

Chronic Knee Osteoarthritis: Intra - articular Sodium Hyaluronic Acid and Radiofrequency Neurotomy of Genicular Nerve

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Abstract

Background: Various modalities have been used for treatment of chronic knee osteoarthritis but with limited benefits. Radiofrequency neurotomy of genicular nerve is emerging as newer modality for pain relief with few complications. The present study was designed with an aim to compare combination of intra articular sodium hyaluronic acid and genicular radiofrequency neurotomy with intra articular sodium hyaluronic acid alone in chronic osteoarthritis patients. **Methods:** 40 patients of either sex, age 40-65 years suffering from knee pain due to advanced osteoarthritis with no benefit from conservative measures were randomly allocated into two groups. In Group A, intra articular sodium hyaluronic acid 6mL was injected under aseptic precautions. In Group B, intra articular sodium hyaluronic acid was followed by radio frequency neurotomy of genicular nerves. All patients were followed with pre-operative and post-operative procedure outcome measurement at 1 week, 4 weeks, 12 weeks and 6 months. **Results:** Both groups were comparable with respect to age, height, weight, gender and BMI (Body Mass Index). Reduction in VAS (Visual Analogue Scale) and improvement in OKS (Oxford Knee Score) was better in Group B as compared to Group A at 1 week, 4 weeks, 12 weeks and 6 months post procedure, all differences being highly significant ($p < 0.001$). **Conclusion:** Combined therapy with intra articular sodium hyaluronic acid and genicular radiofrequency neurotomy is a safe, effective and minimally invasive procedure for knee osteoarthritis. It provides better pain relief and functional recovery of joints as compared to intra - articular sodium hyaluronic acid alone.

Keywords: Hyaluronic Acid; Radiofrequency; Genicular; Osteoarthritis; Knee.

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Introduction

Chronic knee osteoarthritis is the most common joint disease. Nearly 80% of population demonstrates radiographic evidence of osteoarthritis by the age of 65 years [1,2]. Risk factors for osteoarthritis are aging, obesity, injury and congenital anomalies. Osteoarthritis results in symptoms such as –

1. Pain around the joint which is aggravated by weight bearing.

2. Restricted movement.
3. Stiffness
4. Sleep disturbance
5. Psycho-social disability [3-6]

Biomechanical stress over joint components leads to biochemical changes in articular cartilage and synovial membrane. Various modalities have been used for treatment of osteoarthritis by pharmacological and non-pharmacological methods but with limited benefits. With long term NSAIDs,

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side effects are more [7,8]. Glucosamine and intra-articular steroids provide limited benefits.

Intra-articular viscosupplementation with substances like sodium hyaluronic acid is evolving. In osteoarthritis, there is loss of hyaluronic acid from synovial fluid. Therefore, supplementation will help in reduction of pain and stiffness [9]. This complementary therapy has variable response [10 - 12]. Radiofrequency neurotomy of genicular nerves is emerging as newer modality for pain relief in osteoarthritis in elderly patients with few complications, especially for the patients who are not appropriate surgical patients or not willing for surgery. The articular branches supplying the knee joint arise from various nerves - femoral, common peroneal, saphenous, tibial and obturator [13,14]. The articular branches around knee are known as genicular nerves. Studies comparing response of sodium hyaluronic acid are highly variable and studies for radiofrequency neurotomy of genicular nerves are limited. Therefore, the present study was designed with an aim to compare intraarticular sodium hyaluronic acid and RF genicular neurotomy combined with intraarticular sodium hyaluronic acid in chronic osteoarthritis patients.

Methods

This randomized control study was conducted from July, 2015 to March, 2016. Written informed consent was taken from all patients. 40 patients either sex, age 40-65 years suffering from knee pain due to advanced osteoarthritis with no benefit from pharmacological agents like NSAID's were randomly allocated into two groups:

Group A (n=20) - Intraarticular sodium hyaluronic acid

Group B (n=20) - Radiofrequency neurotomy of genicular nerves +Intraarticular sodium hyaluronic acid

Inclusion criteria were presence of chronic knee pain osteoarthritis (more than 3 months), radiologically tibio femoral osteoarthritis (Kellgren Lawrence grade 2-4) and patients refractory to oral analgesics and intra-articular steroid. Exclusion criteria were patients on anticoagulants and bleeding disorders, pacemakers, acute knee pain, previous knee surgery, allergic to sodium hyaluronic acid and presence of psychiatric disorders.

The patients who were eligible underwent diagnostic genicular nerve block of -

1. Superior lateral genicular nerve (SL)
2. Superior medial genicular nerve (SM)
3. Inferior medial genicular nerve (IM)

Diagnostic block was done with 2 ml of 1% injection lignocaine under fluoroscopic guidance. Diagnostic block was recorded as positive if patients had greater than 50% pain relief for more than 24 hours. Patients with positive response were included in study. Sodium hyaluronic acid skin hypersensitivity test was done in all patients. Patients with hypersensitivity reaction were excluded from study.

Under sterile condition patients were placed in supine position on fluoroscopy compatible operation table, with support of pillow under popliteal fossa of knee. In AP view, knee joint and junction of epicondyle with shaft was visualized. In Group A, intra-articular sodium hyaluronic acid was injected (Inj. Hyorth XL 6 ml) under aseptic precautions. After infiltration of 1ml of 1% lignocaine to skin and subcutaneous tissue with 26 G hypodermic needle, 22G spinal needle was placed intra - articularly in the knee. Placement was confirmed in AP and lateral view under fluoroscopy and sodium hyaluronic acid 6 ml was injected.

In Group B, intra-articular sodium hyaluronic acid was injected (Inj. Hyorth XL 6ml) after radiofrequency neurotomy of genicular nerves. Skin and subcutaneous tissue were infiltrated with 1% lignocaine 1 ml at SM genicular nerve, SL genicular nerve and IM genicular nerve locations. RF cannulas of 10 cm length, 10mm active tip (Baylis Medical Company Inc., Canada) were advanced at all 3 points under fluoroscopic guidance one by one percutaneously at junction of shaft and epicondyle of lateral and medial side of femur, and medial junction of tibia with end on view until bony contact was made. Sensory and motor stimulation was checked with RF machine (Baylis Medical Company Inc., Canada; Pain management generator) by connecting RF electrodes to RF cannulas. Sensory stimulation was checked with 50 Hz and 0.5 V for location of genicular nerve. Motor stimulation was checked with 2 Hz and 2 V. Inj. lignocaine 1% 2ml was injected and RF electrode was inserted into RF cannula. RF generator was activated at 80°C for 90 seconds at each point. All patients in both groups were instructed to continue medication for osteoarthritis after the procedure.

All patients were followed with post - procedure outcome measurement at 1 week, 4 weeks, 12 weeks and 6 months. Basal and post procedural Visual Analog Scale (10 mm), Kellgren Lawrence grading system of weight bearing radiograph and Oxford knee scoring system were noted.

Statistical analysis was done with SPSS package for Microsoft Excel. For weight, height and BMI Student's 't' test was used. For patients' variables like sex, OKS, VAS Fisher's exact test and Chi Square test were used. p value <0.05 was considered statistically significant.

Results

Both groups were comparable with respect to age, sex, height, weight and BMI. (Table 1)

Reduction in VAS scores (Table 3, Figure 1) and improvement in OKS (Table 4, Figure 2) was better in Group II compared to Group I at 1 week, 4 weeks, 12 weeks and 6 months post procedure, all differences being highly significant (p<0.001). Therefore, in our study pain relief was there in both groups at 6 months but it was better in Group II vs Group I (p<0.001).

Table 1: Demographic parameters in both groups

Parameters	Group A Mean± SD	Group B Mean± SD	P- value
Age (yrs)	62.5± 2.93	63.0 ± 2.82	>0.05
Weight (kgs)	65.0± 7.07	64.5 ± 0.70	0.14
Height (cms)	158 ± 7.07	160 ± 4.24	0.087
BMI	26. ± 0.56	25.25 ± 1.06	0.56
Sex (F/M)	16/4	18/2	0.66

Table 2: Kellgren Lawrence grading for knee X-ray in both groups

Kellgren Lawrence grading	Group A	Group B
Grade II	4	4
Grade III	10	10
Grade IV	6	6

Table 3: Visual Analogue Scale (0 to 10 mm) in both groups

	Group A	Group B	P value
Basal	8.5 ± 0.7	8.5 ± 0.76	0.16
1 Week	3.0 ± 0.4	2.5 ± 0.64	0.001
4 Week	2.0 ± 0.85	2.0 ± 0.52	0.002
12 Week	3.5 ± 0.71	1.5 ± 0.41	<0.001
6 Months	4.0 ± 0.52	2.0 ± 0.67	<0.001

Table 4: Oxford Knee Scores in both groups

	Group A		Group B		P- Value
	Group	Score	Group	Score	
Basal	Grade-II	20	Grade-II	20	>0.05
1 Week	Grade-II	18	Grade-II	10	0.006
	Grade-III	2	Grade-III	10	
4 Weeks	Grade-II	9	Grade-III	20	<0.001
	Grade-III	11	---	---	
12 Weeks	Grade-II	5	Grade-III	15	0.021
	Grade-III	14	Grade-IV	5	
	Grade-IV	1	---	---	
6 Months	Grade-II	1	Grade-III	6	<0.001
	Grade-III	17	Grade-IV	14	
	Grade-IV	2	---	---	

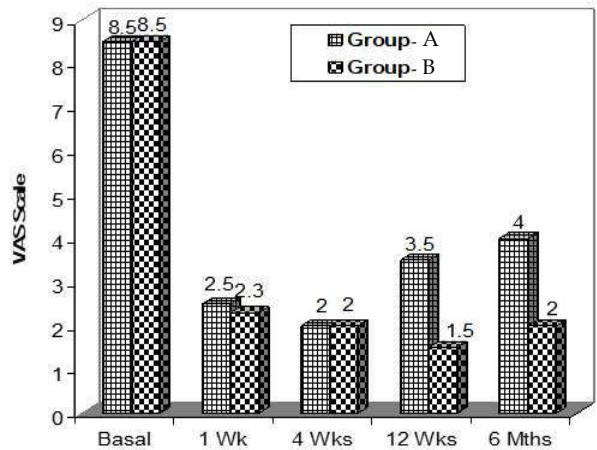


Fig. 1: Visual Analogue Scale (0 to 10 mm) in both groups

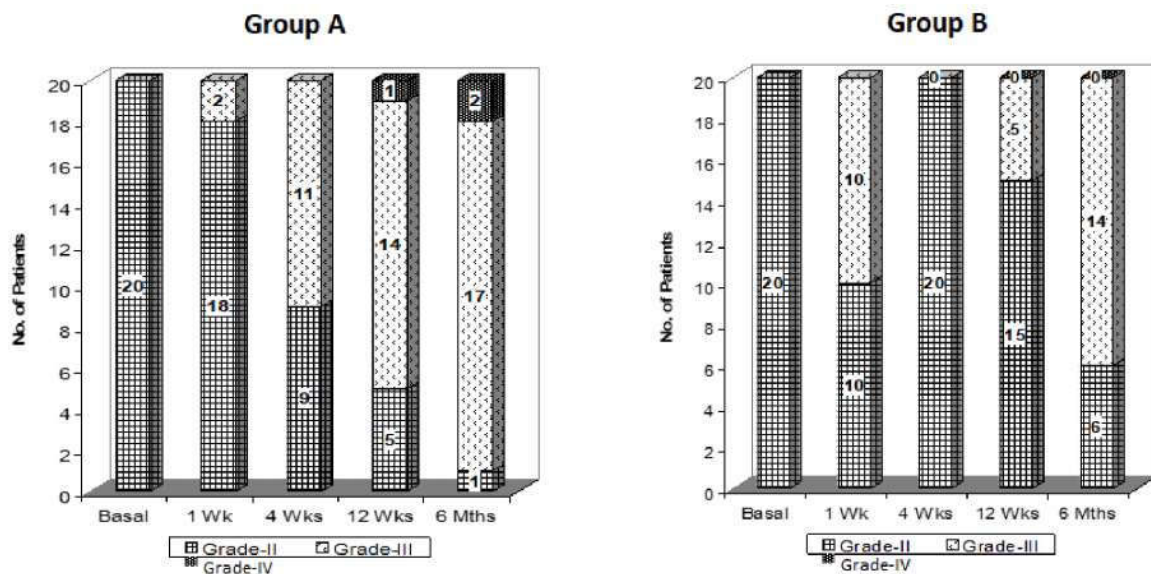


Fig. 2: Oxford Knee Scoring in both groups

Discussion

Chronic knee osteoarthritis is often difficult to manage with traditional non surgical management. Viscosupplementation is a newly available option for patients with symptomatic knee osteoarthritis for intra articular injections [13]. Radiofrequency genicular neurotomy is a newer therapeutic alternative for chronic knee pain [15]. Osteoarthritis is characterized by loss of articular cartilage. A reduction in elastic and viscous properties of synovial fluid occurs. The molecular weight and concentration of the naturally occurring hyaluronic acid decreases. This decreases lubrication and is the main cause for pain production [16,17]. In osteoarthritis, hyaluronic acid binds to CD4 receptors of chondrocytes supporting the role of sodium hyaluronic acid in cartilage [18]. The higher molecular weight of sodium hyaluronic acid may make it more efficacious than

hyaluronic acid because of its longer period of residence in joint space due to slower resorption and enhanced viscoelastic property [16,19].

Altman RD et al. conducted a study involving three groups, Group 1 (Inj. Sodium Hyaluronic acid, n=62), Group 2 (Control, I/A saline, n =65), Group 3 (NSAID naproxen orally, n=63). At 26 weeks, slight pain or pain free, 47.6% in Group 1 vs 33.1% in control group (p=0.039) vs 36.9% in Naproxen group (p=0.22). So, pain relief was comparatively better in sodium hyaluronic acid group [20]. Wobig M et al. conducted a randomized study involving two groups, Group 1 (n=57) Hylon 2ml intra articular for knee osteoarthritis vs Group 2 (n=60) 2mL normal saline intra articular for knee osteoarthritis. At 12 weeks, 47% of the Group 1 was pain free vs 8% in Group 2 (p<0.001). At 26 weeks, 39% in Group 1 vs 13% in Group 2 (p<0.001) [21]. The results of our study prove the benefit of genicular

RF neurotomy of knee along with intra articular sodium hyaluronic acid for chronic osteoarthritis knee patients in whom there is not much response for conservative treatment and suboptimal response for intra articular sodium hyaluronic acid alone.

Conclusion

Combined therapy with intraarticular sodium hyaluronic acid (which triggers cartilage regeneration and provides lubrication to joints) and genicular RF neurotomy is a safe, effective and minimally invasive procedure for knee osteoarthritis, provides better pain relief and functional recovery of joints. Therefore, it has advantage over intraarticular sodium hyaluronic acid alone in providing better pain relief and for longer duration. This combined therapy is effective alternative for knee replacement surgery in elderly patients.

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