

Original Research Article

Role of arthroscopy for early diagnosis and early therapeutic intervention in knee synovitis compared to histopathology

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ABSTRACT

Background: Arthroscopy has been found to be very useful for early diagnosis and also found useful for early therapeutic interventions in patients with synovitis of the knee joint disorders. The objective of the study was to study the role of arthroscopy for early diagnosis and early therapeutic intervention in knee synovitis.

Methods: Hospital based prospective study was carried out at Department of Orthopedics, Dr. D. Y. Patil Medical College, Pune over a period of August 2006 to October 2008 among 30 cases as per the inclusion and exclusion criteria. All patients underwent arthroscopy, clinical examination and histopathology of knee joint tissues. Comparison was made between clinical diagnosis and histopathology as well as between arthroscopy findings and histopathology.

Results: Pain and swelling of knee joint was reported by all patients. Anemia was seen in 70% of the cases. The accuracy of arthroscopic diagnosis was more than clinical diagnosis. Where clinical diagnosis failed to diagnose conditions like villonodular synovitis, pyogenic synovitis and gouty arthritis, the arthroscopic diagnosis was 100% accurate in the first two conditions and 66.7% accurate in the last condition. Where clinical diagnosis was accurate to 80-83% in cases of rheumatoid arthritis, septic arthritis and tubercular arthritis, the arthroscopic diagnosis was 100% accurate. Where in case of osteoarthritis, the clinical diagnosis could identify only 20% of the conditions, arthroscopic diagnosis was able to diagnose 40% of the actual cases.

Conclusions: Arthroscopic diagnosis was more accurate as compared to clinical diagnosis and it was almost 100% in all cases of knee joint diseases except in two. Thus arthroscopic diagnosis can be relied upon and treatment can be started on this basis in view of time consuming and costly histopathological tests.

Keywords: Arthroscopy, Early diagnosis, Therapeutic intervention, Knee synovitis

INTRODUCTION

The histopathological examination of the pathological tissue involved in knee disease is the final confirmatory test in most of the cases. There are various methods to get the pathological tissues like open arthrotomy, needle biopsy, arthroscopic biopsy. Review of literature shows arthroscopic biopsy is most specific and accurate method of obtaining the pathological tissue for histopathological

examination without the morbidity of open arthrotomy and the loss of specificity and sensitivity of needle biopsy.¹

An arthroscopy provides the opportunity to visualize the joint completely helps to document and photograph the various pathological lesions and at the same time can take punch biopsy of exact site of lesion which makes it specific and truly representative of pathological lesions.

The concept of not only visualizing the knee joint but also treating the problem without producing much damage and resulted in the concept of minimal invasive survey i.e. arthroscopy and its extension for diagnosis and treatment of various knee conditions.²

Arthroscopy has dramatically changed the way in which orthopedic surgeon approaches the diagnosis and treatment of a variety of joint ailments, especially of knee. A high degree of accuracy is clearly possible once a surgeon gains experience in arthroscopic techniques. The low morbidity and rapid rehabilitation and early return of patient back to job associated with arthroscopy make the procedure justifiable in variety of joint disorders as a possible adjunct to diagnosis and as a treatment modality in itself.³

The knee joint is the largest articulation in the body and is the joint most commonly injured due to its complex anatomic structure. It is one of the commonly affected joints in various rheumatological conditions. As like the other synovial joints, it is prone to be affected by various pathological conditions ranging from infection, trauma, rheumatic and rheumatoid arthritis, hematological and coagulation disorders and various other pathologies. All of these diseases present as knee swelling and synovitis and pose a challenge for clinical diagnosis.⁴

Symptom complex of pain, swelling and stiffness labeled as arthritis is a common entity of all age groups and prevalent in either sex. Many remain unrelieved of symptomatology with usual analgesics. Arthritis usually presents as monoarticular and poly articular lesion. Mono articular lesion often follows trauma or infection while poly articular lesions are commonly seen in rheumatoid pathology.⁵

METHODS

Study design

Hospital based prospective study.

Place of the study

Present study was carried out at Department of Orthopedics, Dr. D. Y. Patil Medical College, Pune.

Duration of the study

The study was carried out over a period of August 2006 to October 2008.

Sample size of the study

Over the study period, it was possible to include a total of 30 cases as per the inclusion and exclusion criteria of the present study.

Inclusion criteria: Patients with clinical symptoms of knee swelling, pain in range of movements; patients with combined lesions with ligament laxity; patients willing to participate in the present study were included.

Exclusion criteria: Patients suffering from severe systemic diseases; bed ridden patients; patients not willing to participate were excluded from the study.

The clinical diagnosis was based on careful history, physical examination and standard roentgenograms. Clinical examination included range of movements of knee joints, valgus and varus stress test, anterior and posterior drawer test, Lachman test and McMurrays tests. All selected patients were told about the arthroscopic procedure.

Necessary investigations in the form of relevant blood examination like Hemogram, CRP, and arthritic profile were done along with X rays of the knee after taking necessary consent from the patients.

We used following equipments for diagnostic and therapeutic arthroscopy: 30 forward oblique arthroscope, arthroscope trocar and canula, fibro optic cable, xenon light source, endoscopic video camera, television monitor, motorized shaving system and operating instruments like probe, suction canula, 3.4 mm punch biopsy forceps. All optical instruments and cables were soaked in activated gluten aldehyde (cidex) for 60 min. Other operative instruments were sterilized by routine autoclaving.

In all patients pneumatic tourniquet with pressure maintaining 300 mmHg was used. In most cases, spinal anesthesia was preferred over other types of anesthesia. Upon arrival in the operation theatre, patients affected knee was identified and confirmed and was scrubbed with savlon and betadine for five minutes. The region from mid thigh to foot was scrubbed and painted as for arthroscopy in strict aseptic conditions.

The drapes were carefully placed and clipped with the prepared foot being sealed off in strict towels and sheets so that the knee could be maneuvered without possibility of contamination and disturbance of drapes. Use of plastic sheets and adhesive incise drapes were used to seal the field from wet contamination. Normal saline was used in all cases for irrigation. 2 liter plastic bags of normal saline were suspended at least 1.5 m above the level of patient and plastic bags were connected with special large bore plastic tubing to the inflow tube of the arthroscope canula.

Antero-lateral position was preferred for routine arthroscopy. The probing and arthroscopy operative instrument was used via anteromedial portals. The portals were inter-changed as required and accessory portals were used. The knee joint was examined in the following sequence: supra patellar pouch patella femoral pouch,

medial gutter, medial compartment, lateral compartment and gutter and lastly posteromedial compartment. After initial arthroscopic inspection, the structures like anterior cruciate ligament, medial and lateral menisci, tested and seen for their integrity and consistency. After immediately making the entry portals the synovial fluid was collected. After viewing the structures and compartment the findings were documented and photographed digitally. Then using 4 mm punch biopsy forceps synovial biopsy was done and the tissue was fixed in 10% normal saline. The synovial fluid was sent for cytology, culture and for biochemistry.

The data was analyzed using proportions.

RESULTS

Table 1: Distribution of cases as per clinical picture.

Clinical picture	Number	%
Pain	30	100
Swelling	30	100
Restriction of movements	13	43.3
Redness	8	26.7
Morning stiffness	5	16.7
Fever	4	13.3
Chills	1	3.3
Malaise	1	3.3
Weakness	2	6.7

Pain and swelling of knee joint was reported by all patients. This was followed by restriction of movements which was reported by 43.3% of the cases while morning

stiffness was reported by 16.7% of the cases. Fever was present in 13.3% of the cases while there was one case each of chills and malaise.

Table 2: Distribution of cases as per investigations.

Investigations	Number	%
Anemia	Yes	21 70
	No	09 30
CRP	Positive	10 33.3
	Negative	20 66.7
ASO titer	Positive	0 0
	Negative	30 100
RA factor	Positive	5 16.7
	Negative	25 83.3

Mean WBC count: 11520±2990.1

Anemia was seen in 70% of the cases. CRP was positive in one third of the cases. No patient was found positive for ASO titer. Five patients (16.7%) were having positive RA factor. The mean WBC count was 11520±2990.1.

Overall in 12 cases the clinical diagnosis differed from that of gold standard i.e. histopathology. In three cases the diagnosis was chronic non specific synovitis but it turned out to be Osteoarthritis on histopathology. In one case the clinical diagnosis was chronic non specific synovitis but it turned out to be pyogenic synovitis on histopathology. In one case the clinical diagnosis was chronic non specific synovitis but it turned out to be Villonodular synovitis s on histopathology. In three cases the diagnosis was septic arthritis but it turned out to be gouty arthritis on histopathology.

Table 3: Number of cases of clinical diagnosis differed from histopathological diagnosis.

Clinical diagnosis	Histopathological diagnosis	Number	%
Chronic non specific synovitis	Osteoarthritis	3	33.3
Chronic non specific synovitis	Pyogenic synovitis	1	8.3
Chronic non specific synovitis	Villonodular synovitis	1	8.3
Septic arthritis	Gouty arthritis	3	25
Septic arthritis	Tubercular synovitis	1	8.3
Tubercular synovitis	Septic arthritis	1	8.3
Osteoarthritis	Rheumatoid arthritis	1	8.3
Total		12	100

Table 4: Number of cases of arthroscopic diagnosis differed from histopathological diagnosis.

Arthroscopic diagnosis	Histopathological diagnosis	Number	%
Chronic non specific synovitis	Osteoarthritis	3	75
Septic arthritis	Gouty arthritis	1	25
Total		4	100

Overall in four cases only the arthroscopic diagnosis differed from that of histopathology findings. In three cases the arthroscopic diagnosis was chronic non specific

synovitis but it turned out to be Osteoarthritis on histopathology. In one case the clinical diagnosis was septic arthritis but it turned out to be Gouty arthritis on histopathology.

Table 5: Accuracy of clinical diagnosis in comparison to histopathological diagnosis.

Histopathological diagnosis	Correlated with histopathological diagnosis	Not correlated with histopathological diagnosis	Total	Overall accuracy (%)
Rheumatoid arthritis	4	1	5	80
Septic arthritis	4	1	5	80
Osteoarthritis	1	4	5	20
Gouty arthritis	0	3	3	0
Tubercular synovitis	5	1	6	83.3
Traumatic synovitis	3	0	3	100
Villonodular synovitis	0	1	1	0
Pyogenic synovitis	0	1	1	0
Chronic non specific synovitis	1	0	1	100

Table 6: Correlation between histopathological and arthroscopic diagnosis in the study group.

Histopathological diagnosis	Correlated with histopathological diagnosis	Not correlated with histopathological diagnosis	Total	Overall accuracy
Rheumatoid arthritis	5	0	5	100
Septic arthritis	5	0	5	100
Osteoarthritis	2	3	5	40
Gouty arthritis	2	1	3	66.7
Tubercular synovitis	6	0	6	100
Traumatic synovitis	3	0	3	100
Villonodular synovitis	1	0	1	100
Pyogenic synovitis	1	0	1	100
Chronic non specific synovitis	1	0	1	100

Table 7: Comparison between accuracy of clinical diagnosis and arthroscopic diagnosis.

Histopathological diagnosis	Overall accuracy of clinical diagnosis (%)	Overall accuracy of arthroscopic diagnosis (%)
Rheumatoid arthritis	80	100
Septic arthritis	80	100
Osteoarthritis	20	40
Gouty arthritis	0	66.7
Tubercular synovitis	83.3	100
Traumatic synovitis	100	100
Villonodular synovitis	0	100
Pyogenic synovitis	0	100
Chronic non specific synovitis	100	100

The accuracy of clinical diagnosis in comparison to histopathological diagnosis was 100% in case of traumatic arthritis and chronic non specific synovitis. It was 80% or more in cases of rheumatoid arthritis, septic arthritis and tubercular synovitis. It was very low or zero percent in cases of gouty arthritis, villonodular synovitis and pyogenic synovitis.

The accuracy of arthroscopic diagnosis was found to be 100% in cases of rheumatoid arthritis, septic arthritis, tubercular synovitis, traumatic synovitis, villonodular synovitis, pyogenic synovitis, and chronic non specific synovitis. It was 66.7% in case of gouty arthritis and 40% in case of osteoarthritis.

Thus it can be seen from the above table that the accuracy of arthroscopic diagnosis was more than clinical diagnosis. Where clinical diagnosis failed to diagnose conditions like villonodular synovitis, pyogenic synovitis and gouty arthritis, the arthroscopic diagnosis was 100% accurate in the first two conditions and 66.7% accurate in the last condition. Where clinical diagnosis was accurate to 80-83% in cases of rheumatoid arthritis, septic arthritis and tubercular arthritis, the arthroscopic diagnosis was 100% accurate. Where in case of osteoarthritis, the clinical diagnosis could identify only 20% of the conditions, arthroscopic diagnosis was able to diagnose 40% of the actual cases.

DISCUSSION

Pain and swelling of knee joint was reported by all patients. This was followed by restriction of movements which was reported by 43.3% of the cases while morning stiffness was reported by 16.7% of the cases. Fever was present in 13.3% of the cases while there was one case each of chills and malaise.

Anemia was seen in 70% of the cases. CRP was positive in one third of the cases. No patient was found positive for ASO titer. Five patients (16.7%) were having positive RA factor. The mean WBC count was 11520 ± 2990.1 .

Overall in 12 cases the clinical diagnosis differed from that of gold standard i.e. histopathology. In three cases the diagnosis was chronic non specific synovitis but it turned out to be Osteoarthritis on histopathology. In one case the clinical diagnosis was chronic non specific synovitis but it turned out to be pyogenic synovitis on histopathology. In one case the clinical diagnosis was chronic non specific synovitis but it turned out to be villonodular synovitis on histopathology. In three cases the diagnosis was Septic arthritis but it turned out to be gouty arthritis on histopathology.

Overall in four cases only the arthroscopic diagnosis differed from that of histopathology findings. In three cases the arthroscopic diagnosis was chronic non specific synovitis but it turned out to be osteoarthritis on histopathology. In one case the clinical diagnosis was Septic arthritis but it turned out to be gouty arthritis on histopathology.

The accuracy of clinical diagnosis in comparison to histopathological diagnosis was 100% in case of traumatic arthritis and chronic non specific synovitis. It was 80% or more in cases of rheumatoid arthritis, septic arthritis and tubercular synovitis. It was very low or zero percent in cases of gouty arthritis, villonodular synovitis and pyogenic synovitis.

The accuracy of arthroscopic diagnosis was found to be 100% in cases of rheumatoid arthritis, septic arthritis, tubercular synovitis, traumatic synovitis, villonodular synovitis, pyogenic synovitis, and chronic non specific synovitis. It was 66.7% in case of gouty arthritis and 40% in case of osteoarthritis.

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conditions, arthroscopic diagnosis was able to diagnose 40% of the actual cases.

Vordenbaumen et al on correlation analysis found that synovitis was correlated with DAS 28 with a correlation coefficient of 0.74, with CRP with a correlation coefficient of 0.69 and with US 7 with a correlation coefficient of 0.66 and all these correlations were statistically significant.⁶ After six months there was a reduction in the DAS 28 among all patients. The authors concluded that arthroscopy is a very good diagnostic tool over clinical diagnosis and can identify patients with definitive diagnosis for those patients who were missed by clinical means. We also concluded with similar conclusion.

Singhal et al found that rheumatoid arthritis and tubercular arthritis were most common in comparison to other causes of knee joint diseases.⁷ Chronic non specific synovitis was next most common. The clinico-pathological correlation was 68%. We also found that the clinico-pathological correlation was less. Arthroscopy was found to be 85% sensitive, 100% specific. It had a 100% of positive predictive value and 62% of negative predictive value. The authors concluded that arthroscopy guided synovial biopsy is easy and simple and better than clinical diagnosis. We also noted similar observations.

Kuzmanova et al found that the correlation between histological and arthroscopy and the correlation coefficient was 0.76.⁸ We also found that arthroscopy was 100% accurate in comparison to histopathology. The authors noted that the average value of synovitis as per VAS was 43.16 mm. the average value of intensity of inflammatory process as per VAS was 54.31 mm. the authors concluded that two methods i.e. arthroscopy and histopathology are supportive to each and can be used concurrently.

Baeten et al studied cases of rheumatoid arthritis. They found a weak correlation between histopathology reports of synovial fluid and C reactive proteins.⁹ They concluded that "The immune architecture of the synovial membrane is more dependent on local disease activity than on disease duration. Synovium obtained from clinically affected joints shows important histological differences between RA and SpA."

Wechalekar et al in their review mentioned that arthroscopic biopsy is the gold standard and at the same time it is safe for the patients.¹⁰ This test helps to understand the pathogenesis of the diseases. It also helps to understand the mechanism of action of targeted therapies. It is also useful for research. It is better than synovial fluid analysis.

CONCLUSION

Arthroscopic diagnosis was more accurate as compared to clinical diagnosis and it was almost 100% in all cases

of knee joint diseases except in two. Thus arthroscopic diagnosis can be relied upon and treatment can be started on this basis in view of time consuming and costly histopathological tests. Histopathology is costly and time consuming compared to arthroscopy and its use can be recommended especially when the facilities for histopathology are not available.

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Ethical approval: The study was approved by the institutional ethics committee

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