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A hospital based cross sectional study on synovial fluid analysis among patients with different types of knee joint disorders at a tertiary care hospital

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ABSTRACT

Background: Patients presenting with knee joint disorders are subjected to variety of investigations which are often inconclusive. Instead if they are subjected for synovial fluid analysis, they will be benefited. The objective of the study was to study synovial fluid analysis among patients with different types of knee joint disorders at a tertiary care hospital.
Methods: A hospital based cross sectional study was carried out among 30 patients attending the outpatient Department of Orthopedics and suffering from knee joint pain of either left or right or both the sides. Present study was carried out over a period of two years from January 2011 to December 2012 at Department of Orthopedics, Global Hospitals, Secunderabad. All patients were examined in detail and subjected to all necessary investigations.
Results: Males were more than females. The most common joint disease in the study population was tubercular synovitis in 20% of the cases. The most common condition among males was osteoarthritis while there was no such case in females. Rheumatoid arthritis was most common in females while there was no such case in males. Polymorphs were seen in all cases except osteoarthritis and villonodular synovitis. On biochemical analysis of synovial fluid it was found that gouty arthritis did not have proteins. Proteins were minimum in the synovial fluid in case of osteoarthritis while maximum range was found in cases of tubercular arthritis and rheumatoid arthritis.
Conclusions: Synovial fluid analysis is very important to understand the etiopathogenesis of knee joint diseases. Our study showed that synovial fluid of the knee joint analysis was very informative in the diagnosis and proper management of the patients presenting with knee joint disorders.

Keywords: Synovial fluid analysis, Patients, Knee joint disorders

INTRODUCTION

When the synovium gets afflicted the pattern of reaction to affliction is at times distinctive enough to indicate the etiopathogenesis. Various modalities such as physical examination, radiological examination and investigation can be undertaken to facilitate early diagnosis and treatment. Under these circumstances synovial fluid analysis and synovial biopsy have been found as important and valuable adjunct to conventional investigations. The synovial fluid mirrors the pathology of joint diseases in much the same manner as urine reflects process taking place in the kidneys. Combined synovial fluid analysis and synovial biopsy have been found more informative to the accuracy of diagnosis than either of them done. [1]

Synovial fluid analysis is important for two reasons. The first is to identify the joint infection by synovial fluid

gram stain and culture and the second reason is to diagnose crystal induced by polarized light microscopy.[2]

Analysis of the aspirated joint fluid is the key to the diagnosis of infectious arthritis.[3]

Some common diseases such as gout, pseudo gout and septic arthritis as well as other less common diseases can be quickly and almost definitively diagnosed by examination of the fluid from the knee joints. Even if the joint fluid examination is not diagnostic, it can be one of the most useful of a battery of clinical and laboratory tests in differential diagnosis.[4]

Predominant type of leucocyte in synovial fluid clinches the issue between rheumatoid (neutrophil) and tubercular (lymphocyte) arthritis.[5]

When glucose is being determined, the patient should be fasting for about 12 hours because the equilibrium between blood and the synovial fluid is usually attained slowly. The value of serum synovial differential is less than 10 mgm/dl in normal and may be in present in non inflammatory conditions. In septic arthritis, this difference ranges from 20-60 mgm/dl but overlaps significantly with inflammatory group of arthritis.[6]

Present study was carried out to study synovial fluid analysis among patients with different types of knee joint disorders at a tertiary care hospital.

METHODS

A hospital based cross sectional study was carried out among 30 patients attending the outpatient department of Orthopedics and suffering from knee joint pain of either left or right or both the sides.

Present study was carried out over a period of two years from January 2011 to December 2012 at Department of Orthopedics, Global Hospitals, Secunderabad.

Local Institutional Ethics Committee permission was obtained. Informed consent was taken from all patients included in the present study

Detailed history like age, sex, address, occupation and date and time of admission, date of discharge from the hospital was recorded in the pre designed, pre tested, semi structured study questionnaire developed for the present study.

Detailed clinical examination pertaining to onset of symptoms whether it was insidious onset or acute onset was recorded. Duration of the presenting complaint was noted. At the same time progress of the presenting complaint was recorded. History related to trauma, fever, gout, diabetes, tuberculosis, locking of joints, and rheumatoid arthritis history in the past and history of discharging sinus was taken from all patients and recorded.

Past history related to diabetes, hypertension, Koch disease, infections, past history of any operations, past history of any similar procedure done in the past, and history of any allergic reaction was noted and recorded in the study questionnaire.

Family history like presence of any kind of knee disorders in the family members which are of first degree relatives like father, mother, sister, brother, uncle, aunts etc was noted and recorded. Personal history pertaining to bladder and bowel habits, addictions like smoking, alcohol, tobacco etc was asked and noted.

All patients underwent general examination pertaining to built, nutrition like thin built, and moderately built or heavy built etc. was noted. Temperature, respiration, pulse, blood pressure, pallor, icterus, cyanosis, generalized edema, generalized lymphadenopathy was examined for all the patients included in the present study and recorded.

All patients underwent general examination of respiratory system, cardiovascular system, central nervous system and per abdomen examination. The findings were noted and recorded.

Local examination of both the knee joints was carried out in terms of inspection and palpation. Inspection examination included presence of swelling, deformity if any, gait, wasting and redness at knee joints, instability of the knee joint, sinus or discharge of the knee joints etc was inspected and recorded. Palpation was done for presence of tenderness, warmth, range of movements of the knee joints, patellar tap, joint line tenderness, click locking and special tests like Lachman test, McMurrays test, and Anterior drawer test/posterior drawer test etc were carried out for each and every patients included in the present study.

Investigations like hemoglobin, total leucocyte count, differential leucocyte count, erythrocyte sedimentation rate, x-ray of both the knee joints in anteroposterior and lateral position, complete urine examination, serum uric acid, random blood sugar, and rheumatoid factor was analyzed.

The data was recorded in the Microsoft Excel worksheet and analyzed using proportions.

RESULTS

Males were more than females i.e. 60% compared to 40%. Patients in the age group of more than 50 years were less than the patients belonging to age groups of 11-30 years and 31-50 years where 40% patients were seen in each group.

Table 1: Age and sex wise distribution of cases.

Age (years)	Male		Female		Total	
	Number	%	Number	%	Number	%
11-30	6	20	6	20	12	40
31-50	6	20	6	20	12	40
> 50	6	20	0	0	6	20
Total	18	60	12	40	30	100

Table 2: Age wise distribution of cases in various joint diseases of knee.

Joint diseases	Age (years)						Total	
	11-30		31-50		> 50			
	Number	%	Number	%	Number	%	Number	%
Rheumatoid arthritis	1	3.3	4	13.3	0	0	5	16.7
Septic arthritis	3	10	2	6.7	0	0	5	16.7
Osteoarthritis	0	0	0	0	5	16.7	5	16.7
Gouty arthritis	1	3.3	2	6.7	0	0	3	10
Tubercular synovitis	4	13.3	1	3.3	1	3.3	6	20
Traumatic synovitis	1	3.3	2	6.7	0	0	3	10
Villonodular synovitis	1	3.3	0	0	0	0	1	3.3
Pyogenic synovitis	1	3.3	0	0	0	0	1	3.3
Chronic non specific synovitis	0	0	1	3.3	0	0	1	3.3
Total	12	40	12	40	6	20	30	100

Table 3: Sex wise distribution of cases in various joint diseases.

Joint diseases	Sex				Total	
	Male		Female			
	Number	%	Number	%	Number	%
Rheumatoid arthritis	0	0	5	16.7	5	16.7
Septic arthritis	4	13.3	1	3.3	5	16.7
Osteoarthritis	5	16.7	0	0	5	16.7
Gouty arthritis	0	0	3	10	3	10
Tubercular synovitis	4	13.3	2	6.7	6	20
Traumatic synovitis	3	10	0	0	3	10
Villonodular synovitis	1	3.3	0	0	1	3.3
Pyogenic synovitis	0	0	1	3.3	1	3.3
Chronic non specific synovitis	1	3.3	0	0	1	3.3
Total	12	40	12	40	30	100

Table 4: Synovial fluid appearance of normal and diseased joints of knee.

Joint diseases	Total WBC count/cumm	Predominant cell type
Rheumatoid arthritis	9000-12000	Polymorphs 75-80%
Septic arthritis	14800-18500	Polymorphs 85-95%
Osteoarthritis	6400-10000	Lymphocytes 20-45% & macrophages 10-50%
Gouty arthritis	12000-15000	Polymorphs 70-80%
Tubercular synovitis	9600-12700	Polymorphs 50-80%
Traumatic synovitis	10000-10200	Polymorphs 60-70%
Villonodular synovitis	2000	Hemosiderin laden multinucleated joint cell, lipid laden microphages
Pyogenic synovitis	10000	Polymorphs 70%
Chronic non specific synovitis	8000	Polymorphs 40%

The most common joint disease in the study population was tubercular synovitis in 20% of the cases. There were five cases each of rheumatoid arthritis, septic arthritis and osteoarthritis. There were three cases each of gouty arthritis and traumatic arthritis. There was one case each of villonodular synovitis, pyogenic synovitis and chronic non specific synovitis.

The most common condition among males was osteoarthritis while there was no such case in females. Rheumatoid arthritis was most common in females while there was no such case in males. Chronic non specific synovitis, villonodular synovitis, traumatic synovitis and osteoarthritis were seen in males but not in females. Whereas rheumatoid arthritis, gouty arthritis and pyogenic arthritis was not seen in males but was present in females.

Polymorphs were seen in all cases except osteoarthritis and villonodular synovitis. Septic arthritis showed maximum concentration of polymorphs and chronic non specific synovitis showed minimum polymorphs concentration. Hemosiderin laden multinucleated joint cell, lipid laden microphages was seen in villonodular synovitis. Lymphocytes 20-45% and macrophages 10-50% was seen in osteoarthritis.

Table 5: Biochemical analysis of synovial fluid in various joint diseases of knee.

Joint diseases	Protein (gm%)
Rheumatoid arthritis	3.5-6.4
Septic arthritis	5-7
Osteoarthritis	1.5
Gouty arthritis	-
Tubercular synovitis	4-6.8
Traumatic synovitis	2-2.5
Villonodular synovitis	3.5
Pyogenic synovitis	-
Chronic non specific synovitis	2-3

On biochemical analysis of synovial fluid it was found that gouty arthritis did not have proteins. Proteins were minimum in the synovial fluid in case of osteoarthritis while maximum range was found in cases of tubercular arthritis and rheumatoid arthritis.

DISCUSSION

Males were more than females i.e. 60% compared to 40%. Patients in the age group of more than 50 years were less than the patients belonging to age groups of 11-30 years and 31-50 years where 40% patients were seen in each group.

The most common joint disease in the study population was tubercular synovitis in 20% of the cases. There were five cases each of rheumatoid arthritis, septic arthritis and osteoarthritis. There were three cases each of gouty arthritis and traumatic arthritis. There was one case each of villonodular synovitis, pyogenic synovitis and chronic non specific synovitis.

The most common condition among males was osteoarthritis while there was no such case in females. Rheumatoid arthritis was most common in females while there was no such case in males. Chronic non specific synovitis, villonodular synovitis, traumatic synovitis and osteoarthritis were seen in males but not in females. Whereas rheumatoid arthritis, gouty arthritis and pyogenic arthritis was not seen in males but was present in females.

Polymorphs were seen in all cases except osteoarthritis and villonodular synovitis. Septic arthritis showed maximum concentration of polymorphs and chronic non specific synovitis showed minimum polymorphs concentration. Hemosiderin laden multinucleated joint cell, lipid laden microphages was seen in Villonodular synovitis. Lymphocytes 20-45% and macrophages 10-50% was seen in osteoarthritis.

On biochemical analysis of synovial fluid it was found that gouty arthritis did not have proteins. Proteins were minimum in the synovial fluid in case of osteoarthritis while maximum range was found in cases of tubercular arthritis and rheumatoid arthritis.

Najeeb et al analyzed 477 samples of synovial fluid.[7] Females were more than males. But in our study the males were more than females. They found that in the cases with septic arthritis the total leucocyte count was highest and it was lowest in osteoarthritis. We also found similar results. They found similar results for neutrophils also. They also noted that the sugar levels were more in patients with osteoarthritis. We did not do the levels of sugar in synovial fluid analysis. The authors mentioned that proteins were highest in cases with rheumatoid arthritis. We also found similar results. The authors concluded that biochemical analysis of synovial fluid is vital which can help in the diagnosis of the arthritis as well it helps in differentiating between the arthritis types.

Pathak et al studied 50 cases of arthritis and found that the most commonly affected joint was knee joint in 65.8% of the cases.[8] Males were more than females. We also found that males were more than females. But the mean age of males and females was not different significantly. Rheumatoid arthritis was most common followed by tubercular arthritis. Ten cases were of non specific synovitis. The biopsy of synovial fluid was found to be 100% specific and 85% sensitive. It has 100% positive predictive value and a 62% of negative predictive value. The authors concluded that synovial fluid analysis can help in determining the cause of arthritis. It also helps in proper management of patients and avoids unnecessary use of certain drugs.

Vijay et al found that people in the age group of 40-50 years were commonly affected.[9] Males were more affected than females. Pain and swelling was the most common clinical features. Most commonly affected joint was knee joint. We also observed similar findings. Chronic non specific synovitis was the most common followed by tubercular arthritis. The authors concluded that there is a need to proper follow up of patients with chronic non specific synovitis as the repeat biopsy can demonstrate transition of such patients from chronic non specific synovitis to definitive arthritis. The authors also emphasized the need of serological tests in cases where rheumatoid arthritis is suspected clinically or histopathologically to exclude rheumatoid arthritis.

Reddy et al studied 100 cases and found that the most common type was single joint involvement.[10] Knee joint was the joint most commonly affected. Most common cause of joint diseases was rheumatoid arthritis. The next most common condition was tubercular arthritis. Males were more than females. We also observed that males were affected than females. The authors concluded that evaluation of synovial fluid analysis is useful.

CONCLUSION

Synovial fluid analysis is very important to understand the etiopathogenesis of knee joint diseases. Our study showed that synovial fluid of the knee joint analysis was very informative in the diagnosis and proper management of the patients presenting with knee joint disorders. We were able to properly treat the cases of knee joint disorders on synovial fluid analysis results and follow them with success and satisfaction.

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