Role of Arthroscopic Debridement in Improving Function in Patients with Arthritic Knee

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ABSTRACT

Background: Osteoarthritis is the most common musculoskeletal disorder that lead to severe restriction of daily physical activities.

Objectives: To evaluate the effect of joint debridement in decreasing pain and improving function and to identify the groups of patients that will benefit from arthroscopic debridement of arthritic knee.

Methods: Forty-seven patients over 30 years of age underwent elective arthroscopic debridement for the treatment of degenerative arthritis of the knee joint between June 2013 and June 2015 at Alnuman teaching hospital, Baghdad, Iraq and were followed for at least 12 months. Improvement in function, intra operative findings, surgical complications and the need for total knee arthroplasty were noted.

Results: Female to male ratio was 3/1. With mean age of (48.37±8.9) which is lower than that in male (53.08±9.1). Significant improvement was obtained in KL grade 2, 3 and 4. With p value < 0.01 for grade 2 and 3 and a p value of < 0.05 for grade 4. Thirty-four (72.3%) patients returned to their normal daily activities within 22 weeks. Intra operative findings were superior than KL grading in reflecting the significance of debridement.

Conclusion: Arthroscopic debridement is a reliable and effective treatment for knee osteoarthritis in appropriately selected patients.

Keywords: Arthroscope, Knee, Debridement, Osteoarthritis.

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The ever expanding aging population expects of an active life with low dependence rate requires a healthy and well-functioning musculoskeletal system. As life expectancy increases the incidence of musculoskeletal disease will grow, meaning there is an acute need for intervention to prevent and treat these diseases [(1)].

Osteoarthritis is the most common form of musculoskeletal disorder and a disease that has proven to be a challenging disease. it`s impact on health related quality of life is major, as it is a leading cause of physical and psychological disability. The hip and knee are the principle large joints affected by osteoarthritis. It is now believed that osteoarthritis is a disease that involves the entire joint, (Synovial lining, bone, nerves, and muscles) and accompanied by inflammation, neurological and mechanical dysfunctions[(1,2)].

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The prevalence of osteoarthritis increases with age and obesity. The disease affects 10% of males and 18% of females over 45 years. Over 80% of the affected persons will have limitation of movement and greater than 25% cannot perform their activities of daily living[(1,3)].

The treatment strategies of osteoarthritis aim to: reduce pain and physical disability, improve joint mobility, limit the progression of joint damage, and encourage patients to undertake regular muscle strengthening exercises[(4)].

The concept of debridement of the knee joint for arthritic condition was first introduced by Magnuson through an extensive arthrotomy, this procedure came to be known as (house cleaning). Magnuson pointed out that removal of all mechanically irritating products of joint degeneration render the patient symptom free. The technological advances had enabled an increase in arthroscopic knee surgery particularly arthroscopic

debridement for osteoarthritis and arthroscopic partial meniscectomy for symptomatic meniscal tears in the setting of osteoarthritis. Jacson RW suggested that the irrigation of osteoarthritic joint during arthroscopy is of benefit in the management of the arthritic knee. This become popularly known a lavage[5,6].

Arthroscopic debridement was first introduced for the treatment of osteoarthritis of the knee by Sprague in 1981 and it consist of lavage, removal of loose bodies, partial menesectomy, chondroplasty, synovectomy and adhesiolysis[7].

Although, joint lavage and arthroscopic debridement of the knee joint is controversial but still it is commonly performed because it is an outpatient procedure with less serious potential complications than other surgical treatments for osteoarthritis, the post-operative course is predictable, and it does not preclude later definitive surgery, and so patients and surgeons feel it is (worth a try)[8].

Methods

A cross-sectional study between June 2013 and June 2015 at Alnuman teaching hospital. Patients were eligible for arthroscopic débridement if they met the American College of Rheumatology criteria for osteoarthrosis of the knee joint[2] with failure of conservative treatment and one month course of home physiotherapy.

Criteria for inclusion in the study were; age above 30 years, osteoarthritis of grade 2 or higher according to the Kellgren-Lawrence radiographic scale[6,9,10], catching or locking sensation. Patients who had previously sustained a traumatic injury to the knee were included. All patients were informed that the goal of arthroscopy is to diminish pain and improve function and not to cure their arthritis.

Exclusion criteria include; previous infection, osteoarthritis involving the patellofemoral joint only, patients with confounding diagnosis (such as osteoarthritis of the ipsilateral hip or radiculopathy), intra-articular steroid injection of less than three months and, patients with less than 12 months follow up.

Fifty-one patients were eligible for the study; four patients were lost to follow-up, leaving forty-seven patients available for data analysis. Six patients 12.7% had received intra-articular corticosteroid injections, but no patient had had the injection within three months before the surgery.

All patients had had a course of home physiotherapy consisting of quadriceps-strengthening. Patients were followed for at least 12 months. Pain was assessed preoperatively and postoperatively using the simplified WOMAC osteoarthritis index[11]. The West Ontario and Macmaster Universities osteoarthritis index is a disease specific index that has been proven to be both specific and reliable for the evaluation of patients with osteoarthritis of the hip and knee. It comprises three domains, pain, physical function and, stiffness[10].

There are five variables to assess the relation of pain to daily physical activity. Each variable can be scored from 0 that indicate no pain to 4 that indicate extreme pain.

Table 1: Simplified WOMAC index.

KL grade		No	Mild	Moderate	Severe	Extreme
Symptoms	Pain					
	Effusion					
	Locking					
Pain with activity	Walking					
	Stair climb					
	Squatting					
	Praying					
	Rest pain					
Stiffness						

Table 2: Kellgren – Lawrence radiological grading[9,10].

Grade	Features
0	No features of osteoarthritis
1	Doubtful: minute osteophytes of doubtful significance
2	Minimal: definite osteophytes but joint space unimpaired
3	Moderate: moderate diminution of joint space
4	Severe: joint space severely impaired with sclerosis of subchondral bone

A standard physical examination of the knee was performed. Standing, weight bearing anteroposterior radiographs were used to measure the tibiofemoral angle and the widths of the medial and lateral joint spaces.

The severity of the arthritis was scored with the Kellgren-Lawrence (KL) radiological grading[9,10].

Preoperative cefitriaxone 1gm iv 30 min before surgery was given as prophylactic antibiotic. Marking the site of patella, patellar tendon and site of portals with knee in flexion. Under spinal or general anesthesia, pneumatic tourniquet was applied, approach through anterolateral, and anteromedial parapatellar portals.

Intraoperatively: The patellofemoral joint medial gutter and medial compartment, lateral gutter and lateral compartment were systematically evaluated. Cartilage lesions were inspected and were palpated with an angled probe to stage their severity according to ICRS grading scale[11,12]. Grade 1, cartilage that had superficial lesions only. Grade 2, lesions that extend less than 50% of the depth of the cartilage. Grade 3, lesions that extend greater than 50% of the depth of the cartilage. Grade 4, lesions that extend to the subchondral bone plate.

Following evaluation, hypertrophic synovial tissue was debrided, torn meniscus was noted and partial meniscectomy was performed. Loose flaps of articular cartilage were resected, crater edges were smoothed. Bone-drilling was performed to grade 4 cartilage lesions.

The knee was thoroughly irrigated, all loose bodies were removed, and the knee joint was appropriately drained.

Ten ml of lidocaine with or without adrenaline was injected to the suprapatellar pouch and to the portals of entry, dressing with double bandage from mid-thigh to the metatarsophalangeal joint.

Quadriceps muscle exercise begun at the first post-operative day and as tolerated by the patient. Patient walked with partial weight-bearing for five days then, they began weight bearing as tolerated and were given a five days' prescription for pain control as needed. Weight bearing was delayed for 6 weeks in patients who had under gone bone drilling.

The patients were scheduled to have appointments at five days, two weeks, and then monthly for the first 6months, then every 3 months.

Results

This cross sectional study included Forty-seven patients, the majority were females 35 (74.5%) and 12 (25.5%) were males. The mean age of participants was (49.57±9.09) with minimum age of 35 years and the maximum age was 64 years. The largest age group was between 40 and 50 years 16(34%). The largest group according to the BMI was the group of patients that have a BMI of 25-29.9 which has 19 patients comprising (40.4%) of the total percentage of patients, (Table 3).

Mean age of females in the study was (48.37±8.9) and it is lower compared to mean age of males (53.08±9.1). Regarding BMI, the lowest value was 21.1 and highest value was 36.2 with mean value 29.8±3.24.

Mean BMI in females was (30.58±3.01) which is higher compared to BMI of males (27.55±2.92), (Table 4).

The restriction of physical activities particularly that is associated with praying, walking and stair climbing was the most common presenting symptom to all of our patients. Limited physical activities was considered to be mild if simplified WOMAC score was (0-5), moderate (5-10), severe (10-15), and extreme (15-20). Thirty-five (74.4%) patients were with severe limitation of daily activities, 12 patients (25.5%) were with extreme limitation of daily activities. According to KL x-ray grading seventeen patients grade 2 (36.1%), twenty-two patients grade 3 (46.8%), eight patients grade 4 (17%), (Table 5).

Intraoperative findings; meniscal fibrillation was found in 14 patients (29.7%) while meniscal tears were found in 33 patients 70.2% distributed as follows; 23 patients (48.9%) had medial meniscal tear, 3 patients (6.3%) had lateral meniscal tear while combined medial and lateral meniscal tears was found in 7 patients (14.8%), (Figure 1).

Table 3: Frequency distribution of cases group by age, gender, and BMI.

Sex	No. of participants	Percentage
- Male	12	25.5
- Female	35	74.5
Age (years)		
- 30-39	9	19.1
- 40-49	16	34
- 50-59	12	25.5
- 60-69	10	21/3
BMI		
- 20-24.9	4	8.5
- 25-29.9	19	40.4
- >30	24	51.1

Table 4: Mean age, and BMI according to gender distribution among study participants.

Sex	Age mean ±SD (year)	BMI mean ±SD
Males	53.08±9.1	27.55±2.92
Females	48.37±8.9	30.58±3.01
P value	0.12	0.004

Table 5: Limitation of physical activities according to KL grading.

Limit. activities	KL2 No. (%)	KL3 No. (%)	KL4 No. (%)	Total No. (%)
Severe	12 (25.5)	16 (34)	7 (14.8)	35 (74.4)
Extreme	5 (10.6)	6 (12.7)	1 (2.1)	12 (25.5)
Total	17 (36.1)	22 (46.8)	8 (17)	47 (100)

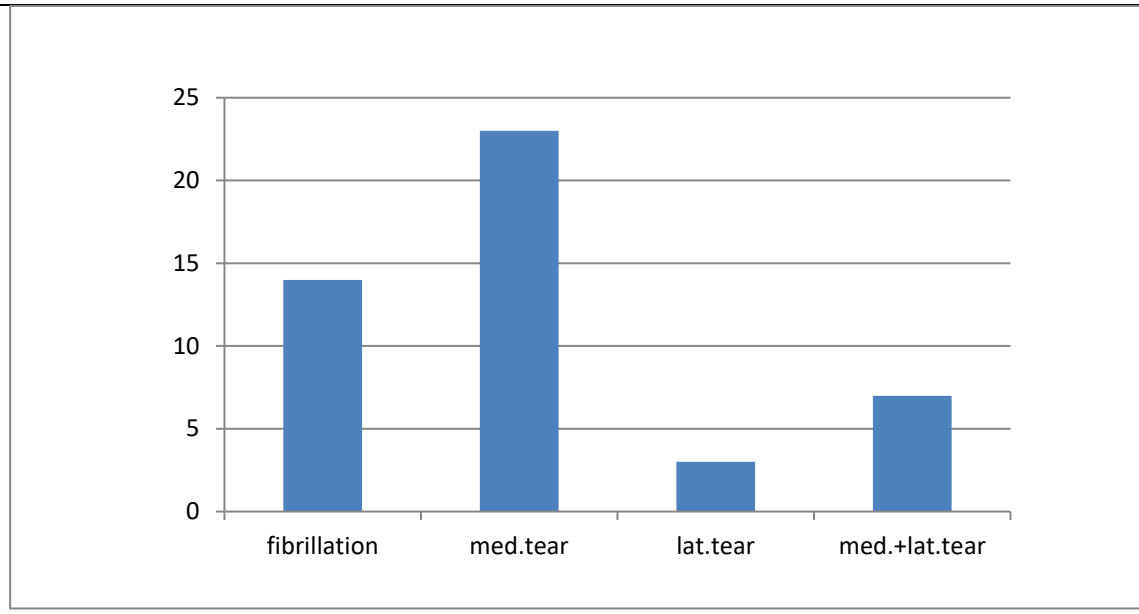

Figure 1: Distribution and type of meniscal lesions.

Relation of pain and limitation of physical activities to gender; Mean preoperative pain score for females was (15.68±2.58) which is higher compared to that for males (14.08±2.64).

Age; The highest mean preoperative pain score was noted in age group above 60 years (16.8±1.61).

BMI; Group of patients that have BMI above 30 experienced the highest mean pre-operative pain score (16.12±2.25) compared to other BMI groups.

KL grading; The highest mean preoperative pain score was noted in KL grade 4 changes (17.87±0.35) compared to grade 2 and grade 3.

Meniscal lesion; The highest mean preoperative pain score was noted in Medial and lateral meniscal tear group (18.00±0.57) followed by fibrillation group.

Post-operative statistics: There was a significant statistical difference between pre and postoperative pain and limitation of physical activities according to gender, age, groups and KL grading while there was no significant statistical difference between pre and post-operative pain and limitation of physical activities in group of patients that have BMI of 20-24.9 and those who have only fibrillation of the meniscus. There was small effect size after treatment in all categories except for lateral meniscal tear where there was medium effect size, (Table 6).

Thirty-four (72.3%) patients returned to their normal daily activities. Eleven (23.4%) patients reached their maximum improvement of function with return to normal or near normal daily activities within 10 weeks post-operatively 14(29.7%) patients in 14 weeks post-operative and 6 (12.7%) patients had the improvement in function 18 weeks post-operatively and only 3 (6.3%)- patients had their maximum improvement in 22 weeks post-operatively, (Figure 2).

Thirteen (27.6%) patients can't return of to their normal daily activities 6(12.7%) with medial meniscal tear 4 (8.5%) with medial and lateral meniscal tears and 3 (6.3%) patients with fibrillation of the meniscus, (Figure 3).

Total knee arthroplasty was performed in two patients with KL of grade 4.

Table 6: Pre and post-operative pain score according to gender, age, BMI, KL grading and meniscal tear.

Sex	Pre-operative pain score	Post-operative pain score	P value	Cohen's d
- Male	14.08±2.64	2.1±1.72	<0.01	0.43
- Female	15.68±2.58	4.7±4.07	<0.01	0.29
Age (years)				
- 30-39	14.55±2.92	2.75±1.72	<0.01	0.38
- 40-49	14.37±2.8	3.3±2.05	<0.01	0.45
- 50-59	15.75±2.59	5.5±4.77	<0.01	0.26
- 60-69	16.8±1.61	4.63±5.44	<0.01	0.24
BMI				
- 20-24.9	13.00±1.82	2.12±1.52	=0.06	0.35
- 25-29.9	14.68±2.9	2.78±1.62	<0.01	0.45
- >30	16.12±2.25	5.35±4.74	<0.01	0.25
KL				
- KL 2	14.05±2.65	2.7±1.42	<0.01	0.40
- KL 3	15.27±2.52	4.05±3.83	<0.01	0.33
- KL 4	17.87±0.35	6.86±5.62	<0.05	0.20
Meniscal tear				
- Fibrillation	15.14±2.31	3.76±3.39	<0.01	0.34
- Lateral	13.66±3.51	2.66±1.6	<0.05	0.57
- Medial	14.73±2.73	3.19±2.39	<0.01	0.42
- Medial + Lateral	18.00±0.57	7.98±6.37	=0.06	0.15

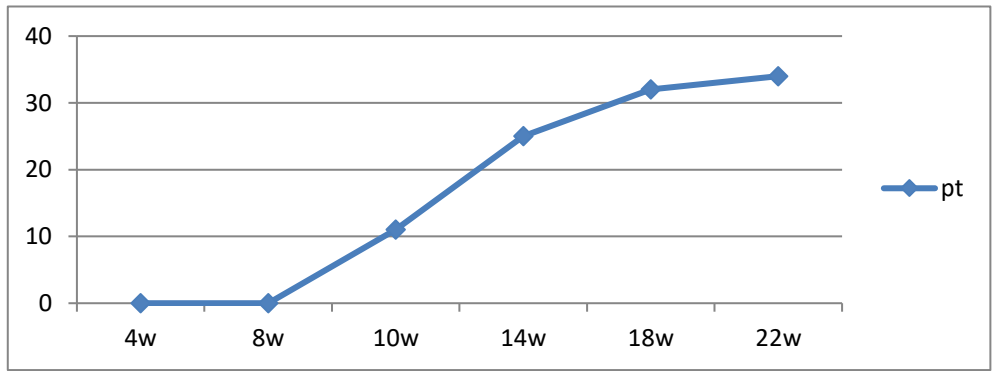

Figure 2: Post-operative improvement of function in patients.

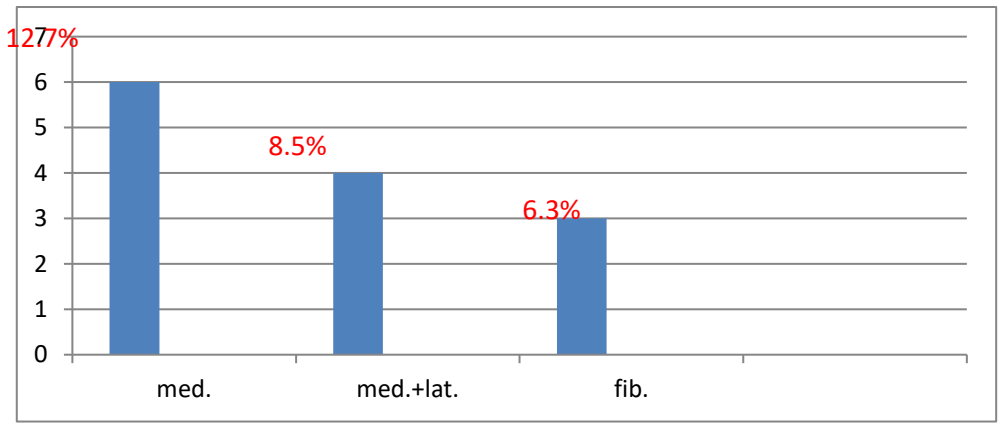

Figure 3: Patients who fail to return to normal daily activities.

Discussion

Degenerative changes in the knee occur with increasing frequency after the third decade of life. cartilage thinning, weak muscle strength, and poor proprioception can contribute to the pain, swelling and functional disturbance of the knee[13].

The indication for arthroscopic debridement based on review of clinical studies on patient selection can be summarized as follows: joint effusion, localized joint line tenderness acute or aggravating mechanical symptoms such as catching or locking and intra articular loose bodies[7,14]. Prevalence of osteoarthritis is significantly higher in females. A Mobasheri[1] estimated the female to male ratio to be about 2:1. In the present study, the female to male ratio was about 3:1 with mean age of females of 48.37±8.9 which is lower compared to mean age of males 53.08±9.1, and that indicate that females are at higher risk in developing osteoarthritis of the knee at a younger age group than males either because of the increase in the BMI, or because of inactivity, or osteoporosis.

We select pain as the primary outcome measure because of its perceived greater relevance to patients for the return to their daily activities.

Geoffery and colleague in a study to assess the effect of knee debridement on the quality of life[7] depended on the WOMAC index in their study. The original WOMAC index consists of seventeen variables. We simplified the WOMAC scoring index to make it more realistic for our patients to evaluate the impact of pain on their daily activities.

In the present study, groups of patients that show non-significant improvement in post-operative pain and function are the group of patients with BMI of (20-24.9), and the group of patients with tear of both medial and lateral menisci with a P value of 0.06 for both groups.

We found that home-based exercises performed by the patient post operatively had a significant effect in reducing pain and improving function. In a study done by Kiran and his colleagues showed that the Kellgren-Lawrence grading reflects the severity of arthritis, and associated with the clinical outcome[6]. The present study shows that the intra operative findings are superior than KL grading in reflecting the significant of debridement, we found that grade 2, 3 and 4 KL can show significant improvement if the lateral compartment is not involved. The significant improvement in post-operative pain score in patients with KL grade 4 gives a clue that arthroscopic debridement is an acceptable solution for patients complaining from severe restriction of activities and who refuses total knee replacement Jacson and Rouse[15] reported satisfactory results at a mean of 2.5 years after arthroscopic partial meniscectomy in 80% of patients with degenerative arthritis, in the present study we found that good improvement and return to normal daily activity was achieved in(72.3%). Roy et al found meniscal tears in 79 (72%) of 110 knees[16]. In the present study the percentage of meniscal tears was found to be 70.2% the medial meniscus was most commonly involved. We agree with Troy D Bornesetal[17] that long standing meniscal tears can cause chondral lesions and this is the cause that 10 patients out of the 13 patients could not achieve good improvement of function. We cannot give a reasonable clinical explanation for the other 3 patients who have only fibrillation of the meniscus. The relation of meniscal tears to the chondral lesions is beyond the scope of the present study.

In conclusion; female patients are more prone to symptomatic osteoarthritis that predispose to limitation of their daily activities and requires surgical intervention. Arthroscopic debridement of arthritic knee is a safe and effective procedure to improve function even in advanced osteoarthritis.

Recommendation; The present study establishes a base-line for comparison with

more studies in this subject. Further studies are required for the classification of meniscal tears and their association with chondral lesions in arthritic knee and their management.

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