

Retrospective study of synovial biopsies-Tertiary centre experience

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Abstract

Introduction: Advancement in medical technology has increased life expectancy. Replacement surgeries have become a common procedure because of aging, affordable population. Also, awareness and affordability of simple techniques like synovial biopsies help in specific diagnosis and treatment. As our hospital is a tertiary government orthopaedic institution, replacement surgeries are done regularly. There are few published data and literature on synovial lesions. Hence, we took up this study to analyse the pattern of synovial lesions.

Aim and Objectives: To study the histopathological spectrum of synovial biopsies done for diagnostic evaluation and during replacement surgeries.

Materials and Methods: The present study comprised of retrospective analysis of synovial lesions diagnosed from July 2015 to June 2018 at Sanjay Gandhi Institute of Trauma & Orthopedics, Bangalore. Total of 214 biopsies were analyzed. Relevant clinical and radiological details were obtained. Synovial biopsy specimens were processed routinely and wherever necessary special stains like Zeihl-Neelsen stain for AFB and Prussian blue stain for hemosiderin were carried out. Lesions were classified under main categories of inflammatory joint diseases, degenerative joint diseases and tumor and tumor like conditions.

Results: In our study, the common age groups affected were between 50-70years. Males were affected more. Most common symptoms were pain and swelling. Knee was the commonest joint involved. Most common histopathological diagnosis was chronic nonspecific synovitis followed by tuberculous synovitis, septic arthritis and rheumatoid arthritis. Also cases of benign tumors such as synovial lipoma arborescence, synovial lipoma, chondromatosis, and pigmented villonodular synovitis were noted in present study.

Conclusion: Histological analysis of synovial biopsies proves to be a valuable tool in establishing an early and specific diagnosis.

Keywords: Synovial biopsy, Histopathology, Non specific synovitis.

Introduction

Arthritis, an important cause for morbidity, is commonly seen in clinical practice in aging population. Advancement in medical technology has increased life expectancy. Replacement surgeries have become a common procedure because of aging, affordable population. Also, awareness and affordability of simple techniques like synovial biopsies help in specific diagnosis and treatment.

Whenever conditions like rheumatoid arthritis, present with typical clinical features, they rarely cause diagnostic problems. Synovial biopsies are indicated when only one joint is affected and helps in distinguishing various aetiologies such as infective, traumatic or crystal induced.¹ However, histopathological study of synovial biopsy has its own limitations and requires correlation of clinical, radiological and serological findings to come to conclusive diagnosis.²

As our hospital is a tertiary government orthopaedic institution, replacement surgeries are done regularly. There are few published data and literature on synovial lesions. Our study aims to determine the pattern of synovial lesions, age and sex distribution, clinico pathological characteristics seen in our tertiary orthopaedic hospital.

Materials and Methods

A retrospective, cross sectional, hospital based study was conducted at Department of Pathology, Sanjay Gandhi Institute of Trauma & Orthopedics, Bangalore, Karnataka, India. The study consisted of 214 cases of synovial biopsies sent to the Histopathology department during period of three years (June 2015-June 2018). Synovial biopsies were

obtained mainly by open method and few by arthroscopic method. The biopsy samples were fixed in 10% buffered neutral formaldehyde. Tissue was processed by increasing concentrations of alcohol and paraffin blocks were prepared. Sections were cut to 4-6 μ , stained by haematoxylin and eosin and examined under microscope for histopathological examination. Special stains and immuno histochemical studies were performed wherever necessary. The final diagnosis was made. The clinical and pathological data were collected from medical records and reviewed for patient demographics, age, sex and histological type of synovial lesion. Data tabulation and analysis done to know the relative frequencies of observed data. Results are expressed as numbers and percentages. Cases were divided into inflammatory, degenerative joint disease, tumor and tumor like conditions.²

Results

In the present study, synovial lesions range from first to 8th decade. The common age group affected were between 61-70 years. Youngest patient was 18 years old and oldest was 80 years. Most common symptoms were pain and swelling. Knee joint was commonest joint involved in 90% of the cases.[table 1]

Table 1: Age distribution of inflammatory joint disease

| Age group | Number |
|--------------|------------|
| <20 | 03 |
| 21-30 | 10 |
| 31-40 | 23 |
| 41-50 | 29 |
| 51-60 | 46 |
| 61-70 | 64 |
| 71-80 | 39 |
| Total | 214 |

Table 2: Histopathological distribution of synovial lesions

| S. No | Lesion | Number of cases (%) | Male | Female | |
|------------|-------------------------------------|--------------------------------|-------------|--------|----|
| I | Inflammatory joint disease | | | | |
| a | Infectious | Tubercular synovitis | 15(7.00%) | 09 | 06 |
| | | Septic arthritis | 14(6.54%) | 08 | 06 |
| b | Autoimmune | Rheumatoid arthritis | 13(6.07%) | 04 | 09 |
| c | Others | Chronic non specific synovitis | 157(73.36%) | 84 | 73 |
| II | Degenerative joint disease | Gout | 01(0.46%) | 00 | 01 |
| | | Pseudo gout | 02(0.93%) | 01 | 01 |
| III | Tumor and tumor like lesions | | | | |
| | Benign | Synovial chondromatosis | 01(0.46%) | 01 | 00 |
| | | GCT tendon sheath | 01(0.46%) | 00 | 01 |
| | | PVNS | 02(0.93%) | 01 | 01 |
| | | Synovial lipoma arborescence | 06(2.80%) | 04 | 02 |
| | | Synovial lipoma | 02(0.93%) | 01 | 01 |
| Total | | 214 | 113 | 101 | |

In the present study, males were predominantly affected with male: female ratio of 1.11:1

Among the 214 synovial biopsies, 157(73.36%) of the cases were not specific for any specific disease entity, were predominant in males. These cases showed fibro collagenous tissue, increased vascularity and variable chronic inflammatory infiltrate. Also, variable villous hypertrophy, hyperplasia of synoviocytes was seen.

There were 15(7.00%) cases of tubercular synovitis with 9 males and 6 females. All of them were from knee joint. All cases showed granulomas with Langhan's type of giant cells. In 5 cases, caseous necrosis was noted. Modified ZN staining was done in all cases; however acid fast bacilli could not be demonstrated.

Septic arthritis was seen in 14 cases with male predominance. Ulceration of the synovial lining with neutrophilic infiltration was seen in all cases.

Rheumatoid arthritis was seen in 13 cases with female predominance of 9 cases. Microscopically, hyperplasia of the synoviocytes, lymphoplasmacytic infiltrate was seen in all the cases (Fig. 1). Pannus formation and ulceration was seen in 5/13 (38.46%) cases. Increased vascularity was seen in 10/13(23.07%) cases. Fibrin deposition was seen in 8/13 (61.53%) cases. Giant cell, Mott cells was noted in one case each. Russel bodies were noted in two cases (Fig. 2)

A case of giant cell tumor of the tendon sheath was seen in a female. Microscopically, well circumscribed, lobulated tumor composed of synovial mononuclear cells

with numerous multinucleated giant cells and foam cells was seen. (Fig. 3)

One case of gout was noted in a female patient. Microscopically, there was deposition of amorphous pink tophaceous material surrounded by giant cell reaction and chronic inflammatory cell infiltrate (Fig. 4).

There were two cases of pseudo-gout one each in male and female. Grossly, synovium had chalky white deposits. Microscopically, granular basophilic crystals are seen in the synovium without giant cell reaction (Fig. 5).

One case of synovial chondromatosis was seen in a male patient involving knee joint. It was decalcified, processed and then sectioned. Microscopically, they showed nodules of hyaline cartilage with endochondral ossification.

Two cases of pigmented villonodular synovitis of the knee were noted which showed villous proliferation of synovium, sub epithelium shows foamy histiocytes, hemosiderin laden macrophages, pseudo glandular spaces lined by synovial cells (Fig. 6).

There were six cases (2.80%) of lipoma arborescence. Microscopy showed mature adipose tissue in the sub synovium. Two cases of synovial lipoma with one each in male and female was noted.

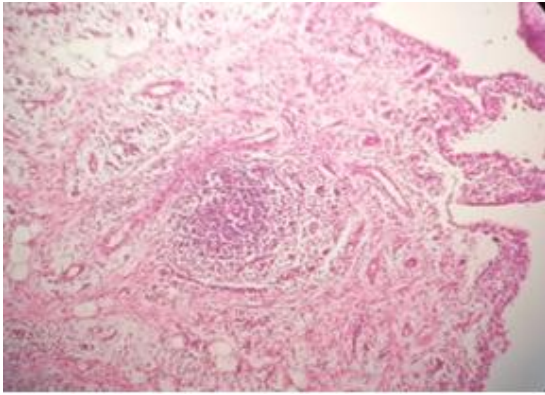


Fig. 1: Rheumatoid synovitis: lymphoid aggregates (H&E100x)

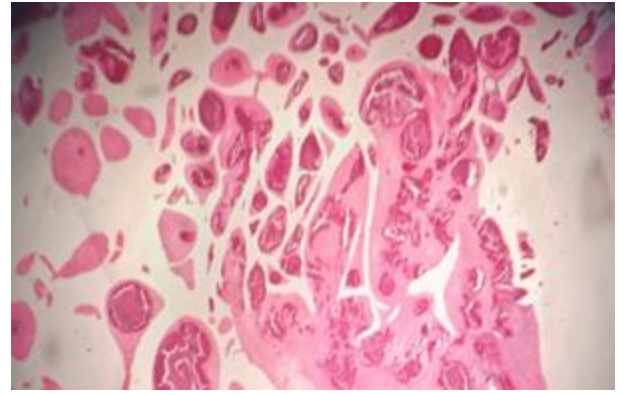


Fig. 5: Pseudogout-bluish CPPD crystals (H&E100x)

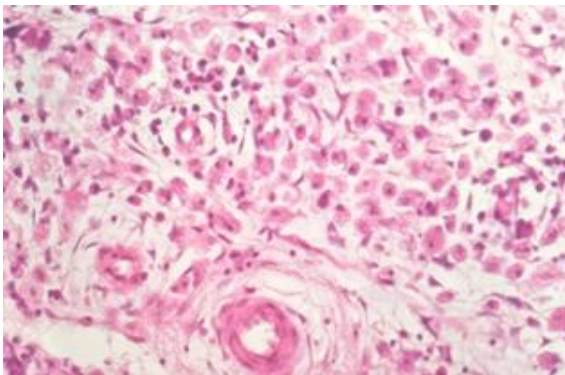


Fig. 2: Mott cell in Rheumatoid synovitis (H&E 400x)

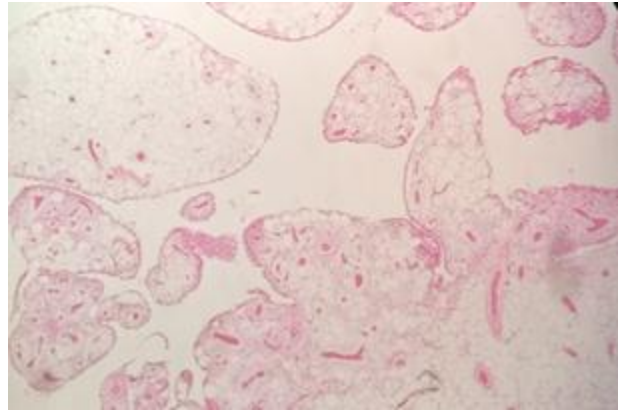


Fig. 6: Lipoma arborescence-lipocytes in sub synovium (H&E100x)

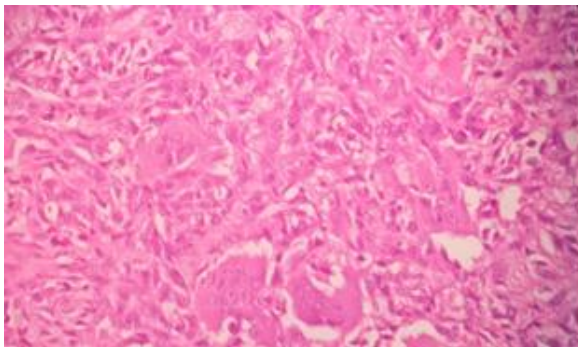


Fig. 3: Giant cell tumor of tendon sheath (H&E 400x). Giant cells and mono nuclear cells.

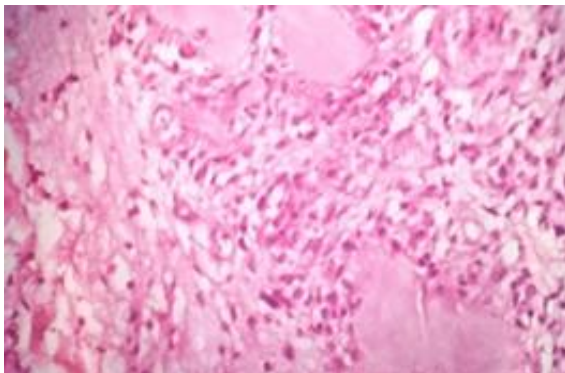


Fig. 4: Gout-Tophaceous material surrounded by foreign body giant cells and chronic inflammatory cells.(H&E 400x)

Discussion

The life expectancy of the general population of the country is increasing due to better living conditions and affordable health care. Hence, age related problems like arthritis are increasingly seen in orthopaedic out patient department. Replacement surgeries have become a common procedure because of improvement in medical technology, government policy, and affordable population. Awareness and affordability of simple techniques like synovial biopsies help in specific diagnosis and treatment. As our hospital is a tertiary government orthopaedic institution, replacement surgeries, arthroscopic biopsies are done regularly; also, diagnosis of chronic synovitis of knee could benefit by undergoing synovial biopsy.⁴

Age

Maximum cases were in the age group of 61-70 years. This is similar to study by Vijay pm et al^[5] where peak incidence was seen in 41-50 years. In a study by Maithili et al, inflammatory lesions predominated in 11-30 year age group.³ The prevalence of inflammatory lesions in the higher age group in our study compared to other studies may be because of the fact that, most of the patients are referred to our hospital for the replacement surgeries.

Sex

In the present study, males were affected more than females. Male: Female ratio of 1.11:1 was seen in our study. This is similar to study by Vijay PM et al where male: female ratio was 1:0.6,⁵ M.S.Sant with Male: female ratio 1:0.58.⁶ Female predominance (69. 23%) was seen in rheumatoid arthritis which is similar to the literature.^{3,5,7}

Histopathological Diagnosis

Chronic non specific synovitis was the commonest inflammatory synovial lesion 157(73%) followed by tubercular arthritis 15(7.00%), septic arthritis 14(6.54%) and rheumatoid arthritis 13(6.07%). Literature search showed similar findings by Vijay PM et al,⁵ where chronic non specific synovitis was 71%, followed by tubercular synovitis 18.07%. In study by Maithili et al³ chronic non specific synovitis was commonest (49%), followed by rheumatoid arthritis (14%), tubercular synovitis (10%). In cases where no specific aetiology was identified, chronic non specific synovitis was diagnosed. It may be due to early stages of rheumatoid arthritis or early osteoarthritis not showing characteristic histopathological and radiological features required for its diagnosis. These cases, when followed up could evolve with distinctive histopathological features on synovial biopsy or might undergo therapeutic remissions due to its self limiting nature.⁵

Tubercular synovitis was the second most common lesion constituting 7%. Caseating granulomas were seen in 6(40%) cases and non caseating granulomas were seen in 9(60%) cases indicating higher incidence of non caseating granulomas similar to study by Vijay PM et al⁵ and Maithili et al.³ Epithelioid cell reaction (100%) and Langhan's giant cell reaction is similar to the literature.⁸⁻¹⁰

Septic arthritis may be caused by haematogenous infection or direct inoculation of the joint following trauma or surgery. It is mainly seen in neonates and infants.² In the present study, septic arthritis was diagnosed mainly based on morphology. Total of 14[6.54%] cases were seen with male predominance. Age group affected was 21-70 years with majority of cases involving knee joint. This is similar to study by Sakhuja AC et al in which 20% of septic arthritis was seen in 1-55 years with male predominance.¹¹ The incidence in higher age group in our study may be because of many accident cases with open wounds referred and treated in our hospital.

Rheumatoid arthritis mainly involves peripheral joints such as, small joints of hands and feet with peak age incidence in 20-40 years with female predominance. In the present study, female predominance was seen with Male: female ratio of 0.4:1. In the present study, knee (95%) and wrist joints (5%) were affected. Study by Abhyankar et al¹² showed similar features. A study by Rooney et al on the analysis of histologic variations of synovitis in rheumatoid arthritis takes into consideration parameters such as synovial hyperplasia, fibrosis, vascular proliferation and inflammation(perivasular, focal and diffuse).¹³ In our study, synovial hyperplasia with lymphoid aggregates were

consistently seen in synovial biopsies of all the clinically suspected rheumatoid arthritis.

Pigmented villonodular synovitis (PVNS) is proliferative disorder of synovium that produces localised or diffuse nodular thickening of synovial membrane. Knee is most commonly affected; though any synovial joint may be affected. Greatest incidence is seen in second to fourth decade with equal sex predilection. Patients complain of pain, swelling or both in affected joint. It appears as villous and nodular thickening of synovial membrane. Microscopically, mononuclear rounded and epithelioid cells, multinucleated osteoclast like giant cells and lipid rich cells are seen. Mononuclear cells contain hemosiderin granules.¹ In our study, two cases were seen with one case each in male and female involving knee joint, with characteristic microscopic features.

Localized giant cell tumor of tendon sheath is histologically identical to PVNS and represents extra articular analogue. It is seen between 30-50 year old with female predominance.¹⁴ It is grossly exclusively nodular, microscopically identical to PVNS, contains less hemosiderin than PVNS. It arises not only from tendon sheath, but also from synovium, extra articular bursa.¹ In our study, one case of giant cell tumor was seen in a female in wrist joint with multinucleated giant cells, mononuclear cells and macrophages.

Synovial chondromatosis is characterised by multiple nodules of metaplastic hyaline cartilage most often showing endochondral ossification.¹ The degree of cellularity and nuclear atypia sometimes may lead to suspicion of malignancy. Correlation of clinical, radiological and histomorphological diagnosis helps rule out well differentiated chondrosarcoma.²

Crystal arthropathies are systemic disorders and show presence of crystals within synovium, articular cartilage and periarticular soft tissue. Clinical features may range from asymptomatic synovial deposits to chronic destructive arthropathies.^{15,16} The three endogenously formed crystals that produce disease are monosodium urate, calcium pyrophosphate dihydrate, and calcium hydroxyapatite. Pseudo gout/Calcium pyrophosphate deposition disease (CPPD) has a prevalence of 15% in aged 65 to 74 years and higher than 40% after age 84. The definitive diagnosis requires synovial fluid analysis. The crystals are weakly birefringent under polarised with rhomboid or rod shaped appearance either intra cellular/extracellular. CPPD and gout can coexist.¹⁷ Synovial biopsy shows characteristic intra articular calcified deposits in synovium, articular cartilage or menisci; affects the knee joint in most of the cases. It is associated with other conditions like hyperparathyroidism, haemochromatosis, renal failure, chronic gout, and hypophosphatemia.¹⁸ Our study had two cases of CPPD presenting with pain in the knee; one case in male and another in female with characteristic histological features. Gout is a caused by super saturation and precipitation of monosodium urate (MSU) crystals in tissues resulting in inflammation and tissue damage. It is common in males with prevalence of 3% of the population.¹⁹

Synovial fluid analysis for crystals under compensated polarized light shows MSU crystals as birefringent needle shaped crystals.²⁰ Characteristic feature in Synovial biopsy is amorphous pink tophaceous material surrounded by giant cell reaction and histiocytes.²¹ In the present study, one case of gout was seen in a female with characteristic histopathological features.

In Lipoma arborescence fatty infiltration of the sub synovial connective tissue is characteristically seen. It is one of the rarest of the synovial proliferative lesions. Grossly, the entire synovium assumes a bright yellow, nodular, papillary appearance. It is considered non-neoplastic and represents an excessive accumulation of fat in the sub synovial space. It was seen in age group of 39-66 years in study by Hallel et al.²² It may mimic synovial lipoma or haemangioma. Histopathology helps in distinguishing it from other lesions. It possibly represents a secondary phenomenon following the degenerative process of the joint.²³ Treatment is synovectomy and recurrence is rare. In our study, there were 6(2.80%) cases of lipoma arborescence with male predominance in the age group of 30-72 years. This is similar to the study by Rao et al.²³ Two cases of synovial lipoma with one case in each in males and females were seen in our study.

Conclusion

This study showed that synovial lesions are more common in males than females. The synovial lesions are mainly inflammatory, predominantly in sixth decade of life. Chronic non specific synovitis is the most common lesion in our study. Clinico radiological, pathological correlation is essential for the diagnosis of inflammatory and non inflammatory lesions of synovium.

Conflict of Interest: None.

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