To study & compare the pain sensitivity and functional outcome in patients of early osteoarthritis knee when treated with intra-articular steroids versus intra-articular hyaluronic acid

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Introduction

Osteoarthritis (OA) is a common disease that affects all structures of the synovial joint. Besides articular cartilage, the subchondral bone, synovial tissue and soft tissue structures around the joint may be more or less involved.[1] Osteoarthritis may occur in any joint, but the spine, hands, hips, knees and feet are predilection sites.[2] In most arthritic knees, some degree of instability, deformity, contracture or a combination of these elements, can be found.[3,4,5] The common causes of arthritis of the knee include Osteoarthritis (OA), Rheumatoid Arthritis (RA), Juvenile Rheumatoid Arthritis (JRA), Post traumatic Arthritis or secondary Osteoarthritis and other types of inflammatory arthritis.

Material and Methods

This study was done 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 between the periods 1st June 2013 to 30th May 2015.

Before procedure patients were divided into following two groups, using random number table generated online (http://www.graphpad.com/quickcalcs/randomized):

1. Steroid Group
2. Hyaluronic acid Group

A total of 86 patients were included in the study of which 46 patients were given intra-articular steroid injection and 33 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, Sri Aurobindo Medical College & Post Graduate Institute, Indore, M.P.

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 were 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

Age distribution

Age	Steroid	H.A.
60-65 yrs	24	18
66-70 yrs	7	6
71-75 yrs	8	2
76-80 yrs	4	4
80-85	3	3
Total	46	33

- A major no of patients in steroid Group were in the age group 60 – 65 years i.e. 52.17 % with mean age of 68.043.
- On the other hand, 54.54 % of patients in H.A. group were in the age group 60 – 65 years, with mean age of 68.212.

Gender distribution

Gender	Steroid	H.A.	Total
Males	16	15	32
Females	29	18	47
Total	46	33	79

- The male population accounts for 40.50 % of the total study group in comparison to 59.49 % females.
- In steroid group, male population accounted for 36.95 % and female was 63.043 %.
- In H.A. group, male population accounted for 45.45 % and female for 54.54 %.

Side involved

Side involved	Steroid	H.A.
Right	21	17
Left	11	9
BI-lateral	14	7

- In steroid Group, 21 patients (43.47%) that were given treatment were right side as compared to 12 patients (26.08 %) on left side while 14 where bi-lateral (30.43%).
- In H.A. Group, 17 patients (51.51%) that were given treatment were right side as compared to 9 patients (27.27 %) on left side while 7 where bi-lateral (21.21%).

Grade of O.A. knee

Grade of O.A. Knee	Steroid	H.A.
Grade I	13	12
Grade II	33	21

- In steroid Group, 13 patients (28.26%) were of grade I while 33 patients (71.73 %) were of grade II.
- In H.A. Group, 12 patients (36.36 %) were of grade I while 21 patients (63.63%) where of grade II.

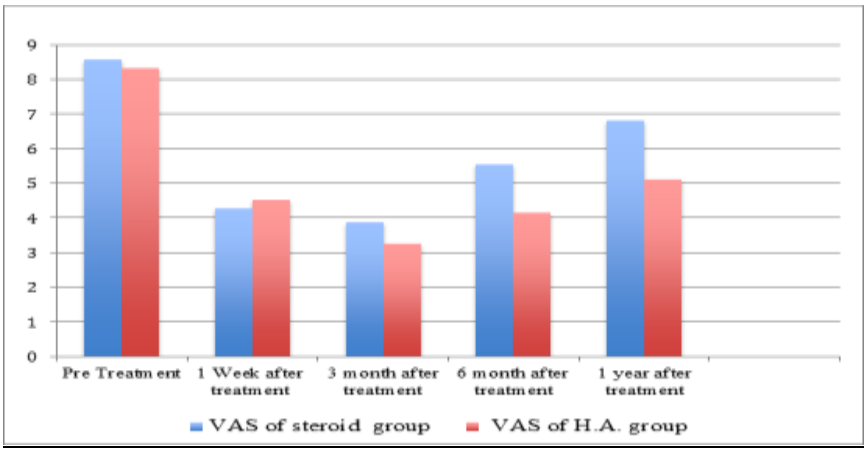
Activity level

Level of activity	Steroid	H.A.
Mild	15	9
Moderate	21	15
Heavy	10	9

- In steroid Group, 15 patients (32.60%) having mild activity level while 21 (45.65%) having moderate and 10 (21.73%) having heavy activity level.
- In steroid Group, 9 patients (27.27%) having mild activity level while 15 (45.45%) having moderate and 9 (27.27%) having heavy activity level.

VAS Score

Time of assessment	VAS of steroid group	VAS of H.A. group	P- value
Pre Treatment	8.565±0.5012	8.333±0.4787	0.0730
1 Week after treatment	4.282±1.026	4.515±1.228	0.3366
3 month after treatment	3.8695±0.8329	3.2424±0.6629	0.0009
6 month after treatment	5.5434±1.069	4.1515±0.9395	0.0001
1 year after treatment	6.8260±0.6431	5.121±0.5999	0.0001

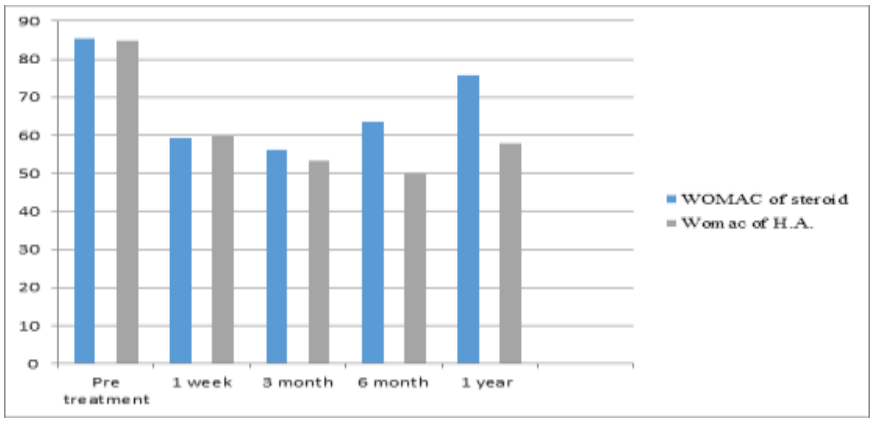


t = 1.854 at pretreatment with p value 0.0730.
t = 0.975 at 1 weeks post procedure with p value 0.3366.
t = 3.645 at 3 months post treatment with p value 0.0009 **significant**.
t = 5.470 at 6 months post treatment with p value < 0.0001 **significant.**
t = 11.506 at 1 yr post treatment with p value <0.0001 **significant.**

- The mean Pre procedure VAS Score in steroid Group is 8.565 which has reduced to 6.826 by the end of one year.
- The mean Pre procedure VAS Score in H.A. Group is 8.333which has reduced to 5.121 by the end of one year.

WOMAC Score

Time of assessment	WOMAC of steroid group	WOMAC of H.A. group	P- value
Pre Treatment	85.5227±3.638	84.818±3.844	0.4753
1 Week after treatment	59.370±3.129	60.2121±10.240	0.4935
3 month after treatment	56.130±2.971	53.212±7.017	0.0460
6 month after treatment	63.4130±8.234	50.3030±8.819	0.0001
1 year after treatment	75.7826±6.463	57.8484±5.432	0.0001



t = 0.7224 at pre treatment with p value 0.4753**.**
t = 0.6927 at 1 weeks post procedure with p value 0.4953.
t = 2.076 at 3 months post treatment with p value 0.0460 **significant**.
t = 6.356 at 6 months post treatment with p value < 0.0001 **significant**.
t = 12.179 at 1 yr post treatment with p value <0.0001 **significant**.

- The mean Pre procedure WOMAC Score in steroid Group is 85.52 which has reduced to 75.78 by the end of one year.
- The mean Pre procedure WOMAC Score in H.A. Group is 84.81 which has reduced to 57.84 by the end of one year.

Discussion

Intra-articular (IA) corticosteroid therapy was first used by Hollander in 1951 in Philadelphia to treat rheumatoid arthritis (Hollander 1953)[6]. The first clinical trial in OA was performed in 1958 by Dr S Miller, White and Norton in Glasgow (Miller 1958).[7]

In Wright's trial (Wright 1960A)[8], no statistically significant difference was detected in the number of knees reported as improved with respect to pain between hydrocortisone acetate (50%) and vehicle (36%) at two weeks post injection.

Valtonen (Valtonen 1981 A)[9] reported that the duration of effect of triamcinolone was substantially longer than that of betamethasone. The explanation for the variability in response to IA corticosteroids is contentious.

The principle of viscosupplementation was pioneered by Balazs and coworkers (Balazs 1982;[10] Peyron 1974; Weiss 1999). The difference in molecular weight (MW) is thought to be of importance with respect to the volume/amount and number of injections, the residue time in the joint and biologic effects.

S.Pietro[11] (2008) meta-analysis in progress are further establishing a role for viscosupplementation in ameliorating the symptoms of knee and hip osteoarthritis. At the moment it is clear that viscosupplementation is more efficacious in the initial and intermediate stages of OA more than at an advanced stages and that this therapy is exceptionally safe compared with other OA treatments.

M Goldberg 2010.[12] In conclusion pain is a central symptom of OA and requires an integrated approach to it's treatment. Both non-pharmacological and pharmacological treatments offer the best chance for pain relief. Pharmacological treatments include NSAIDs, cox-2 inhibitors, opioids, anti-inflammatory creams and IA corticosteroids. IA corticosteroids have been shown to be effective in relieving pain during the first 2 weeks after treatment. IA HA injections have a longer onset of action and longer duration of effect. The exact mechanism of action is still to be delineated, although it is clear that IA HA reduces pain through its effect on peripheral pain receptors as well as an impact on the synovial tissue and its role in enhancing the viscoelastic properties of synovial fluid. Although there have been many studies, there still is a need for additional high quality, randomized control trials with placebos or comparators to clearly delineate the role of IA HA in the treatment of pain in OA. The use of IA HA in other joints requires additional well-structured clinical studies.

Miśkowiec K, Wordliczek J, Liszka H (2011)[13] Intra-articular HA or hylan have proven to be an effective, safe, and tolerable treatment for symptomatic knee OA. In an effort to limit cardiovascular, gastrointestinal, and renal safety concerns with COX-2 selective and nonselective NSAIDs and maximize HA efficacy, it is even proposed using HA earlier in the treatment paradigm for knee OA and also as part of a comprehensive treatment strategy. Our study reconfirmed effectiveness and safety of intra-articular use of hyaluronic acid (Suplasyn) in the treatment of knee osteoarthritis.

R. J. Douglas[14] (2012).[14] Although numerous investigations have been conducted in an attempt to identify the optimal corticosteroid agent, and its optimal dosing regimen for the intra-articular treatment of osteoarthritis, a consensus has not been established. The current recommendations for dosing interval appear to have arisen as a consequence of a misinterpretation of previously published works.[78]

Amir Fakhari[15] (2013) 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. To overcome these limitations, current and emerging strategies to modify HA were reviewed as potential approaches.

Egemen[16] Ayhan, Hayrettin Kesmezacar, and Isik Akgun (2014). The current literature and our experience indicate that IA injections are safe and have positive effects for patient satisfaction. But, we are not sure that what ratio of this worthy outcome derives either from the real disease modifying effect or from the placebo effect of these drugs. When the unclear etiopathogenesis and the heterogeneity of OA are considered, it is hard to categorize the patients and their level of disease for IA injection choice. In regards to our experience, patient characteristics, symptoms, and clinical findings may indicate a practical approach for IA injections. The CS choice is reasonable in acute and persistent synovitis for patients that cannot be operated. The corticosteroids are effective in short-term. We prefer HA for obese patients who are older than 60 years and for patients with extremity malalignment. The supposed long-term effect of HA is attractive for these patients who are not willing to be operated. We prefer PRP for patients who are younger than 60 years, with mild OA and body mass index < 30, and for patients that do not have any extremity malalignment. If the patients are older than 60 years, or their body mass index > 30, or they have moderate OA, we still apply PRP injection, which is followed by a supplementary single dose of HA injection 2 to 4 wk. after PRP injection.80

Trueba Davalillo[17] 2015[17] Both treatments effectively controlled OA symptoms. BM showed higher short-term effectiveness, while HA showed

better long-term effectiveness, maintaining clinical efficacy in a large number of patients 1 year after administration.

Despite similarities, IA-HA products should not be treated as a group, as there are differences in IA-HA products that influence both efficacy and safety. In the available literature, IA-HA products with a molecular weight ≥3000 kDa and those derived from biological fermentation relate to superior efficacy and safety-factors that may influence selection an IA-HA product for OA of the knee.[18]

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 show 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.

Persistance of decreased pain sensitivity and improved functional outcome is shown in H.A. group up to one year.

Bibliography

1. Hill CL, Gale DR, Chaisson CE et al. Periarticular lesions detected on magnetic resonance imaging: prevalence in knees with and without symptoms. Arthritis Rheum. 2003;48:2836-44.
2. Moskowitz RW. Osteoarthritis, Fourth edn. Philadelphia: Lippincott Williams & Wilkins, a Wolters Kluwer business, 2007.
3. Vail TP, Lang JE. Insall and Scott surgery of the knee. 4th ed. Philadelphia Churchill Livingstone, Elsevier; 2006. p. 1455-1521.
4. Insall J, Ranawat CS, Scott WN, Walker P. Total condylar knee replacement. Preliminary report. Clin Orthop Relat Res 1976;120:149-54.
5. Kim RH, Scott WN. Operative techniques: total knee replacement. Philadelphia: Saunders-Elsevier; 2009. p. 91-103.
6. Hollander JL. Intra-articular hydrocortisone in arthritis and allied conditions. A summary of two years' clinical experience. The Journal of Bone and Joint Surgery 1953;35-A(4):983–90.
7. Miller JH, White J, Norton TH. The value of intra-articular injections in osteoarthritis of the knee. The Journal of Bone and Joint Surgery 1958;40B(4):636–43.
8. Wright (A) V, Chandler GN, Morison RAH, Hartfall SJ. Intra-articular therapy in osteo-arthritis. Comparison of hydrocortisone acetate and hydrocortisone tertiary-butylacetate. Annals of the Rheumatic Diseases 1960;19:257–61.
9. Valtonen(A) EJ. Clinical comparison of triamcinolone hexacetonide and betamethasone in the treatment of osteoarthrosis of the knee-joint. Scandinavian Journal of Rheumatology 1981;Supplement 41:1–7
10. Balazs EA. In: Helfet AJ, editor(s). Disorders of the Knee. 2 Edition. Philadelphia: J. B. Lippincott Company, 1982:61–74.
11. I ntra-articular use of hyaluronic acid in the treatment of osteoarthritis Clin Interv Aging. 2008 Jun;3(2):365–369.
12. J Pain Res. 2010; 3: 51–56. Published online 2010 May 10.Intra-articular hyaluronans: the treatment of knee pain in osteoarthritis Victor M Goldberg1 and Laura Goldberg2.
13. Przegl Lek. 2011;68(6):307-10.[Effectiveness and safety of intra-articular use of hyaluronic acid (Suplasyn) in the treatment of knee osteoarthritis].[Article in Polish]Gadek A1, Miśkowiec K, Wordliczek J, Liszka H.
14. International Journal of Clinical Practice Corticosteroid Injection Into the Osteoarthritic Knee Drug Selection, Dose, and Injection Frequency R. J. DouglasInt J Clin Pract. 2012;66(7):699-704.
15. Acta Biomater. 2013 Jul; 9(7):7081–7092. Published online 2013 Mar 15. doi: 10.1016/j.actbio.2013.03.005Applications and Emerging Trends of Hyaluronic Acid in Tissue Engineering, as a Dermal Filler, and in Osteoarthritis TreatmentAmirFakhari1 and Cory Berkland1,2,3,*.
16. World J Orthop. 2014 Jul 18;5(3):351–361. Published online 2014 Jul 18. Intraarticular injections (corticosteroid, hyaluronic acid, platelet rich plasma) for the knee osteoarthritis Egemen Ayhan, Hayrettin Kesmezacar, and Isik Akgun.
17. Clinical efficacy of intra-articular injections in knee osteoarthritis: a prospective randomized study comparing hyaluronic acid and betamethasone. Trueba Davalillo CA, Trueba Vasavilbaso C, Navarrete Álvarez JM, Coronel Granado P, García Jiménez OA, Gimeno del Sol M, Gil Orbezo FPublished Date January 2015 Volume 2015:7 Pages 9—18Accepted 6 November 2014, Published 9 January 2015Approved for publication by Professor Chuan-Ju Liu.
18. Am J Sports Med. 2015 Nov 17.