologies [Table 1]. Ganglion cyst was the commonest non-neoplastic pathology observed in our study (60.6%) followed by synovial cyst (9.1%) and benign cystic lesions, not otherwise categorized (4.5%) [Table 1]. Two cases each of popliteal cysts and meniscal cysts were also seen. Ganglion cysts had a predilection for upper limb (wrist and hand), while synovial cysts were commonly seen in lower limbs.

TSGCT was the commonest benign neoplastic lesion in our study, observed in 12.1% cases followed by PVNS in 3.0% cases [Table 1]. Majority of the cases of TSGCT were seen in upper limb, predominantly in index finger. Two cases of PVNS were observed in our study, one each in foot and hand, thus having no specific site predilection. The solitary case of synovial sarcoma was observed in our study and the lesion was located in the foot, presenting as soft tissue swelling.

Histopathological evaluation was performed in 14 cases (one case reported as nondiagnostic, six cases of TSGCT, four cases of ganglion cyst, two cases of PVNS, and one case of synovial sarcoma). Cytohistological concordance was observed in 12 out of 14 cases with an overall diagnostic accuracy of 85.7% [Table 2].

**DISCUSSION**

Synovial pathologies are commonly seen in diverse clinical settings and commonly present as periarticular swellings. Nonspecific and overlapping clinical findings in these swellings often pose a diagnostic challenge to clinicians as well as pathologists.[4] FNAC is a good technique in the diagnosis of superficial palpable swellings around the joints. The present study was conducted in a tertiary care center in North India and included all synovial pathologies with the aim of categorizing

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### Table 1: Distribution of synovial lesions on FNAC

| lesions on FNAC n = 66) | Number | Percentage |
|-------------------------|--------|------------|
| Nondiagnostic           | 2      | 3.0        |
| Non-neoplastic          |        |            |
| - Ganglion Cyst         | 40     | 60.6       |
| - Synovial Cyst         | 6      | 9.1        |
| - Benign Cyst Lesion, Not otherwise categorised | 3 | 4.5 |
| - Meniscal Cyst         | 2      | 3.0        |
| - Popliteal Cyst        | 2      | 3.0        |
| Benign                  |        |            |
| - Giant Cell Tumor of Tendon Sheath | 8 | 12.1 |
| - Pigmented Villonodular Synovitis | 2 | 3.0 |
| Malignant               | 1      | 1.5        |

### Table 2: Cytohistological correlation in 14 cases with diagnostic accuracy

| Diagnostic Categories | FNAC | Histopathology | Diagnostic Accuracy |
|-----------------------|------|----------------|---------------------|
|                       |      | Conclorant     | Discordant          |                  |
| Nondiagnostic         | Nondiagnostic (1) | - | 1 | 0% |
| Non-neoplastic        | Ganglion Cyst (4) | 4 | - | 100% |
| Benign                | TSGCT (6) | 5 | 1 | 83.3% |
|                       | PVNS (2) | 2 | - | 100% |
| Malignant             | Synovial Sarcoma (1) | 1 | - | 100% |
the lesions based on their cytomorphology. In our study, male predominance was seen with M: F ratio of 1.4:1 and age range of 12–64 years. Bhat et al.\(^4\) and Saini et al.\(^5\) also observed slight male predominance in their study. Maximum lesions in our study were seen around wrist joint followed by foot, similar to previous studies.\(^4,5\) Of 66 cases, two smears were reported as nondiagnostic, whereas rest of the smears were categorized as non-neoplastic and neoplastic based on the cytomorphology.

Non-neoplastic lesions formed the majority of cases in our study (80.3%), while neoplastic lesions were seen in 16.7% cases. Ganglion cyst was the commonest lesion in our study seen in 60.6% cases. Majority of these were seen around wrist joint. Ganglion cysts mostly result from mucoid and cystic degeneration of soft tissues near a joint. FNAC of ganglion cysts reveal a thick, gelatinous, and mucoid fluid usually forming thick folds on the slide and some have referred to this distinctive appearance as a crinkled plastic food wrap pattern.\(^5\) Aspirates from the cyst are markedly hypocellular, usually containing few macrophages in a myxoid background [Figure 1a]. Aspiration of ganglia has become a popular preoperative diagnostic or, in some instances, a therapeutic procedure.\(^6\) Second commonest non-neoplastic lesion in our study was synovial cyst (9.1%). Synovial cysts represent juxta-articular fluid-filled collections lined by synovial cells, which cytologically as well as histologically distinguish them from other juxta-articular fluid collections, particularly ganglion cysts.\(^5\) Synovial cyst represents a focal extension of joint fluid due to herniation of synovial tissue into the surrounding soft tissue that can communicate with joint cavity.\(^7\) Aspirated material from synovial cysts may be thin or thick, straw colored, or transparent depending on the underlying intra-articular disease.\(^5\) Other non-neoplastic lesions seen in our study were benign cystic lesions, not otherwise categorized, meniscal cysts and popliteal cysts. Meniscal cysts are believed to form as a result of tears in the meniscal fibrocartilage and extrusion of synovial fluid through the meniscal tear.\(^5\) Medial meniscal cysts are typically associated with posterior horn tears, whereas lateral meniscal cysts arise from anterior horn and body tears.\(^5\) Meniscal cysts may be classified into three types: intrameniscal, parameniscal, and synovial.\(^8\)

TSGCT was the commonest benign lesion observed in our study (12.1%). These are present as small-firm nodules and are especially common around fingers and wrist. It has typical clinical and cytopathological features which permit definitive diagnosis [Figure 1c, d]. Classical location and lack of bone involvement on radiology is helpful in diagnosis.\(^4\) On FNAC, TSGCT shows multinucleated osteoclastic giant cells and two kinds of stromal cells: spindle-shaped cells and polygonal cells with pale cytoplasm.\(^9,10\)

Two cases of PVNS were also seen in our study. Both cases had radiological evidence of PVNS and were subjected to FNAC for confirmation. PVNS represents intra-articular form of TSGCT [Figure 2a, b]. Once considered a reactive lesion, PVNS is now classified as a neoplastic lesion.\(^5\) PVNS occurs in both localized and diffuse forms and latter is more likely to be associated with large, weight-bearing joints.\(^5\) Less commonly, PVNS may manifest as a joint effusion in which case exfoliative cytology may demonstrate the characteristic findings.\(^11\) More commonly, PVNS will present as a periarticular extremity mass easily susceptible to FNAC.\(^3\)

On imaging, PVNS can have a destructive appearance, may

**Figure 1:** a) Ganglion cyst: FNAC smear showing histiocyte-like cells dispersed in a background of myxoid material (MGG, 100X). b) Gouty tophi: Histopathology section showing characteristic crystals of monosodium urate in synovium and periarticular tissue (H&E, 100X) c) Giant cell tumor of tendon sheath: FNAC smear showing plump fibrohistiocytic cells with oval and pale nuclei and bland chromatin along with variable number of scattered osteoclast-like multinucleated giant cells (PAP, 400X). d) Corresponding histopathology section of giant cell tumor of tendon sheath (H&E, 400X)

**Figure 2:** a) PVNS: FNAC smears showing cohesive cell clusters having bland nuclear features along with the presence of hemosiderin laden macrophages (MGG, 400X). b) Corresponding tissue section of PVNS showing proliferation of synoviocytes along with hemosiderin laden macrophages (H&E, 400X). c) Synovial sarcoma: FNAC smears are highly cellular showing mixture of tissue fragments and dispersed cells (MGG, 100X). d) Synovial sarcoma: Vague scar-like structure at the periphery of the fragment (MGG, 400X). e) Tissue fragments showing small to medium cells with ovoid nuclei and bland chromatin (PAP, 400X)
erode bone, and mimic sarcoma. However, cytological findings in PVNS are quite straightforward and distinctive, consisting of histiocytoid cells (xanthoma cells), giant cells, and pigment, both intracellular and extracellular. Mild cytological atypia may be noted, particularly in the histiocytoid component. Xanthoma cells are also frequent, tend to be located geographically, and often contain fine hemosiderin granules.

The solitary case of synovial sarcoma was observed in our study. Synovial sarcoma is a rare mesenchymal spindle cell tumor, displaying variable epithelial differentiation. The lesion commonly involves the soft tissues of the extremities, primarily near large joints, and presents as painful and rapidly growing palpable mass. Synovial sarcoma is divided into two classical subtypes: Biphasic and monophasic. On FNAC, smears appear moderately to markedly cellular with distinctive pattern of dispersed cells alternating with cohesive cell clusters having uniform cells, depicting bland oval nuclei and contain delicate branching capillaries [Figure 2c–e]. Epithelial cells, squamous cells, round cells, mast cells, necrosis, comma-like nuclei, marked nuclear atypia, secretory mucin, and rosette-like structures may occasionally be observed. Histopathological evaluation was carried out in 14 cases only as rest of the patients were lost to follow up. Overall diagnostic accuracy of 85.7% was observed [Table 2]. Out of the two discordant cases, one case was reported as nondiagnostic on FNAC and on histopathological examination; it was reported as Gouty tophi showing presence of urate crystals with macrophages and few giant cells [Figure 1b]. Crystals were mistaken for artifacts on FNAC smears. The other discordant case was reported as TSGCT on FNAC smears and on histopathological examination; it was diagnosed as PVNS. The cytological smears lacked the characteristic hemosiderin pigment and synovial cell clusters and were misdiagnosed as TSGCT on the basis of presence of giant cells.

Our study had few limitations. First it was a retrospective study. Second, histopathological evaluation was available in a limited number of cases. So more such studies should be carried out in future to further substantiate the results obtained in our study.

Our study highlights the cytomorphological spectrum of synovial lesions in North India. FNAC plays an important role in the diagnosis and also has limited therapeutic ability in few conditions. FNAC also contributes in differentiating ganglion cysts from other bursal cysts which is important for management. We also observed that FNAC had high diagnostic accuracy in diagnosis of synovial pathologies and can be considered as a suitable and cost effective alternative in low resource settings.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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