CLINICO-PATHOLOGICAL STUDY OF INFLAMMATORY SYNOVIAL LESIONS OF KNEE JOINT

Mamatha S. V[1], V. Muralidhara[2]

[1]Associate Professor, Department of Pathology, Sree Siddhartha Medical College, Tumkur.
[2]Associate Professor, Department of Orthopaedics, Sree Siddhartha Medical College, Tumkur.

ABSTRACT

INTRODUCTION

Synovial joints account for most of body's articulation and characterised by wide range of almost frictionless movements. Synovium is the central area of pathology in a number of inflammatory joint diseases. Joint effusions present as diagnostic challenge to physicians and need careful evaluation and interpretation of both clinical and laboratory findings to make accurate diagnosis and avoid unnecessary hospital stay. Joint effusions present as diagnostic challenge to physicians and requiring careful evaluation and interpretation of both clinical and laboratory findings to make accurate diagnosis to avoid unnecessary hospital stay.

AIM OF THE STUDY

Is to study the diagnostic features joint effusion in cases of inflammatory synovitis of the knee joint.

MATERIALS AND METHODS

Prospective study was done over a period of two years in the Department of Pathology in a tertiary care hospital. Joint fluid was obtained by arthrocentesis in patients with joint effusions. Gross, microscopic, microbiological and biochemical parameters were examined in 50 samples of synovial fluids with synovial biopsy correlation.

RESULTS

Out of 50 cases, 20 cases were rheumatoid arthritis, 12 cases of chronic inflammatory arthritis not specified. 10 cases tuberculous arthritis, septic arthritis in 7 cases and gout 1 case.

CONCLUSION

Combination of clinical, radiological, serological, biochemical and microbiologic findings along with synovial fluid and biopsy findings help in diagnosis of specific inflammatory lesions of the synovium and treating the particular condition.

KEYWORDS

Synovial fluid, biopsy, arthritis.

HOW TO CITE THIS ARTICLE: Mamatha SV, Muralidhara V. Clinico-pathological study of inflammatory synovial lesions of knee joint. J Evid Based Med Healthc 2015; 2(59), 8952-56. DOI: 10.18410/jebmh/2015/1265

INTRODUCTION: Synovial (diarthrodial) joints account for most of body's articulation and characterised by wide range of almost frictionless movements.[(1)] The term synovium refers to soft tissue lining the spaces of diarthrodial joints, sheaths, tendons and bursae. Synovium is the central area of pathology in a number of inflammatory joint diseases. Pathology of synovial joints can be considered to be alterations in synovium and cartilage with secondary effects on bone, cartilage and synovial fluid (SF).[(2)] Diseases of the joint fall into two categories, inflammatory and non-inflammatory. Neoplastic disorders of joint are rare, presumably because the cells of the joints are neither undergoing frequent mitosis nor are transient.[(3)] Joint effusions present as diagnostic challenge to physicians and need careful evaluation and interpretation of both clinical and laboratory findings to make accurate diagnosis and avoid unnecessary hospital stay.[(4)]

MATERIALS AND METHODS: A prospective study was done over a period of two years in the Department of Pathology in a tertiary care hospital after obtaining ethical committee clearance. Joint fluid was obtained by arthrocentesis in patients with joint effusions. Fluids were examined immediately or in cases of delay, specimens were stored in refrigerator at 4 degrees and examined within 24 hours. Crystals were examined by wet smear. Gross, microscopic, microbiological and biochemical parameters were examined in 50 samples of synovial fluids with synovial biopsy correlation. Biopsy specimens were fixed in 10% formalin and processed. In cases of tuberculosis, Ziehl – Nelsen (ZN) stain for acid fast bacilli (AFB) was done both in synovial fluids and biopsy.

Submission 05-12-2015, Peer Review 11-12-2015,
Acceptance 17-12-2015, Published 22-12-2015.
Corresponding Author:
Dr. Mamatha S. V, Blood Bank Medical Officer,
Sree Siddhartha Medical College,
Agalakote, Tumkur-572107.
E-mail: drmamathasv@gmail.com
DOI: 10.18410/jebmh/2015/1265

RESULTS: Age of presentation in cases of inflammatory synovial pathology varied from 25-65 years. 18 male and 32 female patients were included in this study with a male: female ratio (M:F) of 1:1.9. Knee joint was involved in all the cases. Pain and joint swelling were the common clinical presentations. Duration of joint swelling ranged from one week to seven years.

Table 1 gives distribution of inflammatory synovial lesions affecting knee joint. Table 2 gives total and differential leucocyte counts in the fluid. On gross examination all the fluids were opaque and yellow. (Figure-1 shows synovial fluid mucin cot test result) The predominant inflammatory cell observed in all the fluids was polymorphs. (Figure-2 showing predominance of polymorphs in permanent stained smear).

In cases of rheumatoid arthritis, joint effusion was seen in 40% cases. Age group varied from 25-65 years. Erythrocyte sedimentation rate (ESR) was raised (35-60 mm/hr). Serum Rheumatoid arthritis (RA) factor was positive in 12/20 cases. Radiologically, joint space reduction, sclerosis, juxta articular osteoporosis and subchondral cysts were seen. Ragocytes were seen on wet mount examination. (Figure-3 showing ragocytes on wet smear) SF glucose level was 26-40 mg/dl and protein 4.2-6.4 g/dl. Microscopic examination in all cases 100% of them showed villous hypertrophy and synovial hyperplasia. Lymphoid follicles, lymphocytic infiltration of subsynovium and few plasma cells were also noted. (Figure-4 showing lymphoid follicles in rheumatoid arthritis).

Chronic non-specific synovitis was seen in 24% patients, presenting with pain, swelling and stiffness of the knee joint with a male predominance (M: F=5:1). ESR was 30-50 mm/hr. X-ray findings were juxta articular osteoporosis and sclerosis in 10/12 cases. SF glucose was 25-30mg/dl and protein 4-5 gm/dl. Microscopic examination of synovial biopsy showed synovial hyperplasia with chronic inflammatory cell infiltration in subsynovium in all cases. Lymphoid aggregates were seen in 8/12 cases. (Figure-5 synovial biopsy with synovial hyperplasia and chronic inflammatory cell infiltrate in chronic non-specific synovitis) Tuberculous arthritis patients presented with pain and swelling in all cases. Stiffness and joint deformity were seen in 4/10 cases. ESR was raised (30-50 mm/hr). Radiologically juxta articular osteoporosis was seen in all cases. Reduction of joint space and erosions were seen in 4/10 cases. Z-N staining for AFB was done in these ten cases but tubercle bacilli were not seen in both SF and biopsy. SF glucose level was 30-40 mg/dl and protein 4.3-4.5 g/dl. On biopsy caseating and non caseating granulomas were seen in all cases, Langhans giant cell in 50% and caseous necrosis in 30%. (Figure-6 showing epithelioid granuloma and Langhans giant cells in tuberculous synovitis).

In septic arthritis patients presented with pain and swelling of the joint, local rise of temperature and fever. ESR was 30 mm/hr. Ragocytes were seen in 5/7 cases. SF glucose levels were 25-40mg/dl and protein 4-5 g/dl. Gram stain was positive in all 7 cases. SF culture showed growth of streptococcus in 3/7cases. Synovial biopsy on microscopic examination showed ulceration of synovium, perivascular infiltration of polymorphs and extensive polymorphic infiltration of sub synovium.

In gouty arthritis, patients presented with pain, redness over the knee joint and local rise of temperature. Serum uric acid level was 8.5 mg/dl. On wet mount examination, numerous intracellular and extracellular, birefringent, needle like crystals exhibiting characteristic yellow birefringence under polarising microscopy were seen. Their morphology was of monosodium urate crystals.

DISCUSSION: Arthritis is frequently encountered in clinical practice and is the important cause of morbidity affecting all ages and both sexes. It may present as monoarticular or polyarticular lesion. Monoarticular lesion follows an infective aetiology, whereas polyarticular lesion is commonly seen in rheumatoid pathology. The relatively frequent occurrence of this problem has led to indiscriminate use of non-steroidal anti-inflammatory drugs by medical practitioners, without arriving at specific diagnosis. Diagnosis can be easily arrived by using a fairly simple technique of arthroscopic synovial aspiration and biopsy and specific treatment can be instituted in cases like tuberculosis.[4]

Inflammatory synovial lesions can be classified as follows:

1. Inflammatory joint disease: (infectious arthritis of known aetiology)- Etiologic agents may be bacterial, spirochaetal, mycobacterial, fungal and viral.
2. Inflammatory arthritis of unknown aetiology such as rheumatoid arthritis, Stills disease/juvenile rheumatoid arthritis, seronegative spondylo arthropathies, psoriatic arthritis, Reiter's syndrome, enteropathic arthritis, sarcoidosis and others.[5]

In the present study knee joint involvement was seen in all cases and rheumatoid arthritis was the most common inflammatory synovial lesion followed by chronic non-specific arthritis. According to Abhyankar et al, tuberculosis was the common lesion followed by rheumatoid arthritis and degenerative joint diseases.[6]

Rheumatoid arthritis was diagnosed in 40% cases. It predominantly involves small joints of hands and feet and knee joint swelling was seen in the present study. Peak age of incidence in our study is 25- 65yrs which is comparable with the study by Amman et al.[7] Female preponderance seen in present study was in comparison with other studies.[7,8,9,10] In 11/20 cases RA positivity was in serum and in 1/20 RA positivity was in synovial fluid. Seropositivitiy was higher in our study which is comparable with the study by Graciela et al.[11] According to various studies [12,13,14,15] synovial fluid total leucocyte count ranges from 4000-60000 cell/cumm with predominance of polymorphs 65%-80% which is in comparison with present study. Synovial biopsy findings such as lymphocytic infiltration and lymphoid follicles along with few plasma cells were seen in our study which is comparable to the study by Vijay PM et al and Garg et al.[5,16]

Chronic non-specific synovitis was the second most common inflammatory synovial lesion in the present study accounting for 24% cases. In our study, no specific etiologic agent or diagnostic features suggestive of specific lesion such as rheumatoid arthritis was found. Most common age of presentation was 32-65 years with male predominance which is in concordance with study by Vijay PM et al and Sant MS et al.[5,17] Biopsy examination showed synovial hyperplasia with chronic inflammatory cell infiltration and focal lymphoid aggregates which is comparable to study by Vijay PM et al[5] Most of the cases of chronic non-specific synovitis could be early stages of rheumatoid or osteoarthritis. Hence these patients should be closely followed up and repeat biopsies can be carried out as they may present with specific diagnostic features in the due course.[5]

Tuberculous arthritis was diagnosed in 20% cases. 7/10 cases were clinically diagnosed, on treatment and presented with knee joint effusion. According to various studies[5,12,13,17] total leucocyte count ranges from 7240-30000cells/cumm which is consistent with present study. Identification of mycobacterium tuberculosis organism on smear or culture is the most reliable method of establishing diagnosis.[18] ZN stain for tubercle bacilli was negative in all ten cases in present study. Berney et al showed that synovial fluid smear stained for acid fast organism will be positive in only 27% of tuberculous joints.[19] Histopathological examination showed caseating and non caseating granulomas in 10/10 cases in present study where as in a study by Vijay PM et al, [5] caseating granulomas was seen in 57.89% and non caseating granuloma in 42.11% cases.

Septic arthritis was seen in 14% cases and is defined as the bacterial invasion of joint space. Most common causes are hematogenous spread or direct invasion of joint space. Knee joint is most commonly affected in adults and hip joint is commonly involved in children.[19] In the present study knee joint was involved and age of presentation was 32-50 years. In majority of cases classic presentation of septic arthritis is single, acutely hot, swollen pain joint in 80-90% cases [20] and in our study 80% cases had similar findings. According to various studies[12,13,15,21,22] total leucocyte count ranges from 25000 to more than 100000 lakhs cells/cumm which is comparable to present study. Krey et al reported that polymorphonuclear neutrophils have a sensitivity of 92% and specificity of 78% in diagnosing septic arthritis.[22,23]

Gouty arthritis is seen in 2% cases. Dai et al reported that total leucocyte count ranges from 4500-10000 cells/cumm with predominance of polymorphs (70%) which is in concordance with present study. Wet mount examination shows numerous intracellular and extracellular, birefringent, needle like crystals exhibiting characteristic yellow birefringence under polarising microscopy.

CONCLUSION: Combination of clinical, radiological, serological, biochemical and microbiologic findings along with synovial fluid and biopsy findings help in diagnosis of specific inflammatory lesions of the synovium and treating the particular condition. Total and differential counts provide a simple way of distinguishing non inflammatory, inflammatory and infectious arthritis. Any synovial fluid with increase in polymorphs indicate joint pathology. Specific diagnosis on biopsy are lymphoid follicles and plasma cell infiltration in cases of rheumatoid arthritis and crystals in case of gout. Synovial fluid examination and identification of the etiologic agent is of importance in treating septic arthritis patients to avoid destruction of synovial joint.

Disease Category	Total Number	Viscosity		Mucin clot test	
Rheumatoid arthritis	20	Normal Low	01 19	Firm Friable	01 19
Chronic non-specific arthritis	12	Normal Low	02 10	Firm Friable	02 10
Tuberculous arthritis	10	Low	10	Friable	10
Septic arthritis	07	Low	07	Friable	07
Gout	01	Low	01	Friable	01

Table 1: Distribution of inflammatory synovial lesions affecting knee joint

Disease category	TLC Cells/ cumm	Mean Cells/cumm	Percentage of polymorphs
Rheumatoid arthritis	3500-18500	16000	85%
Chronic non-specific arthritis	2000-10500	3670	80%
TB arthritis	8000-120000	5060	77%
Septic arthritis	50000-62000	5600	94%
Gout	4500	-	70%

Table 2: Total and differential leucocyte counts in synovial fluid

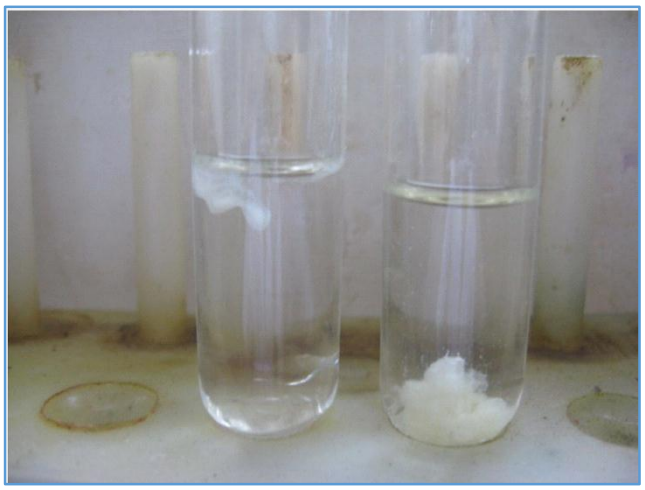

Figure 1: Synovial fluid mucin clot test in cases with joint effusion

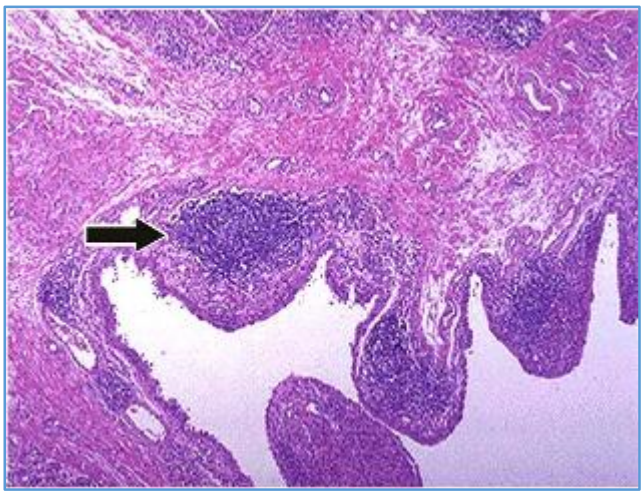

Figure 4: Photomicrograph of synovial biopsy in rheumatoid arthritis showing lymphoid aggregates (H & E, 10x)

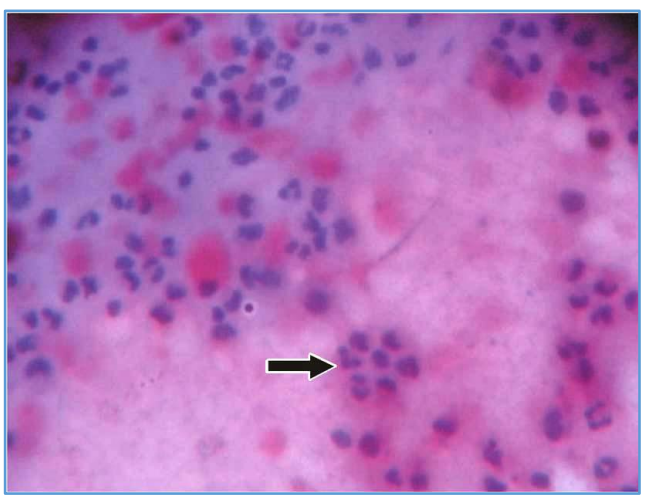

Figure 2: Photomicrograph showing predominance of polymorphs (arrow) in septic arthritis (HXE stain, 10x)

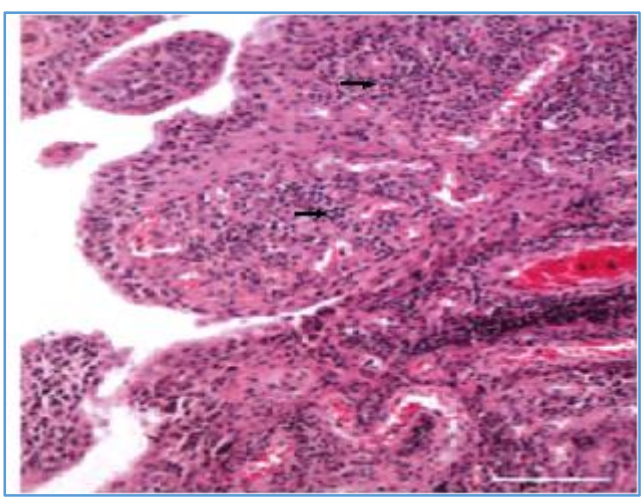

Figure 5: Photomicrograph showing synovial proliferation and lymphoid aggregates in chronic nonspecific synovitis (arrow) (H & E, 10x)

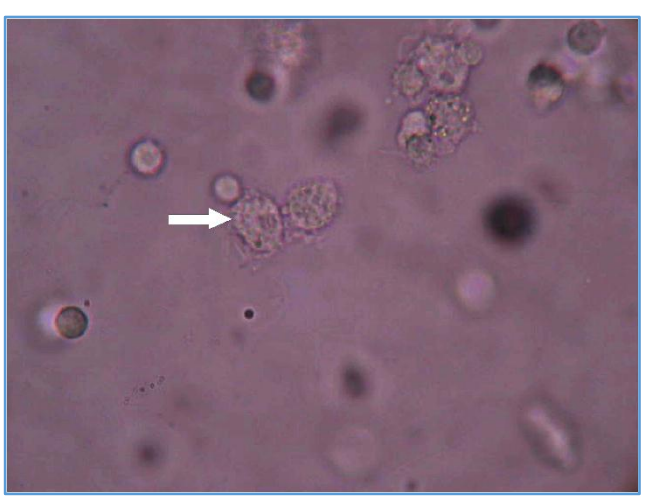

Figure 3: Wet mount examination of synovial fluid in rheumatoid arthritis showing ragocytes (arrow) (40x)

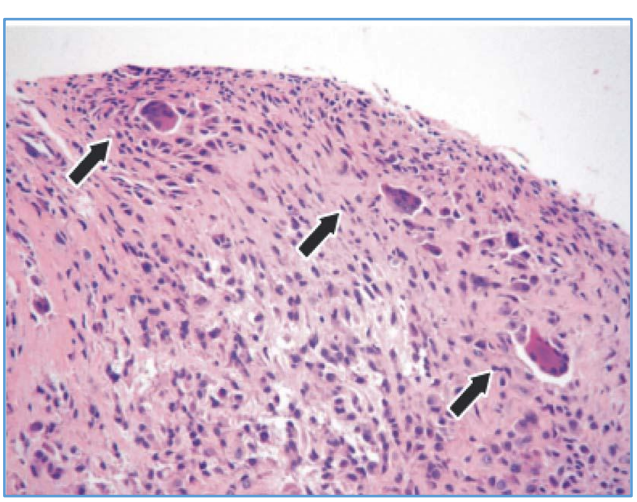

Figure 6: Photomicrograph showing epithelioid granuloma and Langhans giant cells in tuberculous synovitis (arrow) (H & E, 10x)

REFERENCES:

1. Mc Carty DJ. Synovial Fluid. In: Koopman WJ editor. A Text book of Rheumatology. 14th ed. Philadelphia: Lippincott Williams and Wilkins 2001;l(1):83-104.
2. Smith MD. The normal Synovium. Open Rheumatol J 2011;5:100-6.
3. Singhal O, Kaur V, Kalhan S, et al. Arthroscopic synovial biopsy in definitive diagnosis of joint diseases. Int J Appl Basic Med Res 2012;2(2):102-6.
4. Abdullah S, Young min SA, Hudsson J, et al. Gross synovial fluid analysis in the differential diagnosis of joint effusion. J clin Pathol 2001;60(10):1144-1147.
5. Vijay PM, Doddikoppad MM. Clinicopathological study of inflammatory synovial lesions. Int J Bio Med Res 2011;2(4):882-888.
6. Abhyankar SC, et al. A histopathological study of synovium in chronic joint disease. Ind J Pathol Microbial 1987;30:1-5.
7. Amman S, Rustle J, Laukkainen R, et al. The value of synovial fluid assays in the assessment of knee joint destruction in arthritis in a three year follow up study. Ann Rheum Dis 1999;58:559-62.
8. Rosenberg, Andrew. Bones, joints and soft tissue tumours. chapter - 28 in Robbins pathologic basis of disease, 6th edn, editors. Ramzi S Cotran, Vinaykumar and Tucker Collins. Philadelphia; WB. Saunders Co 1999;1246.
9. Hough, Aubrey J. Joints chapter - 75, in Andersons pathology, vol2, 10th edn, Editors Ivan, Damjanov and James Lindu, St Louis; Mosby 1996;2165.
10. Jaffe B, Henry. Degenerative joint disease. Chapter-25, in metabolic degenerative and inflammatory diseases of bones and joints. 1st edn, Philadelphia; Lea & Febiger 1972:725-761.
11. Alacron S Gracela, et al. Seronegative rheumatoid arthritis. Arthritis and Rheumatism 1982;25(5):502-507.
12. Hollander JL, Reginato A, Torralba TP. Examination of synovial fluids as a diagnostic aid in arthritis. Med clin of NA 1966;50:1281-93.
13. Percy JS, Russel AS. Laboratory diagnosis and monitoring of rheumatologic diseases. CMA journal 1975;112:1320-8.
14. Davis MJ, Denton J, Freemont AJ, et al. Comparison of serial synovial fluid cytology in rheumatoid arthritis: delineation of sub groups with prognostic implications. Ann Rheum Dis 1998;47:559-62.
15. Garg ML, et al. Histopathological and histochemical studies of rheumatoid synovitis. Ind J Surg. 1973;35:500-505.
16. Sant MS. Role of synovial biopsy in diagnosis of synovitis of knee joint. Ind J Orth 1994;28(1):3-6.
17. Goldenberg DL, Reed IJ. Bacterial arthritis. N Engl J Med 1985;12:764-71.
18. Berney Steven. et al. Clinical and diagnostic features of tuberculous arthritis. Am j med 1972;53:36-42.
19. Shah BH, Mir T. Concomitant tuberculosis and septic arthritis of knee joint in a diabetic patient. JK Practioner 2003;10(2):127-9.
20. Viser S, Tupper J. Septic arthritis until proven otherwise. Approach and treatment of septic joint in adult patients. Can Fam physician 2009;55(4):374-5.
21. Lawrene RC, Helmick CG, Arnett FC, et al. Estimates of prevalence of arthritis and selected musuloskeletal disorders in the United States. Arthritis Rheum 1998;41:778-99.
22. Krey PR, Bailen D. Synovial fluid leukocytosis. A study of extremes. Am J Med 1979;67:436-42.
23. Margaretin M, Kohlwes J, Moore R, et al. Does this patient have septic arthritis? JAMA 2007;297(13):1478-88.