

ORIGINAL ARTICLE

EFFICACY OF INTRA-ARTICULAR KETOROLAC AND LIGNOCAINE ON POST-OPERATIVE PAIN RELIEF AFTER ARTHROSCOPIC KNEE SURGERY

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Background: Arthroscopy of the knee is preferably done under spinal anaesthesia. The optimal analgesia for effective postoperative pain control is important to permit early discharge, comfort and mobility of the patient. Objective of the study is to assess the efficacy of ketorolac and lignocaine administered intra-articularly for postoperative pain following knee arthroscopic surgery. **Methods:** A total of 133 patients were randomized into two groups with one group receiving intra-articular Ketorolac and the other group receiving intra-articular Lignocaine. Postoperative pain was then assessed using the Visual Analog Scale (VAS) at 4, 8, 12 and 24 hours after surgery. **Result:** Both the groups had effective analgesia at 4 hours. The best analgesia was seen in the group that received Ketorolac Intra-articularly and it was found statistically significant. **Conclusion:** Administration of intra-articular Ketorolac injection is safe and effective way of achieving postoperative pain relief after arthroscopic knee surgery.

Keywords: Ketorolac; Lignocaine; Intra-articular injection; Spinal anaesthesia; Knee arthroscopy

Citation: Niazi ASK, Bajwa MA, Zahra M, Niazi MUK, Zainab I, Anwer A. Efficacy of intra-articular ketorolac and lignocaine on post-operative pain relief after arthroscopic knee surgery. J Ayub Med Coll Abbottabad 2022;34(2):273–8.

INTRODUCTION

Arthroscopy is a routine procedure in orthopaedic centers that can either be diagnostic or therapeutic. It may be performed in Local anaesthesia, spinal anaesthesia or regional anaesthesia. Postoperative pain control is essential to allow early mobilization and return to daily activities. Apart from other analgesics this can also be achieved either with intra-articular administration of lignocaine or intra-articular ketorolac.¹ Since the use of Intra-venous painkillers has adverse effects on the renal system.² Thus, use of Intra-articular painkillers was done. Moiniche *et al* stated that Lignocaine gives short term relief from postop pain (4 hours)³, while Gupta *et al* found that combination of painkiller such as Ketorolac and morphine has effective control on postoperative pain up to 24 hours⁴. Ketorolac, a nonsteroidal anti-inflammatory drug, has proven to give good analgesic effect when given intra-articularly.⁵ The exact mode of action of NSAIDs is not known, it is believed that they act by modulating peripherally acting pain mediators or even acting via the central nervous system.^{2,6-8}

The objective of the study is to determine efficacy of Ketorolac as compared to Lignocaine on post-operative pain relief in arthroscopy of knee done under spinal anaesthesia. A similar study has been carried out by Huey-Ping *et al*¹ in University Hospital, Orebro, Sweden in 2005 in which

procedure was carried out in the Outpatient Department under local anaesthesia. To find out the results in our local settings under spinal anaesthesia; the study was done.

MATERIAL AND METHODS

This study was randomized control trial. The study was approved by hospital ethics committee and verbal informed consent was obtained from the patients that fit the inclusion criteria. 133 patients in the age group of 18 to 48 were scheduled for the surgery and interviewed from February 09 to August 20, 2019. Two groups of 66 (57 males and 9 females) and 65 (61 males and 4 females) patients were made and the effects of the drugs were recorded. Preoperative baseline of Visual Analog Scale was obtained for all (0= no pain, 1= low pain, 2= mild pain, 3= uncomfortable pain, 4= moderate pain, 5= distracting pain, 6= distressing pain, 7= unmanageable pain, 8= intense pain, 9= severe pain, to 10= worst imaginable pain) at rest. The anaesthetist then gave the spinal anaesthesia and procedure was performed. At the end of the procedure, one of the following drugs was administered intra-articularly in a random manner: Group I: ketorolac 30 mg (1 ml) + 4 ml 0.9% saline; Group II: Lignocaine 2% (5 ml). The effect of spinal anaesthesia itself wears off usually after 3 hours; therefore VAS score was recorded at 4, 8 and 24 hours post-operatively for each patient. If the level of

pain of the patient was at VAS 6 or above, the patient was given intravenous Paracetamol 1g/100ml. Patients were discharged the next day when they had adequate mobility and no signs of gastrointestinal disturbance, on oral medications on a compound (Orphenadrine Citrate 50mg + Paracetamol 625 mg).

Patients between ages 18–50 without any gender discrimination having torn ligaments or menisci of knee joint diagnosed on MRI, who were recommended arthroscopic surgery of knee after having anaesthesia fitness were included in the study.

Patient having co-morbid, history of previous surgery, history of substance abuse, history of drug allergy, or any other contraindication to the drugs used in study were excluded.

Collected data was analysed using SPSS version 26.0. The variation in intensity of pain from preoperative baseline was analysed by appropriate statistical tests. On yielding a definite result, One Way ANOVA test determined the groups that had significant variation from each other. The analgesic medications used postoperatively were compared using chi-square test.

RESULT

Table-2 shows that the majority of the patients ranged from 19 to 32 years that is 72.7 % (total percentage of the 2 age groups). The most pain felt by Group I was up to level ‘6’ on Visual Analog Score (VAS) pertaining to be ‘Distressing Pain’ after 8 hours. The pain significantly reduced with time as shown in Table-3.

It is evident from Table-3 that the pain level of the patients went on decreasing with the passage of time. The maximum level of pain recorded for the patients was ‘6’ that were very few.

Table-4 summarizes the *t-test* results for the level of pain difference on gender base at different time. It indicates that the level of pain felt was of equal level for both male and female patients. The results were statistically insignificant as shown in the table below:

Table-5 presents ANOVA results for the level of pain difference among different age groups. The results yielded statistically significant result at 24 hours on usage of Injection Ketorolac ($p=0.041$).

The Group II patients receiving Injection Lignocaine also had the majority of male patients (93.8%) as shown in Table-6 with majority of patients ranging in age from 19-32 years (72.3%) as shown in Table-7.

Table-6 shows that level of pain observed by the patients were up to level ‘8 & 9’ on Visual Analog Score (VAS) who received Injection Lignocaine at 8 and 12 hours. This shows less effectiveness of the drug.

Table-7 indicates that there was difference feeling of pain among male and female patients after 12- and 24-hours interval and were statistically significant. Table-8 shows that level of pain among different level of age group were felt same was statistically significant ($p=0.012$) only for Pain relief at 4 hours.

Table-1: Frequency distribution with respect to “Gender”

Gender	Number of response rate (n=66) Group I Ketorolac		Number of response rate (n=65) Group II Lignocaine	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Male	57	86.4	61	93.8
Female	9	13.6	4	6.2
Total	66	100.0	65	100

Table-2: Frequency distribution with respect to “Age”

Age	Number of response rate (N=66) Group I Ketorolac		Number of response rate (N=65) Group II Lignocaine	
	Frequency	Percentage (%)	Frequency	Percentage (%)
19–25 Years	20	30.3	14	21.5
26–32 Years	28	42.4	33	50.8
33–39 Years	15	22.7	15	23.1
40 Years and Above	3	4.5	3	4.6
Total	66	100.0	65	100

Table-3: Descriptive statistics and frequency distribution group I Ketorolac

Variables	Percentage response rate (N=66)												Mean	SD
	NP	LP	MP	UP	MOP	DP	DIP	UMP	IP	SP	WPP			
Pain Level After 12 Hours	28	21	9	3	1	3	1	0	0	0	0	0	1.1061	1.4156
Pain Level After 8 Hours	15	15	15	5	6	8	2	0	0	0	0	0	2.0606	1.7878
Pain Level After 12 Hours	1	30	12	11	8	4	0	0	0	0	0	0	2.1061	1.3142
Pain Level After 24 Hours	19	18	7	17	2	3	0	0	0	0	0	0	1.6061	1.4452

Note: NP=No Pain, LP=Low Pain, MP=Mild Pain, UP=Uncomfortable Pain, MOP=Moderate Pain, DP=Distressing Pain, DIP=Distressing Pain, UMP=Unmanageable Pain, IP=Intense Pain, SP=Severe Pain, WPP=Worst Possible Pain

Table-4: Independent sample t-test with respect to gender

Variables	Gender	N	Mean	Std. Deviation	F	Sig.
Pain Level After Four Hours	Male	57	1.1404	1.38149	.339	.562
	Female	9	.8889	1.69148		
Pain Level After Eight Hours	Male	57	2.0175	1.80763	.120	.730
	Female	9	2.3333	1.73205		
Pain Level After Twelve Hours	Male	57	2.1404	1.30163	.219	.642
	Female	9	1.8889	1.45297		
Pain Level After Twenty-Four Hours	Male	57	1.5789	1.43859	.000	.993
	Female	9	1.7778	1.56347		

Table-5: One way ANOVA with respect to age

Variables	Age	N	Mean	F	Sig.
Pain Level After Four Hours	19-25 Years	20	1.3000	0.730	0.538
	26-32 Years	28	1.1071		
	33-39 Years	15	1.0667		
	40 Years and Above	3	.0000		
	Total	66	1.1061		
Pain Level After Eight Hours	19-25 Years	20	2.2500	1.462	0.234
	26-32 Years	28	2.3929		
	33-39 Years	15	1.2667		
	40 Years and Above	3	1.6667		
	Total	66	2.0606		
Pain Level After Twelve Hours	19-25 Years	20	1.8500	1.404	0.250
	26-32 Years	28	2.4643		
	33-39 Years	15	1.7333		
	40 Years and Above	3	2.3333		
	Total	66	2.1061		
Pain Level After Twenty-Four Hours	19-25 Years	20	1.5500	2.914	0.041
	26-32 Years	28	1.9643		
	33-39 Years	15	.8000		
	40 Years and Above	3	2.6667		
	Total	66	1.6061		

Table-6: Descriptive statistics and frequency distribution

Variables	Percentage response rate (N=65)												Mean	SD
	N P	LP	MP	UP	MOP	DP	DIP	UMP	IP	SP	WPP			
Pain Level After 4 Hours	5	6	5	6	5	21	9	8	0	0	0	4.1385	2.1204	
Pain Level After 8 Hours	2	6	5	14	13	13	7	1	4	0	0	3.9385	1.9111	
Pain Level After 12 Hours	0	13	5	14	13	8	10	1	1	0	0	3.5692	1.8198	
Pain Level After 24 Hours	6	10	8	12	11	7	11	0	0	0	0	3.1846	1.9275	

Note: NP=No Pain, LP=Low Pain, MP=Mild Pain, UP=Uncomfortable Pain, MOP=Moderate Pain, DP=Distracting Pain, DIP=Distressing Pain, UMP=Unmanageable Pain, IP=Intense Pain, SP=Severe Pain, WPP=Worst Possible Pain

Table-7: Independent sample t-test with respect to gender

Variables	Gender	N	Mean	Std. Deviation	F	Sig.
Pain Level After Four Hours	Male	61	4.1639	2.11487	0.027	.870
	Female	4	3.7500	2.50000		
Pain Level After Eight Hours	Male	61	3.9672	1.95761	1.764	.189
	Female	4	3.5000	1.00000		
Pain Level After Twelve Hours	Male	61	3.5574	1.87550	5.909	.018
	Female	4	3.7500	.50000		
Pain Level After Twenty-Four Hours	Male	61	3.1967	1.99014	11.923	.001
	Female	4	3.0000	.00000		

Table-8: One Way ANOVA with respect to age

Variables	Age	N	Mean	F	Sig.
Pain Level After Four Hours	19-25 Years	14	5.3571	3.932	0.012
	26-32 Years	33	3.8788		
	33-39 Years	15	3.2000		
	40 Years and Above	3	6.0000		
	Total	65	4.1385		
Pain Level After Eight Hours	19-25 Years	14	4.0714	1.393	.254
	26-32 Years	33	3.8485		
	33-39 Years	15	3.6000		
	40 Years and Above	3	6.0000		
	Total	65	3.9385		
Pain Level After Twelve Hours	19-25 Years	14	3.7143	.125	.945
	26-32 Years	33	3.5455		
	33-39 Years	15	3.6000		
	40 Years and Above	3	3.0000		
	Total	65	3.5692		
Pain Level After Twenty-Four Hours	19-25 Years	14	4.0714	1.316	.277
	26-32 Years	33	3.0000		
	33-39 Years	15	2.8000		
	40 Years and Above	3	3.0000		
	Total	65	3.1846		

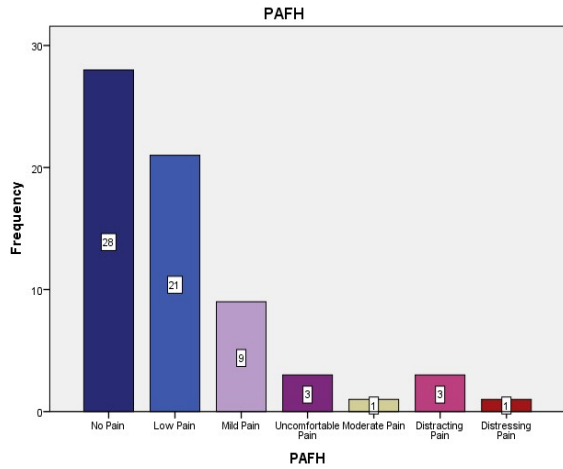


Figure-1: Pain after four hours after Inj Ketorolac

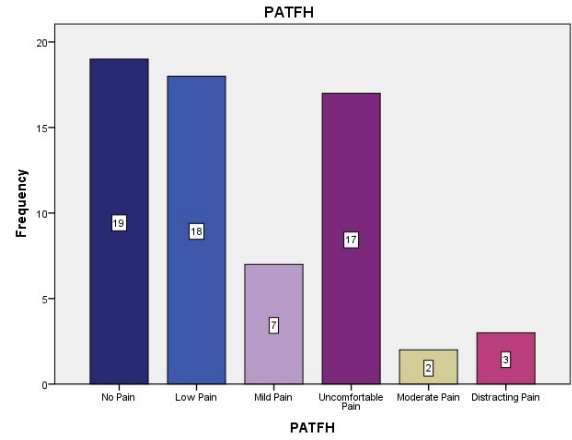


Figure-4: Pain after twenty-four hours after Inj Ketorolac

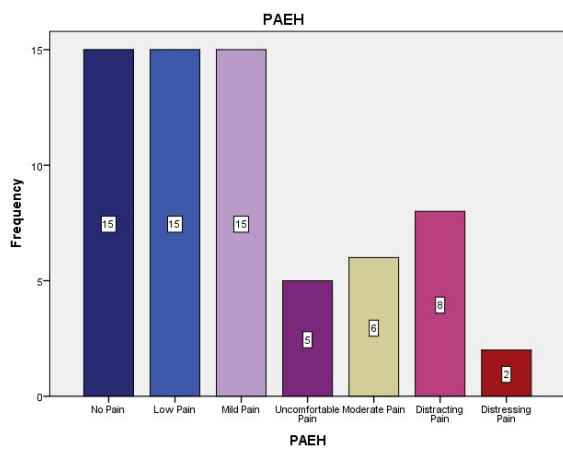


Figure-2: Pain after eight hours after Inj Ketorolac

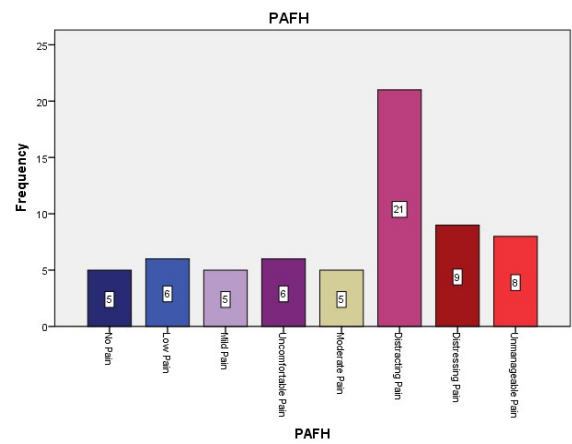


Figure-5: Pain after four hours after Inj Lignocaine

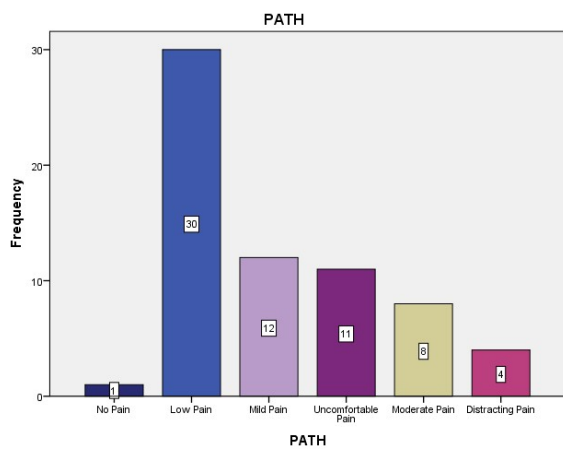


Figure-3: Pain after twelve hours after Inj Ketorolac

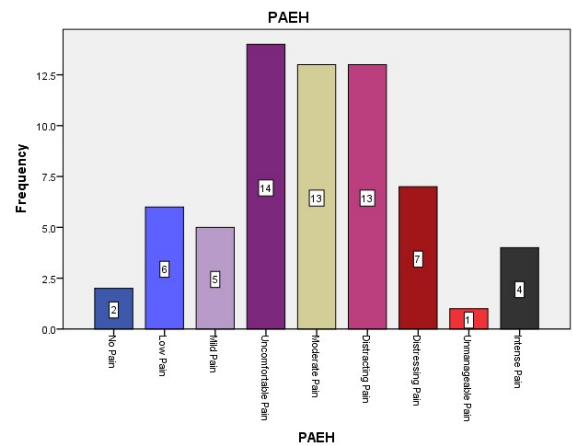


Figure-6: Pain after eight hours after Inj Lignocaine

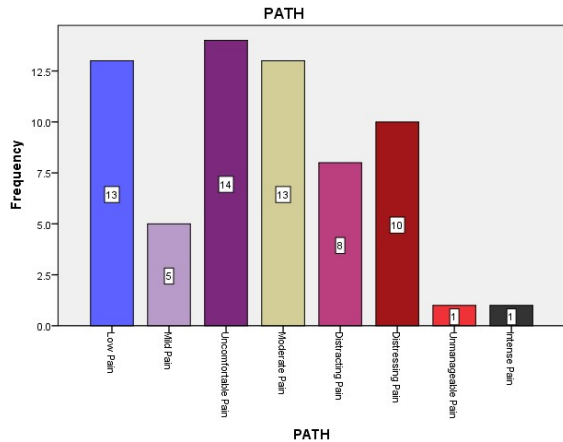


Figure-7: Pain after twelve hours after Inj Lignocaine

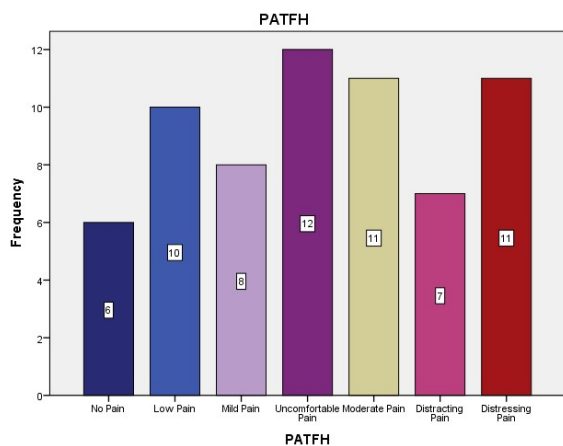


Figure-8: Pain after twenty-four Hours after Inj Lignocaine

The postoperative analgesia was comparatively longer in the patients who received intra-articular Ketorolac as compared to another group ($p=0.041$). Patients with Visual Analog score greater than 6 were given additional analgesia.

DISCUSSION

Arthroscopic partial meniscectomy is the commonest of all the arthroscopic procedures.^{1,9,1} It is imperative to keep the postoperative pain in perspective. Provision of adequate and safe analgesia postoperatively is hallmark of any arthroscopic surgery in Orthopaedic Surgery. Assessment of postoperative pain is quite difficult as the pain threshold varies from patient to patient. Females usually have low threshold as compared to males. So, commonly used VAS method was used to assess the postoperative pain and the effect of administered analgesic. In a comparative study Chirwa *et al* concluded that intra-articular local anaesthesia is

quite effective in providing analgesia for a short period of approximately 2 hours postoperatively.¹¹ Henderson *et al* concluded no significant difference between patients treated with 75 mg Bupivacaine and those who were give saline, which according to author was due to rapid clearance of Bupivacaine from the joint and incisional pain of the arthroscopy port.¹² There have been reports of side effects associated with the use of Lignocaine/ Bupivacaine in literature, though not frequent, they can be potentially serious: hypersensitive reactions and urticaria^{13,14}, neurological complications like perioral anaesthesia and sometimes leading to convulsions¹⁵.

Systemic Opiates are seldom used because of their potential of developing addiction as well as their effect on central nervous system. However, Stein *et al* showed that opiates receptors are present in inflamed peripheral tissues.¹⁶ This paved way for opiates to be used as local analgesics. Raja *et al* compared the effect of morphine and Bupivacaine and found no benefit in using morphine intraarticularly.¹⁷ Ruwe *et al* concluded that morphine given intra-articularly has no effect in postoperative arthroscopic surgery, in fact, patient who received morphine experienced more pain than other groups.¹⁸ They added that the patients who had high VAS scores preoperatively also had higher VAS scores postoperatively.

Other studies have shown good analgesic effect with use of combination of analgesics. In a systemic review of all randomized trials Kalso *et al* concluded that morphine has some analgesic effect postoperatively.¹⁹ A study by Jaureguito *et al* showed that analgesic effect of morphine is dose dependent, with increase of dose up to four times the normal yielded excellent results.²⁰ Reuben and Connelly observed excellent analgesia with intra-articular Ketorolac, particularly when combined with Lignocaine.^{5,10} Gupta *et al* compared the effects of intra-articular injection of Morphine and Ketorolac, and the results were excellent when both of these were used in combination.⁹

CONCLUSION

In this study, the analgesic effects of a single dose of 30mg of Ketorolac given intrarticularly were found to be good. No side effects were found. In literature, there is considerable controversy in the efficacy of using intra-articular Lignocaine and morphine, as well as the potential for serious side effects. In light of our study, we believe that injecting Ketorolac is a good alternative for the provision of effective postoperative analgesia in patients undergoing arthroscopic surgery.

Funding: No funding source

Conflict of interest: None declared

Ethical Approval: The study was approved by the Institutes' Ethical Committee

AUTHORS' CONTRIBUTION

ASKN: Conception of study, designing, study conduction, manuscript writing. UN: Discussion, interpretation. IZ: Material analysis, critical review. MZ: Critical review, study conduction. MB: Peer review, study conduction. AA: Critical review, material analysis

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Submitted: September 21, 2020

Revised: --

Accepted: February 14, 2021

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