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## A comparative study of the efficacy of intra-articular injection of 2% lignocaine in the treatment of osteoarthritis knee in contrast to the injection of normal saline

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### Abstract

Osteoarthritis of the knee is a commonly occurring disorder in the elderly population worldwide. It is usually treated with first-line therapies like life-style modification, analgesics, braces, and physiotherapy. Increasingly second-line treatments – intra-articular platelet-rich plasma, hyaluronic acid, and lignocaine are being offered. We compared 50 knee joints of 25 patients of advanced knee osteoarthritis by treating 25 knee joints with intra-articular 2% lignocaine and other 25 knee joints (allocated randomly) with intra-articular saline injection as a placebo and using NPRS scale and WOMAC SCALE for results.

**Keywords:** Osteoarthritis, lignocaine, NPRS scale, WOMAC scores

### 1. Introduction

Osteoarthritis is by far the most common form of knee joint disease in the elderly <sup>[1]</sup>. It is strongly associated with age. Clinically osteoarthritis is the end result of biochemical and mechanical insult that exceeds the joint's ability to repair itself. There is the deformation of subchondral bone <sup>[2]</sup> with the destruction of articular cartilage <sup>[3, 4]</sup> which are causes of pain in osteoarthritis. In general, patients with osteoarthritis knee are treated with a brace, physiotherapy, and analgesics, etc. Patients who failed to respond to these measures are treated by invasive procedures like intra-articular injection of hyaluronic acid <sup>[5, 6]</sup>, lignocaine and platelet-rich plasma etc.

In our study we compared the relief in knee pain and improvement in functional disability of patients treated with intra-articular 2% lignocaine injections to those treated with intra-articular saline injection by comparing NPRS scores and WOMAC scores.

### 2. Methods

This is an interventional study in which we enrolled 25 patients (14 females and 11 males with mean age of 72 years and range 65 to 81 years) with bilateral comparable osteoarthritis of knees (grade III/IV on Kellgren-lawrence <sup>[7]</sup> grading scale) determined by anteroposterior radiographs of both knee joints in standing position. We excluded patients with different grades of osteoarthritis in both knees, any patients with pre-existing deformity of lower limbs, patients with early osteoarthritis and unilateral arthritis, patients with polyneuropathy, low back pain, etc.

This was a triple-blind study where the person giving intra-articular injection did not know the content of injection, the patient who was given injection also did not know about the contents of the injection as to which side lignocaine was administered and saline in which knee, and lastly the person who collected the feedback and completed the questionnaire also did not know about the sides injected with lignocaine or saline. The study was performed after taking permission from the ethical committee of our institution conducted between April 2020 and March 2021. In total there were 25 patients with both knees of patients randomized with help of software so that one knee was injected with normal saline and the other with 2% lignocaine

and separated into two groups. Baseline NPRS and WOMAC scores were recorded. Patients were placed supine on the operation table and both knees were flexed to 30 degrees, painted with betadine, and draped with sterile sheets. Then under ultrasound guidance, syringe with a 22 gauge needle was inserted in the medial knee joint space. Patients in group I were given three intra-articular 2% lignocaine injections under ultrasound guidance at 1-week intervals and those in group II were given three intra-articular saline injections at 1-week intervals NPRS and WOMAC scores were recorded at 1 month and 3 months.

Pain intensity was assessed using a single 11 points Numeric rating scale (NPRS) in which 0 is equal to no pain and 10 is equal to the worst pain perceivable.

WOMAC consists of 5 questions measuring pain, 2 measuring joint stiffness, and 17 measuring functional limitation with all questions scored on a scale of 0 to 4. Higher scores on WOMAC indicate worse pain, stiffness, and functional limitation [7].

**3. Results**

There were 25 patients enrolled in our study and no patient was lost to follow up. There were no complications reported

after administration of intra-articular injections in any patient. As can be seen from the table I there was a marked decrease in knee pain in group I patients, as seen in decrease in value of NPRS, mean scores from 6.56 at baseline to 3.44 at 1 month and 3.40 at 3 months which shows an almost 50% reduction in knee pain. Similarly, there was improved joint mobility in group I patients indicated by significant differences ( $p < 0.05$ ) in baseline WOMAC scores to those at 1 month and 3 months after the treatment. In contrast, in group II NPRS scores were 6.76 before starting the treatment and 6.68 and 6.64 at 1 month and 3 months respectively. Similarly, there was hardly any drop in WOMAC scores after treatment and thus results were found to be not significant in group II at 1 month and 3 months.

Also when comparing NPRS and WOMAC scores between group I and group II, TABLE 2 shows mean NPRS SCORE of 3.44 in group I patients in comparison to 6.68 in group II at 1 month and mean of 3.40 in comparison to group II at 3 months which is approximately 50% reduction in pain scores. Results were found to be significant ( $p < 0.05$ ) at 1 month and 3 months in group I patients in comparison to group II patients.

**Table 1:** Before and after treatment values of WOMAC and NPRS scores (paired sample t test)

		Group I			Group II		
		Mean	S.D.	P Value	Mean	S.D.	P Value
WOMAC Pain Score	Baseline	11.92	1.32		11.64	1.41	
	1 month	8.44	1.36	<0.01	11.60	1.47	0.32
	3 months	7.12	1.05	<0.01	11.64	1.41	0.08
WOMAC stiffness score	Baseline	4.80	0.91		4.84	0.75	
	1 month	3.24	0.72	<0.01	4.76	0.83	0.16
	3 months	2.84	0.47	<0.01	4.72	0.79	0.08
WOMAC functional score	Baseline	45.04	3.28		44.40	3.04	
	1 month	36.04	2.41	<0.01	44.04	3.21	0.24
	3 months	35.80	2.36	<0.01	44.32	3.08	0.60
WOMAC total score	Baseline	61.76	4.25		60.88	3.63	
	1 month	47.72	3.16	<0.01	60.40	4.03	0.15
	3 months	45.76	2.82	<0.01	60.64	3.86	0.23
NPRS score	Baseline	6.56	0.71		6.76	0.97	
	1 month	3.44	0.65	<0.01	6.68	1.03	0.42
	3 months	3.40	0.71	<0.01	6.64	1.04	0.26

**Table 2:** Comparison of two groups in terms of WOMAC and NPRS scores at 1 and 3 months (independent t test)

			N	Mean	S.D.	P value
WOMAC pain score	1 month	Group I	25	8.44	1.36	<0.01
		Group II	25	11.60	1.47	
	3months	Group I	25	7.12	1.05	<0.01
		Group II	25	11.52	1.39	
WOMAC stiffness score	1 month	Group I	25	3.24	0.72	<0.01
		Group II	25	4.84	0.75	
	3 months	Group I	25	2.84	0.47	<0.01
		Group II	25	4.72	0.79	
WOMAC functional score	1 month	Group I	25	36.04	2.41	<0.01
		Group II	25	44.04	3.21	
	3 month	Group I	25	35.80	2.36	<0.01
		Group II	25	44.32	3.08	
WOMAC total score	1 month	Group I	25	47.72	3.16	<0.01
		Group II	25	60.40	4.03	
	3 months	Group I	25	45.76	2.82	<0.01
		Group II	25	60.64	3.86	
NPRS score	1 month	Group I	25	3.44	0.65	<0.01
		Group II	25	6.68	1.03	
	3 months	Group I	25	3.40	0.71	<0.01
		Group II	25	6.64	1.04	

#### 4. Discussion

Pain is the main issue in osteoarthritis of the knee in addition to stiffness and decreased joint mobility. In our study by using the NPRS scale and WOMAC scale we found a decrease in pain intensity and an increase in joint mobility of patients treated with intra-articular 2% lignocaine injections in comparison to those treated with n saline. Lignocaine is a safe and effective anaesthetic agent used for local anaesthesia. High doses of lignocaine have been found to produce neurological toxicity after spinal anaesthesia [8, 9, 10] and irreversible neurological deficit on the peripheral nervous system [11, 12, 13, 14]. According to Ready *et al.* minimum, irreversible concentration of intrathecal lignocaine in rabbits is 7.6% to 10.6% [8]. There is a report by Baiton *et al.* which states lignocaine-induced irreversible conduction loss in frog nerve is concentration dependent [11]. Kalichman *et al.* showed that local anaesthesia produced a concentration-dependent increase of specific morphological changes, such as the formation of endoneurial edema and axonal degeneration in the rat sciatic nerve [12]. Thus decrease in pain sensitivity of the knee joints can be attributed to degeneration of efferent fibres responsible for mediating tenderness. The increase in joint mobility is probably due to a decrease in knee pain.

In another study, it is suggested that initial excitation and peripheral sensitization of peripheral nociceptors (e.g. due to joint inflammation) results in sufficient input to central pain systems to cause central sensitization of peripheral nociceptors (due to joint inflammation) which may cause sufficient input to central pain systems to cause central sensitization of dorsal horn neurons and higher brain centers [14, 15].

There are various other studies that have reasoned that inflammation in the synovium and other structures of the osteoarthritic knee contribute to sensitization of pain [16]. Inflammation has been shown in peri-articular tissue and muscles also contribute to the severity and frequency of osteoarthritis pain [16, 17].

Osteoarthritis knee results in low-grade inflammation which is implicated in disease progression, generation, and maintenance of pain [18, 19, 20]. Synovial inflammation is implicated in the causation of joint stiffness, effusion, and joint swelling [18] and has a profound effect on the nociceptive system where cytokines seem to be the major player in the production of such effects [19]. Pain research has revealed that both the sensitization of nociceptor located in deep tissue in the joint (peripheral sensitization) and sensitization of spinal cord neurons with joint input (central sensitization) are basic neuronal processes underlying pain and mechanical hyperalgesia in the inflamed joint [21-22].

Pain in osteoarthritis knee has also been attributed to osteophyte formation on the medial aspect of the knee joint, meniscal degeneration or it may also originate from peri-articular tissue. These changes cause stretching of the periosteum and periarticular tissue [2].

In our study, we found not only a significant decrease in knee pain in patients treated with 2% lignocaine but also an increase in range of motion of knees when compared to a study done by Motohiro Kawasaki [23] *et al.* where patients were treated with 10% lignocaine and subsequently results showed a decrease in knee pain but there was no significant increase in range of knee movements. Further we used 2% lignocaine in contrast to 10% lignocaine because of dose and time-dependent toxicity of lignocaine on chondrocytes [24].

Small sample size and a short period of follow-up are limitations of this study. More studies with larger number of

patients and longer follow-up are required to substantiate the findings of the present study.

#### 5. Conclusion

Intra-articular injection of 2% lignocaine in knee joints produces effective long-term analgesia for chronic pain associated with the arthritis of knee and increases joint mobility of osteoarthritic knees.

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