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

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Abstract
Background and Aim: Osteoarthritis (OA) is the most common form of arthritis and a major cause of joint pain and disability. Synovial fluid analysis and biopsy have been found to be a valuable adjunct to conventional investigations and are routinely advised in most cases of joint diseases. Needle arthroscopy of the knee has been advocated as it allows good macroscopic evaluation of synovial inflammation and selective sampling of the synovial membrane thereby overcoming the disadvantage of closed needle biopsy.
Material and Methods: In the decided study period, total of 60 cases were selected as per the inclusion and exclusion criteria decided prior to the start of the study. The clinical examination with movements in knee joints, valgus stress test, lachman test amd McMurrays test was done. After initial arthroscopic inspection, the structures like anterior cruciate ligament, medial and lateral menisci, tested and seen for their integrity and consistency. The synovial fluid was sent for cytology, culture and for biochemistry. The data was analyzed using proportions.
Results: Overall in 24 cases the clinical diagnosis differed from that of gold standard *i.e.* histopathology. In six cases the diagnosis was chronic non-specific synovitis but it turned out to be Osteoarthritis on histopathology. In two cases the clinical diagnosis was chronic non-specific synovitis but it turned out to be pyogenic synovitis on histopathology. In two cases the clinical diagnosis was chronic non-specific synovitis but it turned out to be Villonodular synovitis s on histopathology. In six cases the diagnosis was septic arthritis but it turned out to be gouty arthritis on histopathology.
Conclusion: 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: Histopathology, needle arthroscopy, osteoarthritis, synovial fluid

Introduction
Quantifying inflammation, disease activity and predicting joint destruction in rheumatic diseases remains a significant challenge. Clinical examination remains important, and although this can contribute in assessing synovitis and predicting outcome, it remains insensitive for both these parameters. 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 [1, 2].
Osteoarthritis (OA) is the most common form of arthritis and a major cause of joint pain and disability. We live longer than our ancestors and, for the first time in history, people aged 65 years and older will outnumber children younger than 5 years, and the number of people aged 60 years and above is expected to double by 2050 and more than triple by 2100. Being primarily related to ageing, the prevalence of OA will steadily increase and is expected to be the single greatest cause of disability in the general population by 2030. This will not only affect individuals' quality of life but also account for substantial burden on health care systems globally. Yet current analgesic therapies are limited in efficacy and by significant toxicity and there are no licensed disease modifying drugs [3, 4].
Recently, new criteria for detecting early knee OA were proposed by the first international EKOA workshop (EKOA) without radiographic abnormalities; they allow identification of

people with moderate knee symptoms who have same risk factors as those with definitive knee OA. EKOA prevalence was 9.5% in men and 15.0% in women, and the highest prevalence was noted in middle-aged females. Nevertheless, EKOA's etiology has not been well studied [5-7].

When the synovium gets afflicted, the pattern may indicate the etiopathogenesis. Synovial fluid analysis and biopsy have been found to be a valuable adjunct to conventional investigations and are routinely advised in most cases of joint diseases [7, 8]. Needle arthroscopy of the knee has been advocated as it allows good macroscopic evaluation of synovial inflammation and selective sampling of the synovial membrane thereby overcoming the disadvantage of closed needle biopsy.

Materials and Methods

The present analysis is the hospital based study. It was carried out in the department of orthopaedics in the medical college and hospital. The study was done for the period of two years. In the decided study period, total of 60 cases were selected as per the inclusion and exclusion criteria decided prior to the start of the study.

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

Complete histories of the included patients were recorded. The clinical examination with movements in knee joints, valgus stress test, lachman test amd McMurrays test was done. Included patients were given information 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. Routine operative procedures were followed.

For the routine arthroscopy procedure the antero lateral position was used. With the anteromedial portals the arthroscopy instruments and the probing instruments were used. As per the need the portals were interchanged and replaced with accessory portals.

After initial arthroscopic inspection, the structures like anterior cruciate ligament, medial and lateral menisci, tested and seen for their integrity and consistency. 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

A total of 60 included cases were divided as per the clinical symptoms recorded in the history. Majority of the patients complained of swelling and pain in the knee joint. Next major complain was of the restrictions in the movement of the joint present in 44% individuals. In 14% of cases fever was reported.

Overall in 24 cases the clinical diagnosis differed from that of gold standard *i.e.* histopathology. In six cases the diagnosis was chronic non-specific synovitis but it turned out to be Osteoarthritis on histopathology. In two cases the clinical diagnosis was chronic non-specific synovitis but it turned out to be pyogenic synovitis on histopathology. In two cases the clinical diagnosis was chronic non-specific synovitis but it turned out to be Villonodular synovitis s on histopathology. In six cases the diagnosis was septic arthritis but it turned out to be gouty arthritis on histopathology.

Overall in eight cases only the arthroscopic diagnosis differed from that of histopathology findings. In six cases the arthroscopic diagnosis was chronic non-specific synovitis but it turned out to be Osteoarthritis on histopathology. In two case the clinical diagnosis was septic arthritis but it turned out to be Gouty arthritis on histopathology.

Table 1: Comparative analysis of arthroscopic and clinical diagnosis

Histopath diagnosis	Clinical diagnosis	Arthroscopic diagnosis
Rheumatoid arthritis	82	100
Osteoarthritis	30	48
Gouty arthritis	0	72
Traumatic synovitis	100	100
Pyogenic synovitis	0	100
Chronic non-specific synovitis	100	100
Spectic arthritis	85	100

Thus it can be seen from the above table 1 that the accuracy of arthroscopic diagnosis was more than clinical diagnosis.

Discussion

Synovitis is an important factor for determining the incidence and progression of knee OA10. Infamed synovium secretes proteases such as MMP-3 and disintegrins and metalloproteinases with thrombospondin motifs (ADAMTSs), as well as cytokines such interleukin 1β and tumor necrosis factor α, all of which damage the cartilage matrix. Evidence of synovitis using serum biomarkers, MRI, and arthroscopic fndings are related to the rapid progression of knee OA; nevertheless, these examinations are contraindicated in clinical practice and large epidemiological studies because they are expensive and time-consuming [5, 9].

Some studies investigate the importance of biomarkers in those with early stage of knee OA in large sample cohort studies. Elucidating the prevalence of synovitis in patients with symptomatic knees without radiographic abnormalities and diagnostic serum biomarkers may lead to a better understanding of the pathology and the potential for therapeutic intervention [10, 11].

Histological features such as levels of macrophage infiltration and lining layer hyperplasia are associated with disease activity and structural damages. Validated scores exist in order to assess and quantify histological inflammation within the synovial membrane [2, 12].

Disease activity score 28 has been showed to correlate with histological inflammation of the synovial membrane. Indeed, sublining macrophages are considered a sensitive biomarker of response to treatment. However, synovial biopsies are not routinely performed in order to assess inflammation. In contrast, non-invasive imaging tools are routinely used [13].

Study of synovial fluid has been advocated for long in distinctive diagnosis of articular diseases. Synovial biopsy has come a long way since being attempted first with a dental nerve extractor, introduced into the joint through a large calibre needle. Examination of synovial tissue has been thought to be the only way to make a definitive diagnosis in some infectious, infiltrative, and deposition diseases of joints.

This includes granulomatous diseases and infections by difficult-to-culture organisms such as Chlamydia and Neisseria. This also includes diseases such as sarcoidosis, osteochondromatosis, pigmented villonodular synovitis, hemochromatosis, amyloidosis etc.

Kuzmanova *et al*. 2003 [14] found that the correlation between histological and arthroscopy and the correlation coefficient was 0.76. We also found that arthroscopy was 100% accurate in comparison to histopathology. Wechalekar *et al*. 2014 [13] in their review mentioned that arthroscopic biopsy is the gold standard and at the same time it is safe for the patients. In the present study 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.

Conclusion

Thus arthroscopic diagnosis can be relied upon and treatment can be started on this basis in view of time consuming and costly histopathological tests.

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