



E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2019; 5(4): 845-848
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www.orthopaper.com
Received: 04-08-2019
Accepted: 08-09-2019

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Histomorphological study of synovial lesions

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DOI: <https://doi.org/10.22271/ortho.2019.v5.i4o.1782>

Abstract

Background: The synovium is a specialized mesenchymal tissue that is required for appropriate function of locomotor apparatus. Synovium is the site for a series of pathologic processes that are characteristic and in some cases are specific to distinctive disease. The histopathological examination of the synovial tissue plays a pivotal role in arriving at correct diagnosis in joint disease presenting as unclassified arthritis, suspicious of granulomatous disease, deposition disease or infectious disease with negative synovial fluid analysis.

Objectives: To study the histomorphological features of various synovial lesions and to evaluate synovial scoring.

Materials and Methods: In the present study 104 cases of synovial lesions were evaluated histopathologically.

Results: Out of the 104 cases, chronic nonspecific synovitis (56.7%) was the commonest synovial lesions, followed by tubercular synovitis (12.5%) and Baker's cyst (10.5%). Synovial scoring was applicable in 85 cases and they were grouped into specific and non-specific synovitis.

Interpretation & Conclusion: Majority of the synovial lesions could be classified into various subgroups by histopathological features. The high incidence of chronic nonspecific synovitis may represent a smoldering infection where the causative agent is not demonstrable. In cases of early rheumatoid arthritis, the histopathological features might be non-specific, however if there is strong clinical suspicion then it is worthwhile to do serological test for rheumatoid factor and synovial scoring. Synovial scoring was higher in cases of rheumatoid arthritis and was of less significance in conditions like granulomatous disease, metabolic disease, Lipoma arborescence and Hoffa's disease. Larger studies are needed to assess the reproducibility of synovial scoring system in the evaluation of synovial lesions.

Keywords: Synovitis, synovial tissue, arthritis, synovial scoring

Introduction

The synovial membrane biopsy is useful in the assessment of joint diseases of synovial conditions. It is the final diagnostic procedure. The synovial membrane behaves as a mirror to the joint disease and examination of the synovial membrane often reveals a myriad of features suggestive of disease specific entities^[1].

Diarthrodial or synovial joints are the most commonly affected joints by disease in the body. The joints are open tissue spaces that are communicating directly with periarticular tissues. The capsule is lined by the synovial membrane which also covers the soft tissue structures within the joints and forms bursa. This synovium is labile and reacts to wide variety of changes and noxious influences originating elsewhere in the body^[2].

The symptom complex of pain, swelling and stiffness of joint is labeled as arthritis and is a common Problem encountered in clinical practice. Arthritis may be classified as monoarticular, pauciarticular and polyarticular when it involves one joint, four or less, or more than four joints respectively. Irrespective of the type of arthritis, failure of timely institution of specific therapy leads to increase the morbidity^[2].

Different techniques are applied for synovial membrane biopsy^[3]. Before the era of advanced surgical techniques, pathological material for study of the joint was almost exclusively obtained from post mortem samples. Arthroscopic biopsy is the latest^[4, 5].

The histopathological study of synovial biopsy is one of the most valuable means for diagnosis of joint disease, in cases presenting as unclassified arthritis, suspicion of neoplastic or granulomatous disease, disease characterized by deposition with negative synovial fluid culture.

In many instances clinical, radiological, biochemical and Serological examinations becomes essential for making an accurate diagnosis^[2, 6]. Also examination of the synovial tissue in studies is aimed at elucidating the etiology and pathogenetic mechanism involved in arthritis, leading to potential new target of therapy for these diseases^[1].

Objectives

To study the histomorphological features of various synovial lesions and to evaluate synovial scoring.

Materials and Methods

A retrospective analysis of 104 biopsies of synovial lesions conducted during a 3 year period from June 2016 to May 2019, in the Department of Pathology and Orthopedics, Hind Institute of Medical Sciences.

The clinical information required for the study was obtained from records and by clinical examination, respective medical faculty and were recorded chronologically in the proforma and later categorized accordingly; which included complete clinical details, necessary investigations done. Synovial fluid analysis was done wherever it was possible to aspirate.

Clinically and histologically diagnosed synovial lesions were included in the study. Synovial tissue in amputated limbs were excluded from the study. The synovial biopsies were obtained by open method in the operation theatre. After gross examination of the specimen, the entire biopsy material was fixed in 10% formalin for 12 to 24 hours and representative bits were given. Tissues were processed routinely and paraffin blocks were prepared. 3-5 microns multiple thin sections were cut and stained with hematoxylin and eosin routinely and wherever necessary special stains like Z-N for AFB, Prussian blue stain for hemosiderin were carried out.

The histopathological slides were methodically studied and various lesions were analyzed using the criteria shown in the proforma and diagnosed. Clinical findings and wherever necessary radiological findings were taken in to consideration. In this study, an attempt was made to apply synovial scoring in nonspecific synovitis, Osteoarthritis, Rheumatoid arthritis, Tubercular arthritis, Gouty arthritis, Lipoma arborescence, Hoffa's disease and Hemophilic synovitis taking into account parameters such as hyperplasia of synoviocytes, density of resident cell population and degree of inflammatory infiltrate on scale of 0 to 3 each. With the total score obtained they were divided into two groups as Specific and non-specific synovitis and Mann Whitney test was applied between these two groups.

Results

A total of 104 synovial biopsy specimens were received in the Department of Pathology and Orthopedics, Hind Institute of Medical Sciences for histopathological examination during the study period of 3 years (June 2016 to May 2019) contributing 0.57% of 20,230 total surgical specimens received during the period.

The synovial lesions were categorized in to six groups based on their morphological features. They were degenerative conditions in 3 cases (2.8%), infective conditions in 15 cases (14.4%), inflammatory conditions in 64 cases (61.5%), metabolic synovitis in 2 cases, 1 case of hemophilic synovitis and 19 cases of benign tumor and tumor like lesion (18.2%).

The commonest synovial lesion encountered was chronic nonspecific synovitis in 59 patients (56.7%) followed by Tubercular arthritis in 13 patients (12.5%), Baker's cyst in 11 patients (10.5%), Rheumatoid arthritis (Figure.2) in 5 patients

(4.8%), tenosynovial giant cell tumor (Figure.1) in 4 patients (3.8%), osteoarthritis in 3 patients (2.8%), gout in 2 patients. Least common lesions were hemophilic synovitis, lipoma arborescence and Hoffa's disease in one patient each.

The commonest age group affected was between 41 – 50 years in 23 patients (22.71%) followed by 31 – 40 years in 21 patients (20.1%). The highest incidence was noted in 64 male patients (61.3%) as compared to 40 females with male to female ratio of 1:0.6. Pain was the predominant clinical feature encountered in 86 patients (82.6%) followed by swelling in 82 patients (78.8%). There was no history of trauma noted in any of the synovial lesions in our study. Knee joint (79.8%) was the commonest joint involved, followed by wrist (7.69%), ankle (3.84%) and hip & IP joints of hand (2.80%)

Table 1: Synovial Scoring

| Condition | No. of cases | Mean+ SD | Median | Range |
|----------------|--------------|----------|--------|-------|
| Non-Specific | 59 | 3±0.9 | 3 | 1-5 |
| Specific | 26 | 4.7±0.2 | 4 | 2-9 |
| Rheumatoid | 5 | 8.4±0.5 | 8 | 8-9 |
| Osteoarthritis | 3 | 4.0±1.0 | 4 | 3-5 |
| Tuberculosis | 13 | 4.7±0.6 | 4.5 | 3-5 |
| Others | 5 | 3.3±1.0 | 3.5 | 2-4 |

Synovial scoring was applicable in 85 synovial samples and they were divided into specific and nonspecific groups based on the scores obtained. The non-specific synovitis had a score of 3 ± 0.9 and specific group had a score of 4.7 ± 0.2 , of which rheumatoid arthritis had the highest score ranging between 8-9. Mann Whitney test was applied between the 2 conditions and the p value was less than 0.001.

Discussion

Most of the rheumatologic diseases affecting the synovium are diagnosed on the basis of clinical examination, routine laboratory test, radiographic examination and the analysis of synovial fluid if present^[3].

However in cases of unclassified arthritis, suspicion of neoplastic or granulomatous disease, deposition disease and persistence of infection in spite of negative synovial fluid culture, histological examination of synovial tissue will lead to correct diagnosis^[3].

The present study consisted of 104 synovial biopsies in a period of 3 years. Chronic non specific synovitis was the commonest synovial lesion, comprising of 59 patients (56.7%) from 104 synovial lesions followed by tubercular arthritis in 13 patients.

In the present study majority of the lesions occurred in 11 – 60 years age group, peak incidence was between 41 – 50 years indicating synovial lesions can occur almost in all age groups, but more common in the adult hood. Similar observations were seen in studies by Fletcher *et al* (1975) where age range was between 12 to 88 years and mean age of presentation was 47 years, in M.S. Sant *et al*^[7] the age group was between 20 – 40 years, Sankaran Kutty^[8] had maximum incidence between 20 – 50 years and in Vijay *et al*^[9] also the age group was between 40 – 50 years.

Males were more commonly affected than females in this study with M:F ratio of 1:0.6. Similar observations are seen in study by Fletcher *et al*^[10], Sant *et al*^[7], Vijay *et al*^[9] were 1:0.5, 1:0.58, 1:0.6, indicating that male joints are exposed to more stress when compared to females. Female preponderance was seen in rheumatoid arthritis which is similar to the various other studies^[2, 11].

Pain was the major presenting symptom in the present study in 82% of synovial lesions comprising of 86% followed by swelling

Table 2: Incidence of synovial lesions of knee joint – Comparative Analysis

| Type of lesion | M.S. Sant <i>et al</i> ^[7] | | Rajeev Agarwal <i>et al</i> ^[12] | | Present Study | |
|-----------------------------------|---------------------------------------|------|---------------------------------------------|-----|-----------------|------|
| | No. of Patients | % | No. of Patients | % | No. of Patients | % |
| Osteoarthritis | 1 | 0.72 | 2 | 8 | 3 | 4.4 |
| Tubercular synovitis | 40 | 28.9 | 3 | 12 | 11 | 16.1 |
| Septic arthritis | 4 | 2.9 | 1 | 4 | 1 | 1.4 |
| Chronic non specific synovitis | 65 | 47.1 | 1 | 4 | 51 | 75 |
| Rheumatoid arthritis | 4 | 2.9 | 6 | 15 | 1 | 1.4 |
| Gout | - | - | - | - | 1 | 1.4 |
| Hemophilic synovitis | - | - | - | - | 1 | 1.4 |
| Baker's cyst | - | - | - | - | 11 | 16.1 |
| Diffuse/Localized TGCT | - | - | - | - | 1 | 1.4 |
| Lipoma Arborescens | - | - | - | - | 1 | 1.4 |
| Hoffa's Disease | - | - | - | - | 1 | 1.4 |
| Villonodular synovitis (Figure.4) | 4 | 2.9 | - | - | 1 | 1.4 |
| Syphilitic arthritis | 8 | 5.8 | - | - | - | - |
| Synovial sarcoma | 5 | 3.63 | - | - | - | - |
| Osteochondromatosis (Figure.3) | - | - | 1 | 4 | - | - |
| Loose body | - | - | 1 | 4 | - | - |
| Meniscus/Ligament lesions | - | - | 10 | 40 | - | - |
| Miscellaneous | 7 | 5 | - | - | - | - |
| Total | 138 | 100 | 25 | 100 | 84 | 100 |

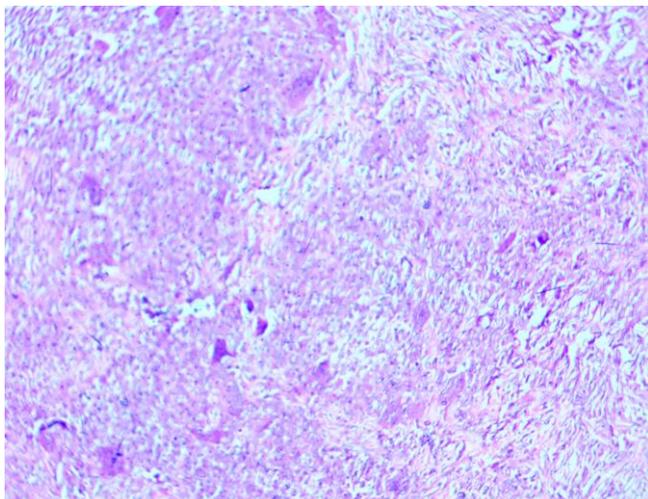


Fig 1: H & E stain section of Giant cell tumor of tendon sheath extending to synovium (10xview)

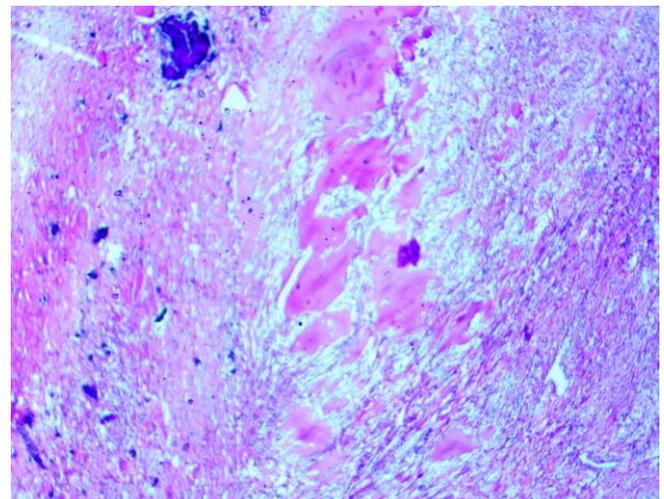


Fig 3: H & E stain section of Synovial Osteochondromatosis (10xview)

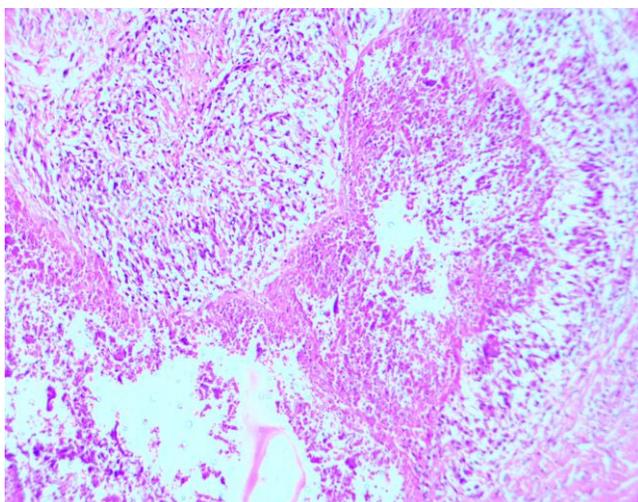


Fig 2: H & E stain section of Rheumatoid Synovitis showing palisaded granuloma (10xview)

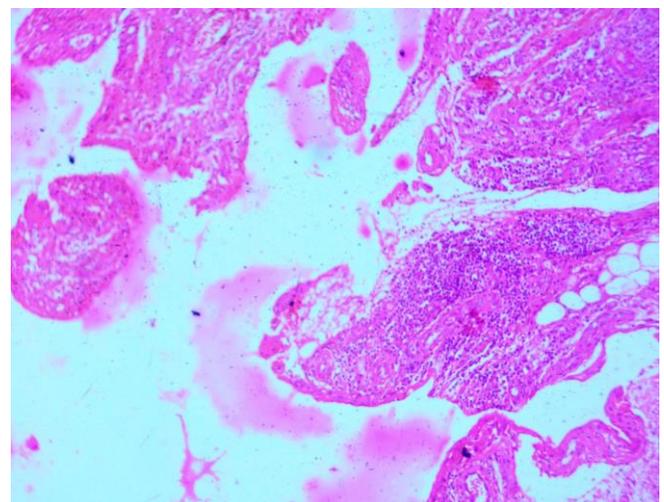


Fig 4: H & E stain section of Villonodular Synovitis (10xview)

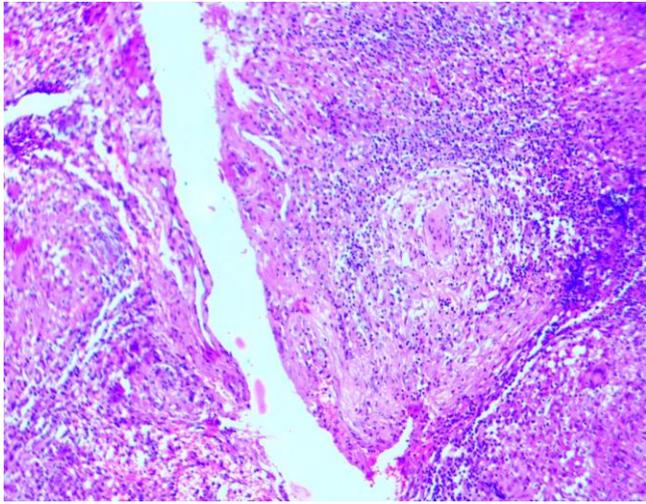


Fig 5: H & E stain section of Tubercular Synovitis (10xview)

In the present study knee joint was the common joint involved by synovial lesions in 84 patients (79.8%) out of the 104 synovial biopsies and it was most commonly affected by chronic nonspecific synovitis in 51 patients (61.4%) followed by tubercular synovitis (Figure. 5) and bakers cyst in 11 patients (13.2%) each and osteoarthritis in 3 patients (3.6%) and the rest as shown in the table. Similar observations were made by Fletcher *et al* [10], M.S.Sant *et al* [7], M. Sankaran Kutty [8], Vijay *et al* [9] that knee was the predominant joint involved and chronic nonspecific synovitis was the commonest lesion encountered.

In the present study synovial scoring was applicable in 85 cases and they were classified into two groups as specific and non-specific synovitis which had 26 and 59 cases respectively. The non specific synovitis group had a score of 3 ± 0.9 , whereas that of specific was higher having 4.7 ± 0.2 . The highest score in the specific group was seen in the category of rheumatoid arthritis which had 8.4 ± 0.5 and osteoarthritis which had a score of 4.0 ± 1.0 . When Mann Whitney test was applied between the two groups the P value was less than 0.001. Kren *et al* [13] also observed that rheumatoid arthritis has a score of more > 5 and Osteoarthritis has score of 2.0 ± 1 .

The synovial scores frequently turns out to be significantly different between degenerative and rheumatic joint disease.¹⁴ When no characteristic findings of disease such as rheumatoid arthritis are not seen and when the synovial score is equivalent or more than 5 could be indicator of rheumatoid arthritis. However the synovial scoring was of less significance in conditions like granulomatous disease, metabolic disease, lipoma arborescens, Hoffa's disease as these cases had characteristic histopathological findings.

In recent years histopathological scores have been established with purpose of correlating the clinical grades of severity of rheumatoid arthritis and synovitis and objectifying the inflammatory infiltration and effect of medical therapy on synovitis. However, they have only confirmed that majority of histological characteristic show no good correlation with clinical results^[15, 18].

Conclusion

Synovial scoring is higher in cases which had distinct histopathological features of rheumatoid arthritis. Whereas, it is of less significance in conditions like granulomatous disease, metabolic disease, lipoma arborescens, hoffa's disease and these are diagnosed based on characteristic

histopathological findings.

Larger studies are needed to assess the reproducibility of synovial scoring system in the evaluation of synovial tissue, particularly to differentiate an early rheumatoid arthritis from other various non-specific synovitis. Other investigations like HLA typing, cytogenetic studies and genotyping may be helpful in further evaluation of the lesions.

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