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Original Research Article

To Evaluate the Efficacy of Intra-articular Injection of Triamcinolone versus the Combination of Genicular Nerve Block and Intra-articular Injection of Triamcinolone in Patients with Knee Osteoarthritis

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Abstract:

Background: Knee osteoarthritis is one of the leading cause of disability worldwide. Most patients do not progress to TKA and of those that do, 15–40% continue to suffer from refractory knee pain. Genicular nerve neurolysis/Rhyzotomy and intra-articular steroid injection (IASI) are available treatment options for patients with knee osteoarthritis. Genicular nerve block (GNB) under fluoroscopy guidance is based on bony landmarks (area connecting the shaft to the epicondyle). This simple technique permitted successful blockade of three Genicular nerves and may be performed by local Anaesthetic drugs or Radiofrequency Ablation. In this study, I want to investigate the efficacy of IASI versus the combination of GNB and IASI in patients with knee osteoarthritis.

Aims and Objectives: The primary objective of our study is to assess and compare the pain relief in patients after intra-articular injection of triamcinolone versus the combination of it with the Genicular nerve block. The secondary objective is to compare the functional capacity improvement as measured by WOMAC score.

Methods: The prospective observational type of study was carried out on thirty patients with Kellgren–Lawrence grade 2–3 knee OA in the department of Anaesthesiology at Gandhi Medical College Bhopal after the approval of Institutional Ethics Committee of our hospital. The patients were assigned into 2 groups randomly as IASI (N=15) and GNB+IASI (N=15) group. Patients were assessed with a detailed history and thorough pre procedure examination. All the patients were evaluated with Visual analogue score (VAS) for pain intensity and Western Ontario and Mc Master Universities Osteoarthritis Index (WOMAC) for functional status of the patients. All assessments were measured and compared at baseline, 1 month, 3 month and 6th month after treatment.

Results: All evaluation parameters were significantly improved in IASI and IASI+GNB groups. However, the WOMAC score of IASI+GNB group was significantly lower than WOMAC score of IASI group during all the intervals of time ($p<0.001$).

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Conclusions: When combined with IASI, GNB yields better analgesic effect and improves functional capacity in patients with knee osteoarthritis compared to only IASI.

Keywords: Knee · Osteoarthritis · Intra-articular · Steroid ·Triamcinolone · Genicular nerve

1. INTRODUCTION

Osteoarthritis (OA) of the knee is the most widespread chronic joint disease worldwide leading to pain, disability and massive healthcare costs [1, 2]. Its primary symptoms are pain, joint dysfunction with range of motion (ROM) limitation and muscle atrophy [3]. Symptomatic OA is observed in 12% of individuals over 60 years old and is strongly related with age and obesity [4]. Traditional conservative treatment modalities for knee OA includes pharmacological treatments including non-steroidal anti-inflammatory drugs (NSAIDs), physical therapy and intra-articular injection therapies including corticosteroids (CS) and hyaluronic acid [5]. Intra-articular CS injection therapy is widely used in knee OA over decades with a rationale to reduce joint inflammation and pain with the delivery of these anti-inflammatory agents. Although there is a general consensus about the efficacy of intra-articular CS administration, there are still concerns about the duration of analgesic effect and the effects of prolonged exposure. A recent Cochrane review of intra-articular CS for the treatment of knee OA concluded that intra-articular application of CS was more effective than placebo in reducing pain at first 2 weeks after injection but it was lasted in 4–24 weeks [6]. Although conservative treatment modalities of knee OA are effective in most of the patients, significant improvement may not be obtained and additional treatments may be required in a small percentage of the patients. Genicular nerve block (GNB) is reported to be a safe and effective treatment modality in patients with knee OA who have severe chronic pain [7, 8]. GNB under fluoroscopy guidance is based on bony landmarks (area connecting the shaft to the epicondyle) and anatomical studies demonstrating that genicular nerves are accompanied by genicular arteries or collateral ligament [9, 10]. GNB may be performed by local Anaesthetic or radiofrequency (RF). Generally, a diagnostic block with local Anaesthetic drugs is performed before and RF is applied if a successful response is obtained [11]. However, some studies indicated that the effect of local Anaesthetic drugs may be prolonged with CS [12, 13]. We hypothesized that analgesic effect of IASI might be better with GNB.

2. MATERIAL AND METHOD

Study design

Inclusion criteria	Exclusion criteria
Patients suffering from chronic knee pain for more than 3 months	Patient's refusal
Osteoarthritis of knee grade II and III	Infection
Age group-40-80 years of age	Septic arthritis
	Patient with neurological deficit

An observation type of study was carried out on thirty patients who had knee OA diagnosed with radiography and/or ultrasound (US) and admitted to pain clinic in the Department of Anaesthesiology at Gandhi Medical College, Bhopal Madhya Pradesh. After approval of the Institutional Ethics Committee of our hospital, patients were assigned into 2 groups randomly

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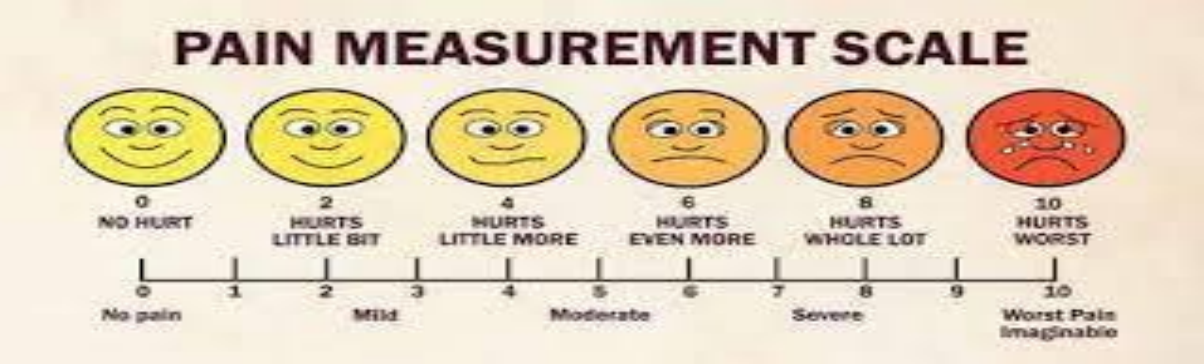
as IASI (N=15) and GNB+IASI (N=15) group. Prior to the study, a power analysis was performed by a statistician and it is confirmed that the number of the participants are suitable for the study. All patients were physically examined to exclude the other causes of the knee pain such as bursitis, tendinitis, baker cyst or referred pain sources such as achilles tendinitis or pyriformis syndrome. At the beginning of the study, the patients and/ or legal caregivers were informed regarding the study and their written and verbal consents to participate were obtained.

Evaluation parameters

(a*) Radiographic evaluation* Bidirectional direct x-ray radiographies of the patients were taken and evaluated to exclude bone pathologies such as fracture and dislocation. Severity of HO was graded according to Kellgren–Lawrence classifcation [14]. Kellgren–Lawrence classification divides knee OA into 5 grades. Grade 0 refers to absence of radiographic features of OA. Grade 1 is defined as doubtful joint space narrowing (JSN) and possible osteophytic lipping. Grade 2 includes definite osteophytes and possible JSN on anteroposterior weight-bearing radiograph. Grade 3 refers to multiple osteophytes, definite JSN, sclerosis, possible bony deformity and grade 4 includes large osteophytes, marked JSN, severe sclerosis and definite bony deformity.

(b*) Pain and functional evaluation* Pain severity of the patients were evaluated with visual analogue scale (VAS) score between 0 (no pain) to 10 (very severe pain).



Western Ontario and Mc Master Universities Osteoarthritis Index (WOMAC) was used for functional evaluation of the patients. The WOMAC consists of 24 items divided into 3 subscales: pain (5 items): during walking, using stairs, in bed, sitting or lying, and standing, stiffness (2 items): after first walking and later in the day, physical Function (17 items): stair use, rising from sitting, standing, bending, walking, getting in/out of a car, shopping, putting on/taking of socks, rising from bed, lying in bed, getting in/out of bath, sitting, getting on/off toilet, heavy household duties, light household duties [16]. Higher scores are associated with worse functional status.

C-arm imaging and injection procedure

All the patients were taught how to define pain using the visual analog scale (VAS). Patients were assessed with a detailed history and thorough pre procedure examination. In the operating room standard monitoring was instituted. Injection procedure was performed according to NHS protocol for corticosteroid injection of intra-articular, periarticular or soft tissue. For IASI+GNB group, the injection site was cleaned with 10% polyvinylpyrrolidone (PVP) iodine solution and covered with a disposable patch before injection. No pre-

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medication or sedative drug was administered before the procedure. Each patient was placed in supine position with a pillow under popliteal fossa to avoid discomfort. For C-arm guided GNB (N=15), a volume of 2-3 ml lignocaine was injected at each target site: the superior lateral, superior medial, and inferior medial genicular nerves. After GNB procedure, intra-articular triamcinolone 40 mg was injected with a 22 G needle from the superior medial aspect of the knee in supine position with 30 degree flexion at knee joint. For IASI group, same injection procedure was performed without GNB injection. The injection site was cleaned with same PVP iodine solution after injection.

Study protocol

The patients were randomly divided into two groups as intra-articular steroid (IASI) and IASI with GNB (IASI + GNB) group. VAS scores and WOMAC scores of the patients before, 1 month, 3 month and 6th month after treatment were recorded and compared.

Statistical analysis

All observations were analysed using Unpaired t-test with the help of MS excel. Variables were presented as mean & standard deviation. P value <0.05 was considered to be significant.

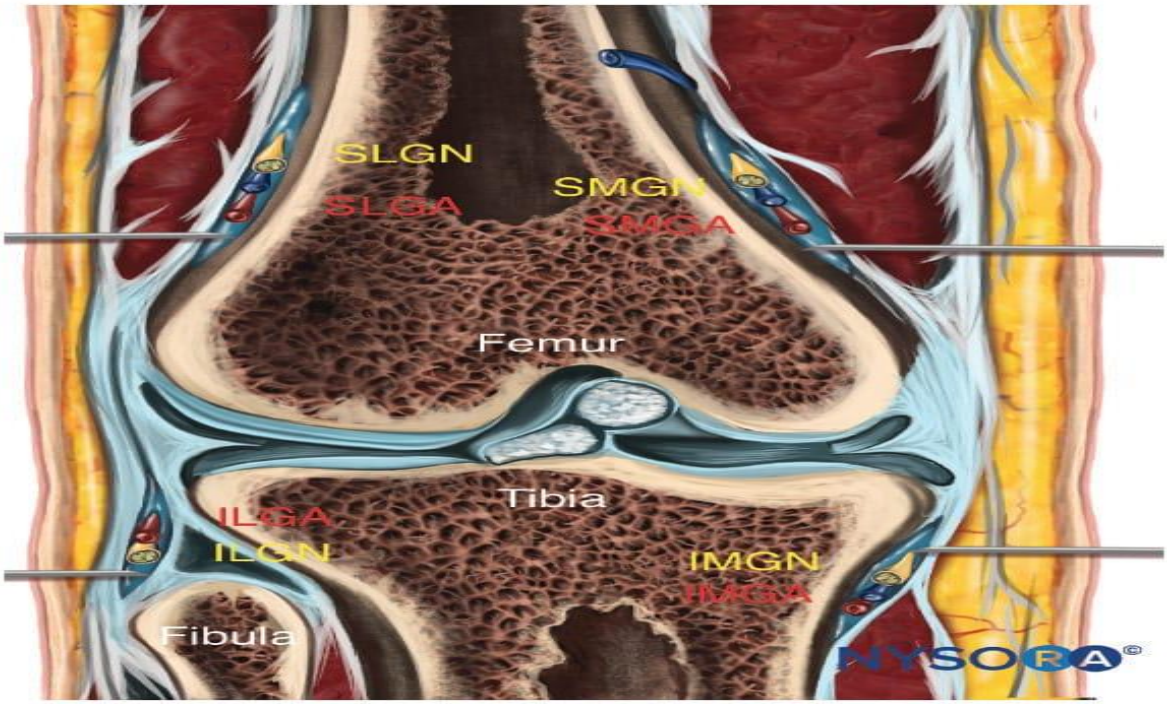

Figure 1: Anatomy of the genicular nerve showing needle insertion and distribution of the local anaesthetic. SLGN, superolateral genicular nerve, and artery; SMGN, superomedial genicular nerve, and artery; ILGN, inferolateral genicular nerve, and artery; IMGN, inferomedial genicular nerve, and artery.

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Figure 2 **Figure 3**

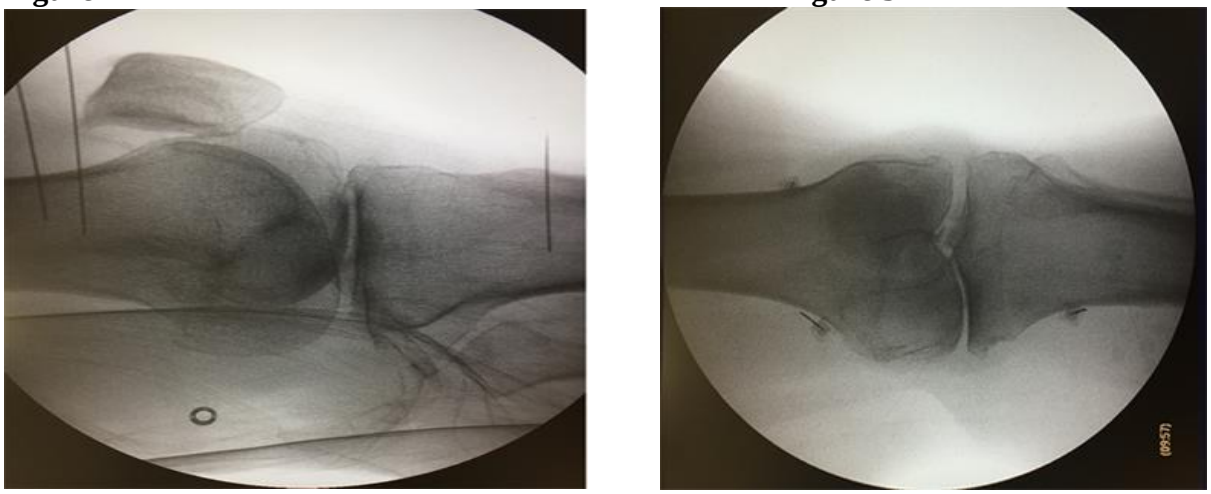

Figure 2, Lateral and Figure 3 Anterior/posterior C-arm guided images of the final needle position during Genicular Nerve Blocks are shown

3. RESULTS

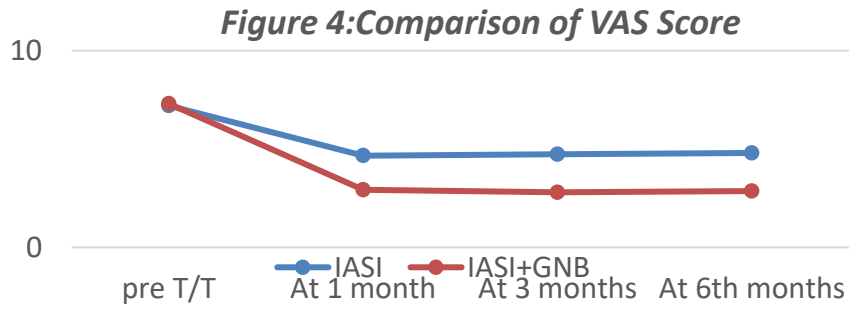

Table 1: Comparison of VAS Scores at different time intervals

VAS SCORE	IASI (N=15) GROUP	IASI+GNB (N=15) GROUP	P VALUE
PRE TREATMENT	7.2±1.37	7.3±1.68	
After 1 MONTH	4.66±1.12	2.93±0.51	0.01
After 3 MONTHS	4.73±0.92	2.8±0.59	0.003
After 6 MONTHS	4.8±1.45	2.86±1.36	0.003

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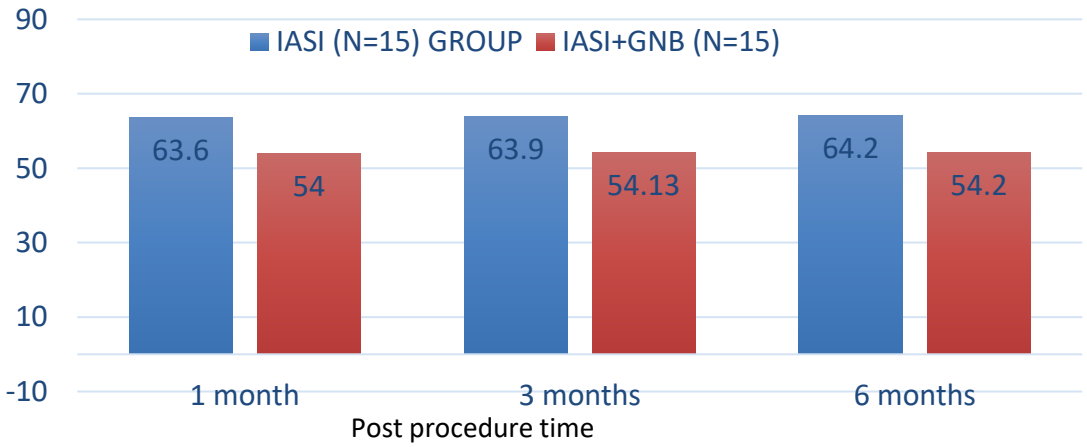
Figure 2: Comparison of WOMAC SCORE at different time interval



In comparison of IASI + GNB and IASI groups, IASI+ GNB group had shown significant improvement in terms of all evaluation parameters during all the intervals of time ($p<0.05$)

4. DISCUSSION

The present study has compared IASI alone or combined with GNB with pain intensity and functional capacity. We found significant improvement in the IASI+GNB group in all parameters. All evaluation parameters had significantly improved in the IASI group also. However, the IASI+GNB group showed more significant improvement in all evaluation parameters. IASI is a treatment modality which has been used for knee OA for decades. CS agents have both anti-inflammatory and immunosuppressive effects. They interrupt the inflammatory and immune cascade via nuclear receptors [18]. Thus, they decrease vascular permeability, inhibit proinflammatory cell accumulation and suppress inflammatory mediators such as metalloproteinase, superoxide radicals, prostaglandins and leukotriene [19]. Clinically they also increase the viscosity of joint fluid resulting in reduced pain and increased joint mobility [2, 20]. A recent Cochrane review of Bellamy et al. concluded that IACSI was more effective than a placebo in reducing pain at 1–2 weeks' post-injection. However, little evidence of any such effect was observed at 4–24 weeks' post-injection [9]. This may be attributed to the short half-lives of CS agents [13]. Our results are in accordance with recent clinical data. We found significant improvement in the VAS scores of patients treated with IASI. Moss et al reported increased pain and more functional disability in patients with knee OA who have high scores in the Pain DETECT questionnaire [20]. In accordance with Moss et al., we found notably high WOMAC in both groups suggesting that higher LANSS questionnaire scores are associated with increased functional disability. After IASI treatment we found significant improvement in WOMAC suggesting that this modality not also decreases the peripheral component of pain but also improves central sensitization and thus reduces functional disability and increases QOL.

Innervation of the knee joint is provided by various articular branches. In a recent cadaveric study, Yasar et al. investigated the locations of superomedial and inferomedial branches of genicular nerves by determining anatomical landmarks for ultrasound guidance and concluded that superior and inferior genicular nerve branch injection can be performed

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accurately by using landmarks [21]. GNB can be performed by radiofrequency (RF) neurotomy or neurolysis of these nerves by local anaesthetics. Most studies in the literature emphasize the efficacy of RF on GNB. Only Kim et al have compared the efficacy of lignocaine and lignocaine combined CS in patients with knee OA. They concluded that although GNB is an effective treatment for knee OA, addition of CS does not produce a long-time analgesic effect [10]. In contrast to Kim et al, we used CS for intra-articular injection and not for GNB. In the IACSI+GNB group, we found significant improvement in VAS and WOMAC scores. We also determined that the decrease in pain intensity evaluated by VAS was better in the IASI+ GNB group when compared to IASI alone suggesting that GNB enhances the analgesic effect of IASI treatment. Although we found significant improvement in the functional status of patients in both groups evaluated with WOMAC, functional improvement was better in the IASI+GNB group suggesting that GNB also improves functional capacity in patients with knee OA.

5. CONCLUSION

Knee OA is a chronic joint disease characterized by severe pain and functional disability. The majority of patients benefit from conservative treatment modalities but additional treatments may be required in a small percentage of patients. GNB is a novel treatment used for this minor patient group. When combined with IASI, GNB produces a better analgesic effect and improves function in patients with knee OA. This preliminary study has certain limitations. We performed this study with a rather limited number of individuals and follow-up time. However, we performed a power analyses prior to the study which indicates that the number of individuals in our study is adequate for significant results. Nonetheless, our results are significant and should not be underminded. Further studies with a larger patient population and extended follow-up time may reflect the real benefits of GNB performed with local anaesthetics.

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