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Original Research Article

Indications and effectiveness of arthroscopic lavage and debridement in osteoarthritis knee

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ABSTRACT

Background: Degenerative joint disease will afflict most of the people if they live long enough. The majority of patients with osteoarthritis present to orthopaedic surgeons seeking relief of pain and associated restoration of function. Various intraarticular and periarticular structures may be the cause of pain. Improvement in osteoarthritis by arthroscopic lavage and debridement is seen due to various mechanisms.
Methods: In a prospective study from July 2016 to December 2018, 35 patients with primary osteoarthritis knee were assessed for effectiveness of arthroscopic lavage and debridement in relieving symptoms of osteoarthritis of knee and to determine the indications of arthroscopy in osteoarthritis of knee. Assessment was done using variables as age of the patient, body mass index, varus deformity, radiographic grading and arthroscopic grading.
Results: A declining trend was seen on follow up over time; 91.4% excellent to good results seen at one month follow up, 76.1% at six months, 49.93% at twelve months, 37.5%, at eighteen months, 23.07% at twenty-four months and 28.5% at thirty months. Results at six month follow up when compared, were better for age less than 50 years (88.8% Vs 73.1% in >50 years age), normal weight patients with BMI 18.5 to 25(94.5% Vs 58.5% in overweight), varus angulation $<10^0$(93.1% Vs 0% in $>10^0$), radiological grade I and II (95-100% Vs 45-50% in grade III and IV) and arthroscopic grade I and II (94-100% Vs 0-77% in grade III and IV).
Conclusions: Arthroscopic lavage and debridement is an effective method of treatment for osteoarthritis knee in patients with grade I and grade II osteoarthritis having symptoms of pain and locking due to loose bodies or degenerative meniscal tears.

Keywords: Arthroscopic lavage, Arthroscopy indication, Knee, Osteoarthritis, Painful knee

INTRODUCTION

Osteoarthritis is the most common form of arthritis and a leading cause of chronic disability, in a large part due to knee and/or hip involvement. Osteoarthritis was the term originally proposed by John Spender in 1886. The terms osteoarthrosis and degenerative joint disease have a certain appeal but are nonspecific. Furthermore, they give no information about the pathologic processes that characterize the disorder. Arthritis deformans, as proposed by Heine in 1926, was for many years considered a synonym for osteoarthritis in the European medical community.[1] The World Health Organisation estimates that Osteoarthritis is a cause of disability in at least 10% of the population over age 60 years.[2] Knee is most commonly involved joint. Knee osteoarthritis alone is often associated with disability as heart and chronic lung diseases. Women are more commonly affected.

Over the twentieth century, the definition of Osteoarthritis has evolved from "hypertrophic arthritis" to the most common current consensus definition: "Osteoarthritis diseases are a result of both mechanical and biological events that destabilize the normal coupling of degradation and synthesis of articular cartilage, chondrocytes, extracellular matrix and subchondral bone.[3] Although they may be initiated by multiple factors including genetic, metabolic, developmental and traumatic; osteoarthritic diseases involve all of the tissues of the diarthrodial joint. Ultimately, Osteoarthritic diseases are manifested by morphological, biochemical, molecular, and biomechanical changes of both cells and matrix which leads to softening, fibrillation, ulceration, loss of articular cartilage, sclerosis and eburnation of subchondral bone, osteophytes and subchondral cysts. When clinically evident, osteoarthritic diseases are characterised by joint pain, tenderness, crepitus, limitations of movements, occasional effusion and variable degrees of inflammation without systemic effects. Diagnostic criteria have been developed for osteoarthritis by Altman et al (1986).[4]

The majority of patients with osteoarthritis present to orthopaedic surgeons seeking relief of pain and associated restoration of function. Despite of extensive understanding of the disease, the exact cause of pain is yet to be found. The various intraarticular and periarticular structures may be the cause of pain which is later confounded by individual psychology. Cartilage itself is aneural but there is rich sensory innervation of other joint tissues. Unmyelinated type C-fibers capable of nociception are sparsely but specifically distributed in the knee. Most are located outside the synovial space; within bone, periosteum, and capsule. Within the joint space, these fibers seem to be confined to the outer rim of the meniscus and through some areas of synovium, particularly if the synovium is inflamed.

Despite decades of study, the relationship of pathology in the subchondral bone to cartilage breakdown in osteoarthritis is still an enigma. Interest in this relationship has increased recently because of observations that: Bone marrow edema may be related to both pain and bone remodeling in osteoarthritis; osteocytes undergo metabolic changes related to bone remodeling and secrete cytokines that stimulate cartilage degeneration; focal osteonecrosis occurs in osteoarthritis, suggesting common mechanisms of disease.

Various mechanisms have been given behind the improvement in osteoarthritis due to arthroscopic lavage and debridement. These beneficial effects may be because of removal of cartilage debris, proliferated synovium, osteophytes, degenerated meniscus, loose bodies and mediators of inflammation such as cytokines, by cooling effect, by adjusting the osmotic pressure of the synovial fluid and pH, by dilution of the degenerative compounds, by disruption of the adhesions and by placebo effect.

METHODS

It was a prospective study done at HIMS, Safedabad, Barabanki, U.P, India from July 2016 to December 2018. Total number of patients in the study was 35. Aim of the study was to assess the effect of arthroscopic lavage and debridement in relieving symptoms of osteoarthritis of knee and to determine the indications of arthroscopy in osteoarthritis of knee.

Inclusion criteria

- All patients with primary osteoarthritis knee seeking treatment who were not relieved of their symptoms with conservative management and were not willing to undergo any major surgery were included.

Exclusion criteria

- Patients with secondary osteoarthritis were excluded from study.

A thorough history was taken, and clinical examination was done. Standard anterio-posterior and lateral plain radiographs of the knee were taken, and grading was done by using the Kallgren and Lawrence system into 4 grades.

Patient positioned supine over the operating table, under spinal anesthesia and tourniquet was applied. Parts were scrubbed, painted and draped. With knee flexed 70 degrees the patellar apex palpated, and a longitudinal stab incision is made just lateral to the border of the patellar tendon (anterolateral portal). Similarly, medial side portal was made (anteromedial portal). Following compartments were examined- supra-patellar pouch, medial compartment, medial para-patellar gutter, lateral para-patellar gutter, patellofemoral joint, intercondylar notch, lateral compartment.

Arthroscopic debridement is defined as joint lavage that includes dilution of the concentration of degradative enzymes as well as removal of small, free, mechanically irritating products of chondral, meniscal or synovial degeneration; removal of discrete chondral or osteochondral loose bodies; partial meniscectomy and/or judicious chondroplasty.

After examining the joint, all degenerative tissues were removed. Loose body, if any, were also removed. Menisci and cruciate ligaments were examined. Torn and degenerated fragments were removed, and menisci were balanced. Thorough lavage was given with normal saline; cartilage debris (wear particles, macromolecules) was seen in wash fluid. Skin incision was closed with 2-0 ethilon. Sterile dressing and compression bandage were applied, and tourniquet was deflated. Articular cartilage degeneration was graded according to the Outer bridge's arthroscopic classification.

Postoperatively, intravenous antibiotics and anti-inflammatory drugs were given as a routine. Quadriceps and hamstrings strengthening exercises given from 1st post-operative days, sutures were removed on 10th Post-operative day. All patients were followed up at a regular interval of 2 week to 4 weeks for a period of 6 months to 30 months and results were evaluated by using Rationale of the Knee Society Clinical Rating System (Score 100-80=Excellent,70-79=Good,60-69=Fair and <60=Poor).[5]

Statistical analysis

Data entry and Statistical analysis were performed using Microsoft Excel and SPSS software, p value less than 0.05 was taken as significant.

RESULTS

In the present study, out of total 35 patients, 18(51.4%) were males and 17(48.6%) were females, 18 patients (51.4%) were treated for right knee osteoarthritis and 17(48.6%) were treated for left knee, 18 patients (51.4%) were normal (BMI <25) and 17(48.6%) were overweight (BMI>25, 6(17.1%) patients had $<10^0$ whereas 29 (82.9%) had $>10^0$ of varus angulations of knee, 4(11.4%) patients had radiological grade I, 18(51.4%) had grade II, 9(25.7%) had grade III and 4(11.4%) had grade IV osteoarthritis. Loose bodies in knee joint were present in 10(28.6%) patients. Meniscal tear was present in 16 (45.7%) patients, 1(2.9%) patient had arthroscopic grade I, 17(48.6%) had grade II, 13 (37.1%) had grade III and 4 (11.4%) had grade IV.

Assessment

At 1 month follow up 13(37.1%) patients had excellent, 18 (54.3%) had good and 3 (8.6%) had fair results in total 35 patients.

At 6 months follow up 6(17.1%) patients had excellent, 21(60%) had good, 6(17.1%) had fair and 2(5.7%) had poor results in total 35 patients.

At 12 months follow up 1(4.1%) patients had excellent, 11(45.83%) had good, 7(29.16%) had fair and 5(20.6%) had poor results in total 24 patients.

At 18 months follow up 6(37.5%) patients had good results, 50% had fair and 2(12.5%) had poor results in total 16 patients.

At 24 months follow up 3(23.07%) patients had good, 8(61.53%) had fair and 2(15.38%) had poor results in total 13 patients indicating that results decline with time.

At 30 months follow up 2(28.5 %) patients had good results, 57.14% had fair and 1(14.28%) had poor results in total 7 patients indicating that results further decline with time.

At 6 months follow up the results were evaluated based on the different variables - age of the patient, body mass index, varus deformity, radiographic grading and arthroscopic grading to determine the indications for arthroscopic lavage and debridement for osteoarthritis of the knee joint.

Results in age groups were compared and 88.8% excellent to good results were found in <50 yrs. age group compared to 73.1% in >50 yrs. age group (Figure 1).

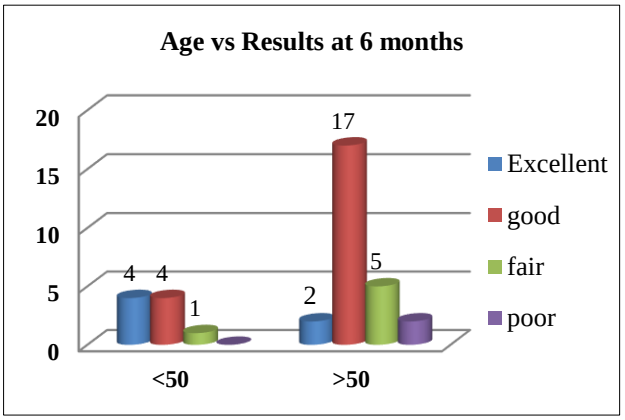

Figure 1: Results in age group <50 yrs (n=9) and >50 yrs (n=26) in total of 35 patients at 6 months follow up (χ^2=6.706, p value = 0.082 Not Significant).

Results in normal and overweight patients were compared and 94.5% excellent to good results were found in patients with BMI 18.5-25 and only 58.8% in patients with BMI 25-30 (Figure 2).

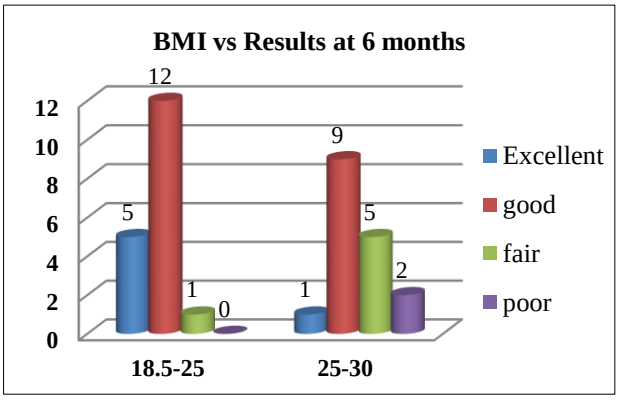

Figure 2: Normal BMI (18.5-25) (n=18) and overweight with BMI (25-30) (n=17) patients in total 35 patients at 6 months follow up (χ^2=7.74 p value = 0.05 Significant).

Results in normal and malaligned knees were compared and 93.1% excellent to good results were found in $<10^0$ varus angulation but none had excellent or good result in $>10^0$ varus angulation (Figure 3).

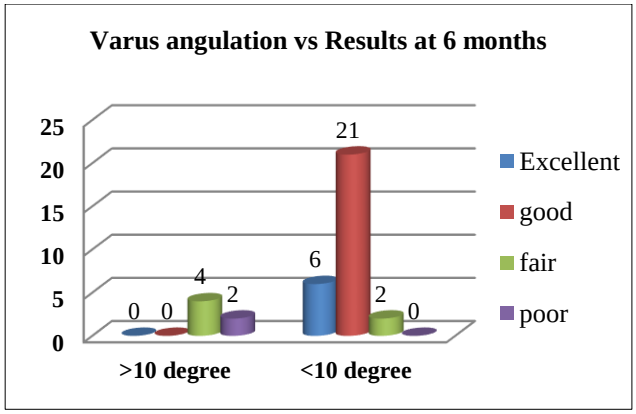

Figure 3: Patients with varus angulation >10^0 (n=6) and <10^0 (n=29) in total of 35 patients (χ^2 =25.613 p value <0.001 very highly significant).

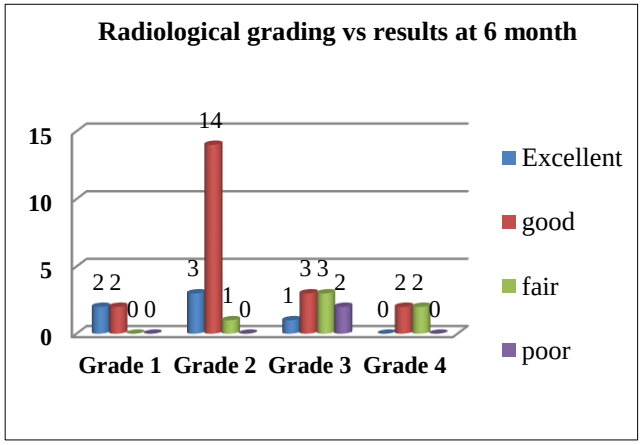

Figure 4: Radiological grade I (n=4), grade II (n=18), grade III (n=9) and grade IV (n=4) in total of 35 patients (χ^2 =17.315, p value = 0.044 Significant).

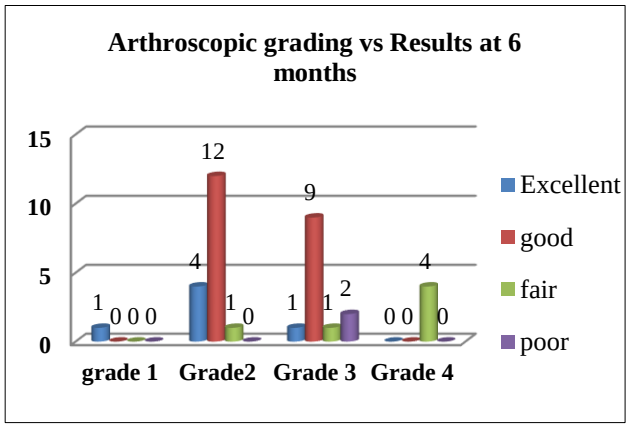

Figure 5: Arthroscopic grade I (n= 1), grade II (n=13) and grade IV (n= 4) in total of 25 patients (χ^2=30.784, p value <0.001 very highly significant).

Results were compared according to radiological grades where 100% and 94.5% excellent to good results were found in grade I and grade II respectively but 44.4% and 50% only in grade III and IV each (Figure 4).

Results were also compared according to arthroscopic grades where 100% and 94.1% excellent to good results were found in grade I and grade II respectively but 76.9% and none in grade III and IV each (Figure 5).

DISCUSSION

In this study arthroscopic lavage and debridement was performed for thirty-five patients with primary osteoarthritis knee. The knee joint was carefully examined and then joint lavage was done that includes dilution of the concentration of degradative enzymes as well as removal of small, free, mechanically irritating products of chondral, meniscal or synovial degeneration, we removed discrete chondral or osteochondral loose bodies, did partial meniscectomy, and/or judicious chondroplasty, removing unstable cartilage but taking care not to damage healthy cartilage nor to expose bare bone.

At the end of 6 months 77% of the patient were having significant improvement in their pain and function, 17% of the patients were having some pain relief whereas 5.7% patients were not having improvement. Those patients with poor outcome had severe osteoarthritis and had malaligned knee joint.

Results have been evaluated with variables like Body Mass Index, grade of osteoarthritis, malalignment, condition of the articular cartilage and presence or absence of mechanical irritants.

Gunter Spahn reported the outcome to be better in non-obese and mild to moderate osteoarthritis.[6] Similarly in this study it was seen that patient with normal Body Mass Index have better functional outcome and they are pain free for longer time as compared to obese patients (Figure 2).

Salisburg and Jackson underlined the importance of minimal axial limb malalignment and biomechanical stable joints in achieving good results.[7,8] In this study it was found that patient with malalignment >10 degrees have poor outcome and their pain returns to pre-operative levels within 6 months (Figure 3).

Gross et al, were not able to show significant correlation between pre-operative radiological grading and the outcome.[9] There is significant correlation between these two and patient with grade I or II arthritis do well with the procedure (Figure 4). Patients with grade III arthritis had fair improvement. According to John Richmond arthroscopic knee surgery is beneficial for mild to moderate osteoarthritis (Kallgren-Lawrence grade I and II).[10]

Brian Day stated that patients with mechanical irritants such as loose bodies or degenerative meniscal tears are more likely to benefit from arthroscopic lavage and debridement.[11] All the patients who had loose bodies, osteophytes or meniscal tears had excellent to good results after arthroscopic removal of these and lavage (Figure 5). The response is long lasting. This clearly

shows that in addition to the primary pathology they had additional symptoms of pain, locking and instability due to these mechanical irritants and lavage in addition to the above-mentioned benefits has an additional advantage of removal of these irritants.

Jackson reported that over-debridement leads to poorer functional outcome.[8] It is suggested that the surgeon should be judicious in his debridement. The purpose of this surgical technique is not to restore the cartilage integrity or the lower limb alignment but to remove the intraarticular irritating factors with the purpose to alleviate the knee pain and to slow down the osteoarthritis evolution.

Moseley et al, attributed the success after the procedure to a washout or placebo effect.[12] The weakness of his study resides in the low representative population - most of the patients were males from a Veteran Hospital, and in the absence of information about the meniscal pathology. Author do not agree that the improvement is only subjective because long lasting symptom free outcomes cannot be attributed only to subjective element though subjective component does play a role.

The most important factor in determining success is proper patient selection, and many who have osteoarthritis of the knee will not benefit from arthroscopic debridement. Patients who have end-stage osteoarthritis or severe malalignment and those who do not have mechanical symptoms are unlikely to improve. The important considerations are how effective the treatment is and whether the expected benefits justify the risks, potential complications and cost. An objective analysis of outcome studies in patients who have osteoarthritis of the knee joint clearly shows that properly selected patients will benefit greatly from arthroscopic debridement and many will be saved from the increased morbidity and potential complications of alternative treatments.

Most of the published literature on arthroscopic lavage and debridement for osteoarthritis of the knee joint has comprised retrospective studies. The results vary among different observers and this modality of treatment is still controversial. Currently orthopaedic surgeons have not reached a consensus with regard to which patients should be applied this surgical procedure for the treatment of knee osteoarthritis. Most of the authors report improvement in 50 to 80% individuals, however, as one would expect with the degenerative condition, results deteriorate with time, but many were unable to identify pre-operative factors predicting long term results.

Indications for arthroscopic debridement of the Osteoarthritis knee do exist. This procedure may be even more important in young patients in whom it may buy some time for knee replacement. More so knowledge gained during arthroscopy may be helpful in deciding the future procedure such as high tibial osteotomy or knee replacement.

Decrease of the knee pain level is the most common short- and medium-term result obtained in selected patients by performing debridement arthroscopy for osteoarthritis. Patients must be counselled that in addition to the routine risks of knee arthroscopic surgery and anaesthesia, the results of arthroscopic debridement of the osteoarthritic knee are not entirely predictable, the goals are limited and that their prognosis includes a likely need for future and additional arthritis treatment including a possible need for future reconstructive surgery.

CONCLUSION

Arthroscopic lavage and debridement are an effective method of treatment for osteoarthritis knee in selected patients. Patients with grade I and grade II osteoarthritis have good results and grade III osteoarthritis have fair results. Patients with normal body mass index have good results. Poor results are seen in knees with mal alignment. Patients with symptoms of pain and locking due to loose bodies or degenerative meniscal tears benefit maximum from arthroscopic lavage and debridement. Arthroscopic debridement should be conservative, removing only fibrillated and scaling fragments of articular cartilage.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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