

Efficacy of Intra Articular Hyaluronic Acid versus Arthroscopic Debridement in Terms of Improvement in Pain Score in Kellgran - Lawrence Grading II & III Osteoarthritis of Knee Joint

KAMRAN SAEED¹, SAJJAD A KHAN², IFTIKHAR AHMED³

ABSTRACT

Aim: To evaluate and compare the efficacy of the treatment by intra articular hyaluronic acid injections and arthroscopic debridement of knee osteoarthritis in terms of alleviating pain and functional outcome.

Study design: A randomized experimental study

Place and duration of study: Department of Orthopedics, Ch. Rehmat Ali Memorial Trust Hospital, attached to Continental Medical College Lahore from 1st January 2012 to 31st December 2014.

Methodology: One hundred and twenty patients above the age of 40 were included in this study. Knee joint radiographs were taken and evaluation of pain score was done. The selected patients were divided in two equal groups (group A and group B) and each group comprised of 60 patients. All the patients included in the study were explained about the procedures and a written consent was also taken. Group A patients were treated by weekly intra articular hyaluronic acid injections for five weeks and group B patients were treated by arthroscopic debridement. Functional outcome was evaluated by pain domain of knee society knee rating system.

Results: After one month of the procedures, in group A, 8 patients (13.4%) improved with pain score upto 20, 16(26.7%) improved with pain score upto 30, 14(23.3%) improved with pain score upto 40, and 22 (36.7%) improved with pain score upto 45(p=0.004). In group B, 8 patients (30%) improved pain score upto 20, 20patients (33.3%) improved pain score upto 30 and 22 patients (36.7%) improved pain score up to 40. After three months pain score was 30 in 20patients (33.3%), and pain score 40 in 14 patients (23.3%). After six months of follow up pain score was 30 in 24 patients (40%), and pain score was 40 in 14 patients (23.3%) and it was marked improvement as compared to group B.

Conclusion: It was concluded that in patients with osteoarthritis of the knee joint, treatment with Intra articular hyaluronic acid injections is a better option than arthroscopic debridement in terms of pain relief and patient's mobility.

Keywords: Osteoarthritis, Intra-articular hyaluronic acid, arthroscopic debridement

INTRODUCTION

Osteoarthritis of the knee joint is the most prevalent disease around the world in middle aged and elderly patients. It affects approximately 6% of adult population and this percentage increases in individuals who are more than fifty-five years of age¹. Females are affected more commonly than males². The main presenting complaint was pain and limitation of joint movements. The matrix metalloproteinases (MMPs) and cytokines (e.g., IL-1) synthesized by chondrocytes and inflamed synovial membrane cells of the articular cartilages appear to be the important mediators of cartilage destruction in OA. Synthesis and secretion of growth factors and

inhibitors of MMPs and cytokines are apparently inadequate to counteract these degradative forces and progressive cartilage degradation and OA results³.

Early stages of the condition are characterized by changes in cartilage thickness, which in turn are associated with an imbalance between cartilage breakdown and repair. Erosions and crackings appear in the superficial layer of cartilage and progress over time to deeper layers, resulting eventually in large clinically observable erosions. Thick bony outgrowths called spurs sometimes develop. Along with joint damage, osteoarthritis may also lead to pathophysiologic changes in associated ligaments and the neuromuscular apparatus. The severity of arthritis is assessed clinically with the pain domain of "Knee Society Score System" (Table 1)⁵ and radiologically by "Kellgren Lawrence System" (Table 2)⁶. Plain standing radiograph of the knee joint is the gold standard investigation. The radiographs can depict joint-space loss, as well as subchondral bony sclerosis and cyst formation⁷.

Department of Orthopaedic, Continental Medical College, Township, Lahore

Department of Medicine, Continental Medical College, Lahore

Department of Ophthalmology, Continental Medical College, Township, Lahore

Correspondence to Dr. Kamran Saeed, H # 179- A4, Punjab Government Employee's Cooperative Housing Society, College Road, Lahore. Email: kamranortho@yahoo.com Cell: 0321 9466360

The aim of the treatment in osteoarthritis is to reduce symptoms, minimize functional disability and limit the progress of structural changes in the affected joint. The primary management of the knee pain is with analgesics, changes in life style, physiotherapy and intra-articular steroid injections^{8,9}. However, after failure of this conservative management, options left for treatment include intra articular hyaluronic acid, arthroscopic joint lavage and debridement, open debridement, high tibial osteotomy for medial or lateral uni-compartmental osteoarthritis, hemi or total knee arthroplasty and arthrodesis^{10,11}. The Meta analysis confirmed the therapeutic efficacy and safety of intra-articular injections of hyaluronic acid for the treatment of osteoarthritis of the knee¹². Hyaluronic acid injections improve the viscosity of the synovial fluid and bring the joint environment to an optimum level. Safety and tolerability of hyaluronic acid are good in more than 90% of patients¹³. Through the use of arthroscope we can evaluate the pathology and perform different procedures¹⁴. Arthroscopic debridement represents one option for treatment of the patient with degenerative arthritis of the knee and includes joint lavage, removal of loose bodies and partial meniscectomy. The debridement is used for palliative purposes as it temporarily relieves the pain associated with arthritis¹⁵.

The objective of this study was to evaluate the efficacy of intraarticular hyaluronic acid injection in osteoarthritis of the knee joint as compared to arthroscopic debridement of knee joint in osteoarthritis of knee

METHODOLOGY

This randomized experimental study was carried out in Department of Orthopedic Surgery, Ch. Rehmat Ali Memorial Trust Hospital, Lahore from 1st January 2012 to 31st December 2014. One hundred and twenty patients of either sex above the age of 40 with history of pain knee joint were selected from the outpatient department. Patients below 40 years and with history of injury or accident, prior intervention like intraarticular steroid injections within three months were excluded. Standing x-rays of the knee joint in antero-posterior and lateral views were taken and the patients were graded radiologically by the "Kellgren Lawrence Grading system" (Table: 5) Only K-L grade II & III patients were included in the study. Clinically the evaluation of pain was assessed by pain domain of the "knee society score system" (Table 6), this score describes the clinical condition of the patients in terms of pain, knee joint movements, stability and joint functions. Investigations including a complete physical examination, standard blood tests like complete blood examination blood sugar random, a

chest radiograph and ECG were done. They were divided in two equal groups, each group comprised of 60 patients and the respective procedure was explained to each group. A written consent was also taken from all the patients. Patients of group A were injected intra articular hyaluronic acid after giving intradermal anaesthesia by the method shown in Fig.1. The injections were given weekly for five weeks with a 24 gauge needle under strict aseptic conditions in the operation theatre as an outdoor case. In Case of joint effusion, aspiration was done before the injection to prevent dilution of the injection. Patients in group B were admitted in the hospital, arthroscopic debridement in operation theatre was performed by using two portals in all cases under spinal anesthesia and discharged on the next day. Monitoring of ECG and blood pressure was standard in all cases during the entire duration of the procedure. All the debridements were done by a single surgeon to minimize the bias for the study. Patients in both the groups were followed up for six months after completion of treatment. The improvement in pain outcome was compared in both groups by "Knee Society Score", before and after one month, three months and six months of respective procedures (Table 6)

The statistical analysis of the data was done by SPSS version 18. Frequencies and percentages were presented for categorical variables while mean and standard deviation were presented for numerical variables. For results and comparison student t test was applied and p-value of <0.05 was considered statistically significant.



Fig. 1: Method for injecting a knee joint. The patient is lying supine on the examination table with the right knee extended. The injection site is marked along the superolateral corner of the patella. The needle is angled slightly toward the underside of the patella.

RESULTS

The study included total one hundred and twenty patients with osteoarthritis of the knee joint. The osteoarthritis increased with increasing age,

22(18.33%) patients in 40-45 years age group and 41(34.16%) above the age of 60 (Table 3). Females 98(83.3%) outnumbered the males 22(18.3%). Female to male ratio is 2:1.45 (Table: 4) which is near to Hawker et al² who observed it 2.25. In group A, 10 (16.6%) patients were males and 50 (83.3%) females. In group B, 12 (20%) patients were males and 48(80%) females.. According to K-L system of classification, In group A, 36(60%) patients were in grade II and 24(40%) in grade III with mean of 2.60±0.05 whereas in group B, 38(63.33%) were in grade II and 22(36.60%) in grade III with mean of 2.63±0.49 (Table: 5). Before procedure, in group A, 8(13.4%) patients had pain score 10, 26(43.3%) had 20 and 26(43.3%) had 30. While in group B, 4(6.7%) patients had pain score 10, 42(70%) had 20 and 14(23.3%) had 30. After one month procedure, in group A, 8(13.4%) patients improved mildly with pain score upto 20, 16(26.7%) improved moderately with pain score up to 30, 14(23.3%) improved moderately with pain score upto 40, and 22(36.7%) improved markedly with pain score up to 45. While in group B, 18(30%) patients improved pain score mildly up to 20, 20(33.3%) patients improved pain score moderately upto 30 and 22(36.7%) patients improved pain score moderately upto 40. Thus the pain score improved moderately in 70% of the patients in group B as compared to 86.6% in group A. After three months the score in group A improved as shown in table 7. After six months the score in group improved in group A improved further as shown in table 8

Pain at injection site in 8(13.4%) patients in group A and pain and mild effusion in 13(26%) patients were noted postoperatively in group B. These were transient and subsided in 4-5 days. No serious complication was seen in any of the case.

Table 1

Knee Society Score System	Objective Scoring
None	50
Mild or occasional	40
Stairs only	30
Walking & stairs	20
Moderate	10
Occasional	20
Continual	10
Severe	0

Table 2: The Kellgren and Lawrence (K-L) system⁶ of classifying the severity of knee osteoarthritis (OA) using five grades:

Grade 0	<i>no radiographic features of OA are present</i>
Grade 1	doubtful joint space narrowing (JSN) and possible osteophytic lipping
Grade 2	definite osteophytes and possible JSN on anteroposterior weight-bearing radiograph
Grade 3	multiple osteophytes, definite JSN, sclerosis, possible bony deformity
Grade 4	large osteophytes, marked JSN, severe sclerosis and definitely bony deformity

Table 3: Prevalence with age (n = 120)

Age (years)	n	%age
40- 45 years	22	18.33
46 -50 years	25	20.83
56 -60 years	32	26.66
>60 years	41	34.16

Male female ratio = 2 : 1.45

Table 4: Demographic data of the patients (n=120)

Variable	Group A	Group B
Male	10(16.6%)	12(20%)
Female	50(83.3%)	48(80%)

Table 5: Frequency and percentage of patients according to K-L grading

Grading	Group A	Group B
II (mild)	36(60%)	38(63.33%)
III(moderate)	24(40%)	22(36.66%)
Mean±SD	2.60±0.05	2.63±0.49

Table 6: Comparison of pain score in both groups before and after procedures

Pain score	Group A	Group B
Before procedure		
10	8(13.4%)	4(6.7%)
20	26(43.3%)	42(70%)
30	26(43.3%)	14(23.3%)
One month after procedure		
20	8(13.4%)	18(30%)
30	16(26.6%)	20(33.3%)
40	14(23.2%)	22(36.7%)
45	22(36.7%)	-

Table 7

Pain score	Group A	Group B
Three months after procedure		
20	4(6.6%)	16(26.6%)
30	20(33.3%)	20(33.3%)
40	14(23.3%)	22(36.7%)
45	22(36.7%)	-

Table 8

Pain score	Group A	Group B
Six months after procedure		
20		16(26.6%)
30	24(40%)	22(36.7%)
40	14(23.3%)	22(36.7%)
45	22(36.7%)	-

DISCUSSION

OA Knee is the most common disease of joints which causes pain and functional limitations in elderly. The risk factors include advancing age, obesity, trauma, positive family history, muscle weakness, hormonal disturbances and disorders of the bone. Osteoarthritis of the knee presents at an early age in this part of the world (South Asia)¹⁶ which is most likely due to our working conditions and habits which need squatting. We studied 120 patients above the age of 40, the incidence was 18.33% at 40-45 years and 34.16% above the age of 60. So, it increased with the increasing age¹⁷. 37.50% were males and 62.50% females and the male female ratio was 1.45.

The prevalence of knee OA was higher (58.33%) among lower income group which is in accordance with the findings of Arijit et al¹⁸, Goldman et al¹⁹ and Shadab et al²⁰.

The disease is asymptomatic in the early years of its onset but as it progresses, pain, is the main presenting symptom and is presumed to arise from a combination of mechanisms, including osteophytic periosteal elevation, Vascular congestion of subchondral bone, synovitis, fatigue in muscles that cross the joint, overall joint contracture, Joint effusion and stretching of the joint capsule and tears in the menisci. The severity of pain is determined by the knee society score system⁵ and classified in to mild, moderate and severe. The severity of disease is determined by "The Kellgren Lawrence Grading System⁶ in accordance with radiological changes and graded from 0-4 grades. 0-1 grades represent normal, grade-2 represents mild disease, grade-3 moderate disease and grade-4 severe disease (Table 1&2). In our study the, Pain score before the procedure in group A, was 10, 20, and 30 in 13.4%, 43.3% and 43.3% patients respectively. In group B, it was 10, 20 and 30 in 6.7%, 70% and 23% patients respectively. K-L grading in group A, was mild (grade-II) in 60% patients and moderate (grade III) in 40%. In group B, mild (grade-II) in 63.33% patients and moderate (grade-III) in 36.66%.

Intra-articular injections of hyaluronic acid is considered one of the treatment options for osteoarthritis when traditional non surgical management is either ineffective or the medicines used are not tolerated (e.g., analgesics and non steroidal anti inflammatory agents²¹). Although restoration of the elastoviscous properties of synovial fluid seems to be the most logical explanation for the mechanism of action, other mechanisms must exist. In our study in this category in group A after the procedure, 36.7% patients improved markedly with mild occasional pain and pain score of 45, 23.3% improved moderately with mild joint pain on climbing the stairs only and pain score of 40, 26.6% also improved moderately with mild joint pain only on walking and pain score of 30 and in 13.3% patients the pain remained moderate with pain score of 20. It is obvious that the pain score improved significantly in 86.6% of patients and the improvement was more in patients having Kellgren Lawrence stage II.

The score in group A improved in terms of pain as compared to group B the arthroscopic debridement group after three months see table 7. The pain and mobility of the patients of osteoarthritis of knee in group A improved after six months almost 40% (Table 8) as compared to the arthroscopic debridement. Huang et al²² and Wang et al¹² also

confirmed the therapeutic benefits and safety of intra-articular injection of hyaluronic acid in the treatment of osteoarthritis of the knee.

Arthroscopic debridement seems to be an optimal option in relieving pain for the patients having mild to moderate osteoarthritis of the knee joint and is safe as compared to open debridement. It involves joint lavage, removal of damaged cartilage and bone and partial meniscectomy. The relief in pain is prompt which is thought to be secondary to the removal of the cartilaginous debris and inflammatory factors. Patients having mechanical symptoms do well with arthroscopic debridement as compared to intra articular hyaluronic acid injections. In our study in this category in group B, after the procedure 36.7% patients improved moderately with pain score 40, 33.3% also improved moderately with pain score 30 and 30% improved only mildly with pain score 20. It is clear that the pain score improved moderately in 70% of the patients as compared to 86.6% in group A. So, the arthroscopic surgery seems to be less effective as compared to the better results achieved by intra articular sodium hyaluronate particularly in patients without mechanical symptoms in K-L grades II & III. Lazic et al²³ in a recent study also concluded that due to poor results of arthroscopic debridement, trend for the procedure is declining and it is currently indicated (in the UK) only if there is a history of mechanical locking of the knee. Bellamy et al²⁴ also showed superiority of intra articular injections over the placebo in improving pain and morbidity of the knee joint.

CONCLUSION

It is concluded that the arthroscopic debridement technique appears to have limited role today than in the past in alleviating pain in OA of knee joint. Intra-articular injection treatment by sodium hyaluronate is a newer available option and has become increasingly popular in patients without mechanical symptoms. It is cost effective, well tolerated, provides better pain relief and improved functions and might have longer-term benefits for patients with osteoarthritis of knee joint and may be considered other solution to debridements.

Acknowledgement: The author is thankful to Dr. Sajjad A Khan², Assistant Professor Of Medicine, Continental Medical College, Township, Lahore and Dr. Iftikhar Ahmed³, Associate Professor Of Ophthalmology, Continental Medical College, Township, Lahore for conception and design of the study, analysis and interpretation of the data, drafting and editing the article & revising it critically till the final submission.

REFERENCES

1. Dhar HL. Common diseases and elderly. *Bombay Hosp J* 2002; 44: 61-7.
2. Hawker GA, Wright JG, Coyte PC, Williams JL, Glozier R, Badley EM. Difference between men and women in rate of the use of hip and knee arthroplasty. *N Engl J Med* 2000; 342: 1016-22.
3. Lohmander LS et al. Cartilage matrix metabolism in osteoarthritis: markers in synovial fluid, serum, and urine. *Clin Biochem* 25:167-1674,1992
4. Radin EL, Paul IL. Response of joints to impact loading. I. In vitro wear. *Arthritis Rheum.* 191 May-Jun. 14(3):356-62. [Medline].(ref for changes in joint)
5. Scuderi GR, Bourne RB, Noble PC, Benjamin JB, Lonner JH. The new Knee Society Knee Scoring system. *Clin Orthop Relat Res.* 2012; 470: 3-19.
6. Kellgren, J. H.; Lawrence, J. S. (1957). "Radiological assessment of osteoarthrosis". *Annals of the rheumatic diseases* 16(4): 494–502. PMC 1006995. PMID 13498604.
7. Recht MP, Kramer J, Marcelis S, Pathria MN, Trudell D, Haghighi P, et al. Abnormalities of articular cartilage in the knee: analysis of available MR techniques. *Radiology.* 1993 May. 187(2):473-8. [Medline]
8. Chen Ti W, Jinn L, Chee J, Yu TL. Therapeutic effects of hyaluronic acid on osteoarthritis of the knee. A meta-analysis of randomized controlled trial. *J Bone Joint Surg (Am)* 2004; 86-A: 538-45.
9. Livesley PJ, Doherty M, Needoff M, Moulton A. Arthroscopic lavage of osteoarthritic knees. *J Bone Joint Surg (Br)* 2006; 88-B: 366-73.
10. Aron RK, Skolnic AH, Reinert SE, Ciombor D. Arthroscopic debridement for osteoarthritis of the knee. *J Bone Joint Surg Am* 2006; 88:936- 43.
11. Stuart MJ, Lubowitz JH. What, if any, are the indications for arthroscopic debridement of the osteoarthritis knee? *Arthroscopy* 2006; 22: 238-9.
12. Wang CT, Lin J, Chang CJ, Lin YT, Hou SM. Meta-analysis of therapeutic effects of hyaluronic acid on osteoarthritis of the knee. A of randomized controlled trials. *J Bone Joint Surg Am* 2004; 86: 538-45.
13. Kolarz G, Kotz R, Hochmayer I. Long-term benefits and repeated treatment cycles of intra-articular sodium hyaluronate (Hyalgan) in patients with osteoarthritis of the knee. *Semin Arthritis Rheum* 2003; 32: 310-19.
14. Clarke HD, Scott WN. The role of debridement: through small portals. *J Arthroplasty* 2003; 18: 10-4.
15. Nadeem D. Importance of clinical diagnosis in knee arthroscopy. *Pakistan Post Grad Med J* 2001; 12:1-4.
16. Iqbal P, Shah SGA, Safdar M. Joint replacement surgery. Review of 102 cases. *Proceeding Shaikh Zayed Postgrad Med Inst* 1991; 5: 14-21
17. Zhang Y, Jordan JM. Epidemiology of osteoarthritis. *Clin Geriatr Med.* 2010; 26:355–69. [PMC free article] [PubMed]
18. Ajit NE, Nandish B, Fernandes RJ, Kasthuri A, Shanbhag DN, Goud BR. Prevalence of knee osteoarthritis in rural areas of Bangalore urban district. *IJRCI* 2014; 1(S1):1-8.
19. Goldman L, Ausillo D. *Cecil Text Book of Medicine.* Vol.2. 22nd Ed. New Delhi: Ajanta Offset; 2004:1698-1702
20. Shadab M, Zulkifl M, Itrat M. Prevalence of knee osteoarthritis in patients visiting NIUM hospital Bangalore *IJHM* 2014; 2 (2): 61-64
21. Phiphobmongkol V, Sudhasaneya V. The effectiveness and safety of intra-articular injection of sodium hyaluronate (500-730 kDa) in the treatment of patients with painful knee osteoarthritis. *J Med Assoc Thai* 2009; 92(10):1287-94.
22. Huang TL, Chang CC, Lee CH, Chen SC, Lai CH, Tsai CL. Intra-articular injections of sodium hyaluronate (Hyalgan) in osteoarthritis of the knee. a randomized, controlled, double-blind, multicenter trial in the Asian population. *BMC Musculoskelet Disord* 2011; 12:221.
23. Lazic S, Boughton O, Hing C, Bernard J. Arthroscopic washout of the knee: a procedure in decline. *Knee.* 2014 Mar; 21(2):631-4.
24. Bellamy N, Campbell J, Robinson V, Gee T, Bourne R, Wells G. Viscosupplementation for the treatment of osteoarthritis of the knee. *Cochrane Database Syst Rev* 2006;2: CD005321.