

Management and Assessment of Pain Sensitivity and Functional Outcome in Patients of Early Osteoarthritis Knee: A Comparative Study

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Received: 03-11-2023 / Received: 10-12-2023 / Accepted: 23-01-2024

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Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to assess compare the pain sensitivity and functional outcome in patients of early osteoarthritis knee when treated with intra-articular steroids versus intra-articular hyaluronic acid.

Methods: This study was conducted at Department of Orthopaedics, Government Medical College West Champaran, Bettiah, Bihar, India to analyze the pain sensitivity and functional outcome in patients of early osteoarthritis knee when treated with intra-articular steroids versus intra-articular hyaluronic acid using VAS and WOMAC scoring system for the period of 2 years. A total of 100 patients were included in the study of which 50 patients were given intra-articular steroid injection and 50 patients were given hyaluronic acid.

Results: A major number of patients in steroid Group were in the age group 60 – 65 years i.e. 58%. On the other hand, 50% of patients in H.A. group were in the age group 60 – 65 years. In steroid group, male population accounted for 40% and female was 60%. In HA group, male population accounted for 48% and female was 52%. In steroid Group, 24 patients (48%) that were given treatment were right side as compared to 10 patients (20%) on left side while 16 where bi- lateral (32%). The mean Pre procedure VAS Score in steroid Group was 8.412 which had reduced to 6.8245 by the end of one year. The mean Pre procedure VAS Score in H.A. Group was 8.322 which had reduced to 5.110 by the end of one year. The mean Pre procedure WOMAC Score in steroid Group was 84.5516 which had reduced to 77.7715 by the end of one year. The mean Pre procedure WOMAC Score in H.A. Group was 85.814 which had reduced to 58.8236 by the end of one year.

Conclusion: In conclusion, our study showed that the Pain sensitivity and functional outcome of Intra articular therapy performed via H.A. group are similar till three months in comparison to Steroid group.

Keywords: Intra-Articular Steroids, Intra-Articular Hyaluronic Acid, Osteoarthritis Knee.

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Introduction

Osteoarthritis (OA) is the most common cause of knee pain and a leading cause of disability globally. It is a progressive disorder caused by gradual loss of articular cartilage. Many mechanical and biochemical factors have been suggested as the responsible causes for cartilage destruction leading to OA. Cytokines and various growth factors (GF) may also play a role in the regulation of catabolic and anabolic process in the pathophysiology of knee OA. The catabolic process is mainly mediated by Interleukin-1 and tumor necrosis factor- β that activate proteolytic digestion of articular cartilage. Various GF as tissue GF- β and insulin GF-1 may help body's attempt to repair the degenerated cartilage. Various conservative treatment modalities including both pharmacological and the non-pharmacological modalities are recommended in clinical guidelines. [1,2] However, if these are

ineffective then intraarticular (IA) injections (corticosteroids, viscosupplements, blood-derived products) are considered as the second line of the non-operative modality of treatment. [3]

Native HA is a glycosaminoglycan with high molecular weight found mostly in the extracellular matrix of many tissues. [4] It is a major component of the synovial fluid that promotes viscoelasticity and helps to protect articular cartilage and adjacent soft tissues. OA correlates with reduction of HA found in the synovial fluid, resulting in lower elasticity and viscosity. Viscosupplementation by injection of exogenous HA into the synovial joints aims at restoring the normal rheological environment and has been established as an effective treatment option. [5] According to a meta-analysis of 40 different controlled trial, it has been proven that HA injections significantly reduce pain

in knee OA. [6] HA preparations available for intra-articular use differ on their molecular weight. The low molecular weight preparations (0.5-1.5 million Dalton) can achieve maximum concentration into the joint and are thought to reduce inflammation, however, they present lower elastoviscosity than native HA. [7]

High molecular weight preparations (6-7 million Dalton) result in a better increase in fluid retention into the joint and possibly present with stronger anti-inflammatory effect. [8] Efficacy might be related to the rheological properties and molecular weight of the preparation. [9] Studies concerning the intra-articular use of HA with different molecular weight for the treatment of knee OA have been published over the last years with conflicting results, but possibly favoring high molecular weight HA. [10-12]

The aim of the present study was to assess compare the pain sensitivity and functional outcome in patients of early osteoarthritis knee when treated with intra-articular steroids versus intra-articular hyaluronic acid.

Materials and Methods

This study was conducted at Department of Orthopaedics, Government Medical College West Champaran, Bettiah, Bihar, India for two years to analyze the pain sensitivity and functional outcome in patients of early osteoarthritis knee when treated with intra-articular steroids versus intra-articular hyaluronic acid using VAS and WOMAC scoring system for the period of 2 years. A total of 100 patients were included in the study of which 50 patients were given intra-articular steroid injection and 50 patients were given hyaluronic acid

Before procedure patients were divided into following two groups:

1. Steroid Group
2. Hyaluronic acid Group

A total of 100 patients were included in the study of which 50 patients were given intra-articular steroid injection and 50 patients were given hyaluronic acid. Patients were assessed on the basis of VAS and WOMAC scoring system. The patients were followed up at 1 weeks, 3 months, 6 months and 1 year. The study was conducted at the Department of Orthopaedics, SNMMCH, Dhanbad, Jharkhand, India.

Inclusion Criteria-

- Adults aged 40 or above.
- Radiologically diagnosed patients of early
- Osteoarthritis knee up to K.L. grade II

Exclusion Criteria

- Glucocortico steroid injections in previous 3 months
- Sepsis knee
- Poly neuropathy
- Associated medical co-morbidity such that the patient is unfit for procedure
- Patient not willing for procedure

Clinical Assessment

Detailed history of all patients was taken. All patients were assessed clinically and functionally using the VAS and WOMAC scoring system. The preoperative medical evaluation of all the patients was done to prevent potential complications that can be life threatening or limb threatening. Any limb length discrepancies were noted. Presence of any hip or foot deformity was assessed. The extensor mechanism was assessed for any quadriceps contractures. The knee deformities were examined for any fixed varus or valgus deformities or presence of any flexion contracture.

Radiographic Assessment

Standard guidelines were utilized to get knee radiographs – standing anteroposterior view and lateral view and skyline view of patella. Any collateral ligament laxity, subluxation of tibia, presence of osteophytes, any bony defects in the tibia and femur and the quality of bone was assessed. Patients belongs up to K.L. grade II were included in study.

Treatment Procedure

All patients after thorough pre-procedure evaluation were taken up for procedure by the same team, patient in supine position. Sterile preparation is done from thigh to toe and the patient is draped. We used superolateral approach patient lies supine with the knee almost fully extended with a thin pad support underneath the knee to facilitate relaxation. The clinician's thumb is used to gently rock then stabilize the patella while the needle is inserted underneath the supralateral surface of patella, aimed towards the center of the patella, and then directed slightly posteriorly and inferomedially into the knee joint. Same approach is used in both groups, one group treated with 80mg glucocorticosteroid (depomedrol) and another one with 4 ml vial containing 60 mg sodium hyaluronate with molecular weight of (500,000-730,000 daltons) fraction of purified natural sodium hyaluronate.

Results

Table 1: Demographic data

Age	Steroid N(%)	H.A. N(%)
60-65 yrs	29 (58)	25 (50)
66-70 yrs	8 (16)	9 (18)
71-75 yrs	7 (14)	6 (12)
76-80 yrs	3 (6)	5 (10)
80-85	3 (6)	5 (10)
Gender		
Males	20 (40)	24 (48)
Females	30 (60)	26 (52)
Side involved		
Right	24 (48)	27 (54)
Left	10 (20)	11 (22)
BI-lateral	16 (32)	12 (24)
Grade of O.A. Knee		
Grade I	15 (30)	20 (40)
Grade II	35 (70)	30 (60)
Level of activity		
Mild	16 (32)	15 (30)
Moderate	24 (48)	25 (50)
Heavy	10 (20)	10 (20)

A major number of patients in steroid Group were in the age group 60 – 65 years i.e. 58%. On the other hand, 50% of patients in H.A. group were in the age group 60 – 65 years. In steroid group, male population accounted for 40% and female was 60%. In HA group, male population accounted for 48% and female was 52%. In steroid Group, 24 patients (48%) that were given treatment were right side as compared to 10 patients (20%) on left side while 16 where bi- lateral (32%). In H.A. Group, 27 patients (54%) that were given treatment were

right side as compared to 11 patients (22%) on left side while 12 where bi- lateral (24%). In steroid Group, 15 patients (30%) were of grade I while 35 patients (70%) were of grade II. In H.A. Group, 20 patients (40%) were of grade I while 30 patients (60%) were of grade II. In steroid Group, 16 patients (32%) having mild activity level while 24 (48%) having moderate and 10 (20%) having heavy activity level. In HA Group, 15 patients (30%) having mild activity level while 25 (50%) having moderate and 10 (20%) having heavy activity level.

Table 2: VAS Score

Time of assessment	VAS of steroid group	VAS of H.A. group	P- value
Pre Treatment	8.412+0.5012	8.322+0.4740	0.0745
1 Week after treatment	4.226+1.028	4.510+1.216	0.3316
3 month after treatment	3.8620+0.8320	3.2424+0.6624	0.0007
6 month after treatment	5.5421+1.035	4.1515+0.9340	0.0001
1 year after treatment	6.8245+0.6420	5.110+0.5967	0.0001

The mean Pre procedure VAS Score in steroid Group was 8.412 which had reduced to 6.8245 by the end of one year. The mean Pre procedure VAS Score in H.A. Group was 8.322 which had reduced to 5.110 by the end of one year.

Table 3: WOMAC Score

Time of assessment	WOMAC of steroidgroup	WOMAC of H.A. group	P- value
Pre Treatment	84.5516+3.620	85.814+3.810	0.4728
1 Week after treatment	59.325+3.110	61.2115+10.210	0.4910
3 month after treatment	56.110+2.940	54.205+7.008	0.0425
6 month after treatment	63.4105+8.210	52.3010+8.816	0.0001
1 year after treatment	77.7715+6.420	58.8236+5.417	0.0001

The mean Pre procedure WOMAC Score in steroid Group was 84.5516 which had reduced to 77.7715 by the end of one year. The mean Pre procedure WOMAC Score in H.A. Group was 85.814 which had reduced to 58.8236 by the end of one year.

Discussion

Osteoarthritis (OA) refers to a clinical syndrome of joint pain with multifactorial etiopathogenesis that is characterized by the gradual loss of articular cartilage, osteophyte formation, subchondral bone

remodeling, and inflammation of the joint. [13] OA is a major source of disability owing to pain and loss of function. It is the most common form of joint disease, and among the top 10 causes of disability worldwide. [14] With aging of the population and increasing obesity, OA arises as a major public health problem and an important financial burden for the global economy. [15] For the knee OA, various conservative treatment modalities are recommended by clinical guidelines. [1,15,16]

Five different steroids are approved by Food and Drug Administration that can be given in OA knee. These are triamcinolone hexacetonide (THA), methylprednisolone acetate, betamethasone acetate, triamcinolone acetate, betamethasone sodium phosphate, and dexamethasone. There is some published study that compares the result of different steroids in knee OA but could not document any conclusive results or recommendations. Steroids have both anti-inflammatory and immunosuppressive effects. These agents act on nuclear steroid receptors and interrupt the inflammatory and immune cascade at several steps. Thus, it decreases vascular permeability and inhibits the accumulation of inflammatory cells, phagocytosis, metalloprotease, production of neutrophil superoxide, and prevents the synthesis and secretion of several inflammatory mediators such as prostaglandin and leukotrienes. Clinically it decreases erythema, heat, swelling, and tenderness of the inflamed joints and it also increases the relative viscosity of joint fluid. [17] Steroid injections are usually used to treat acute and chronic inflammatory conditions. It decreases acute episodes of pain and increases joint mobility during the flare of knee OA. [18] The reported side effects of steroid injection include cortisone flare reaction, softening of the cartilage, the increase in blood sugar level, infection, and development of Cushing syndrome, usually seen after frequent injections. A major number of patients in steroid Group were in the age group 60 – 65 years i.e. 58%. On the other hand, 50% of patients in H.A. group were in the age group 60 – 65 years. In steroid group, male population accounted for 40% and female was 60%. In HA group, male population accounted for 48% and female was 52%. In steroid Group, 24 patients (48%) that were given treatment were right side as compared to 10 patients (20%) on left side while 16 where bi-lateral (32%). In H.A. Group, 27 patients (54%) that were given treatment were right side as compared to 11 patients (22%) on left side while 12 where bi- lateral (24%). In steroid Group, 15 patients (30%) were of grade I while 35 patients (70%) were of grade II. In H.A. Group, 20 patients (40%) were of grade I while 30 patients (60%) where of grade II.

In steroid Group, 16 patients (32%) having mild activity level while 24 (48%) having moderate and 10 (20%) having heavy activity level. In HA Group, 15 patients (30%) having mild activity level while 25 (50%) having moderate and 10 (20%) having heavy activity level.

The mean Pre procedure VAS Score in steroid Group was 8.412 which had reduced to 6.8245 by the end of one year. The mean Pre procedure VAS Score in H.A. Group was 8.322 which had reduced to 5.110 by the end of one year. The mean Pre procedure WOMAC Score in steroid Group was 84.5516 which had reduced to 77.7715 by the end of one year. The mean Pre procedure WOMAC Score in H.A. Group was 85.814 which had reduced to 58.8236 by the end of one year. Amir Fakhari [19] (2013) reported that hyaluronic acid is a naturally occurring biomolecule abundantly available in body tissues and fluids. Due to the prevalence of hyaluronic acid in the body and its desirable properties, HA has been utilized in several types of biomedical products. This article reviewed the physical and chemical characteristics of HA as applied to tissue engineering, dermal filling, and viscosupplementation. In each application, difficulties such as potential toxicity of crosslinking techniques, high viscosity of HA solutions, and rapid elimination have been raised as limitations to improve biomedical products derived from HA. Heyworth et al [20] did a prospective, randomized, double blinded clinical study of HA, steroid, and placebo. They found that the both steroid and placebo groups showed significant pain relief for ten weeks and its effect disappeared by 12 weeks. While patients of HA group continue to have pain relief until 26 weeks after that, it was not statistically significant. Askari et al [21] compared IA-HA with IA-steroid in 140 cases, in a randomized study. Western Ontario and McMaster University Osteoarthritis Index (WOMAC), Knee Injury and Osteoarthritis Outcome Score (KOOS), and the visual analog pain scale were used in accessing the result. Similar to our study they also found superior results was seen in HA group than the steroid.

Conclusion

Intra articular therapy improves the functional ability of the patient and the ability of the patient to get back to pre-disease state, which is to have a pain free mobile joint, as reflected by improvement in the post treatment VAS and WOMAC Score. In conclusion, our study showed that the Pain sensitivity and functional outcome of Intra articular therapy performed via H.A. group are similar till three months in comparison to Steroid group.

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