Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 **VOL14, ISSUE 03, 2023**

ORIGINAL RESEARCH

Comparative assessment of pain management in Total Knee Replacement between Local infusion analgesia (LIA) and cocktail of Local infusion analgesia (LIA)+ Adductor canal block (ACB)

Chetan R. Jaju[1], Anant A. Takalkar[2*]

[1]Associate Professor, Department of Orthopaedics, MIMSR Medical College, Latur, Maharashtra, India.
[*2]Professor, Department of Community Medicine, MIMSR Medical College, Latur, Maharashtra, India.

Corresponding Author: Dr Anant A. Takalkar, Professor, Department of Community Medicine, MIMSR Medical College, Latur, Maharashtra, India.

Received: 19 February 2023 **Revised:** 11 March2023 **Accepted:** 24 March 2023

ABSTRACT

Background: Total knee arthroplasty (TKA) is usually associated with moderate to severe postoperative pain.Early postoperative mobilization is critical to both reduction of immobility-related complications and achieving the optimal functional outcome following surgery. **Objectives:** To compare the effectiveness of pain management by LIA and LIA+ACB in promoting early functional recovery after TKR.

Material and Methods: The study was conducted in the orthopedic department at MIMSR Medical College, Latur in 68 patients coming to Outpatient department with complaints of pain and stiffness of knee, suffering from osteoarthritis was assessed. **In Group A,** the patients will receive LIA and i**n Group B,** the patients will receive LIA + ACB. All cases will be done under single shot Spinal Anaesthesia.

Results: We included 34 patients each in LIA and LIA+ACB group in our study. In LIA group, 16(47.1%) were males and 18(52.9%) were females. In LIA+ACB group, 10629.4%) were males and 24(70.6%) were females. Involvement of left side was seen in 52.9% cases in LIA group as against 64.7% in LIA+ACB group. Involvement of right side was seen in 47.1% cases in LIA group as against 35.3% in LIA+ACB group. Pain at rest, sitting position, knee flexion, knee extension, standing and walking on the first postoperative day was less in LIA+ACB group compared to LIA group. ($p<0.05$).

Conclusion: Pain at rest, sitting position, knee flexion, knee extension, standing and walking on the first postoperative day was less in LIA+ACB group compared to LIA group. ($p<0.05$) and there is no difference in the pain perceived at rest, knee flexion, knee extension, standing and walking on the day of surgery between two groups on the second postoperative day ($p>0.05$). There is no difference in the pain perceived at sitting and at knee flexion on the day of discharge between two groups on the second postoperative day. ($p>0.05$).

Keywords: Total knee replacement, pain, VAS score, Local infusion analgesia (LIA), Local infusion analgesia (LIA)+ Adductor canal block (ACB).

INTRODUCTION

Total knee arthroplasty (TKA) is a highly rewarding procedure for treating patients with advanced osteoarthritis (OA) of the knee.[1] The number of patients undergoing TKA is

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

projected to increase six-fold in the coming two decades owing to an increase in life expectancy. [2] Severe acute postoperative pain may interfere with patients' ability to sleep, walk, and actively participate in rehabilitation activities. [3] Results from studies indicate that inadequate pain management during hospitalization may fail to achieve functional outcomes leading to further complications pneumonia, deep vein thrombosis, or pulmonary embolus. [4,5]
Total knee arthroplasty (TKA) is usually associated with moderate to severe postoperative pain. [12,13] Early postoperative mobilization is critical to both reduction of immobility-related complications and achieving the optimal functional outcome following surgery. Effective postoperative analgesia, including peripheral nerve block, opioids and non-opioid medications, has been found to facilitate rehabilitation, improve patient satisfaction, and may reduce length of hospital stay. [6,7,8]
Femoral nerve block (FNB) may provide superior pain relief to patient-controlled analgesia (PCA) with opioids. However, it is associated with increased risk of fall from prolonged motor blockade. Adductor canal block (ACB) has been shown to be an alternative technique to FNB for postoperative pain control after TKA. LIA (Local infusion analgesia)has been shown to provide superior postoperative analgesia and earlier mobilization compared to placebo[10,11], intrathecal morphine[12], epidural analgesia[13] and FNB.[14] Furthermore, LIA is less expensive and easier to perform than FNB, albeit with similar analgesic effects. [15]
So, the present study was planned to study the efficacy of a LIA for early rehabilitation after a total knee replacement and compare it with LIA+ACB.

Objectives

To compare the effectiveness of pain management by LIA and LIA+ACB in promoting early functional recovery after TKR.

MATERIAL &METHODS

Study Area: The study was conducted in the orthopedic department at MIMSR Medical College, Latur.

Study Population: Patient coming to Outpatient department with complaints of pain and stiffness of knee, suffering from osteoarthritis was assessed.

Eligibility Criteria

Inclusion Criteria

Patients undergoing unilateral TKR.

Exclusion Criteria

- Bilateral TKR
- Elderly >80 years
- Revision TKR
- History of Arrhythmia/Cardiac complications
- Those not willing to give consent.

Sample Size: 34 in each group, so total 68

Study Design: Experimental study

New clinically diagnosed cases were recruited in group A and group B for the study. Patients were explained about the study in detail and patient information sheet was given to the patient. Informed valid consent was obtained from patients who are willing to participate in the study.
On admission the principal investigator collected the relevant demo graphic and clinical data using the pre designed proforma (appendix). History of diabetes mellitus and rheumatoid arthritis if any taken. Parameters like walking distance, aids used, preoperative pain score, analgesics used etc. also will be noted.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

Preoperative knee assessment will be done. Range of movements will be measured preoperatively. Extensor lag if any will also be noted. X-rays would be reviewed and, the deformity present will be documented.

The patients would be randomized into two arms

In Group A, the patients will receive LIA

In Group B, the patients will receive LIA + ACB. All cases will be done under single shot Spinal Anaesthesia.

LIA-The first 30 ml of the cocktail mixture will be injected into the posterior knee capsule and soft tissue around the medial and lateral collateral ligaments before implantation of the actual components.

The quadriceps muscle, retinacular tissues, pesanserinus, and suprapatellar and infrapatellar fat pat will be then infiltrated with the rest of the cocktail while the cementis setting.

ACB-All blocks will be performed under ultrasound guidance. The adductor canal block will be performed at the midthigh level, identifying the superficial femoral artery deep to the sartorius muscle in a short-axis view. At this level, the saphenous nerve can usually be found lying at the junction between the artery, the vastus medialis muscle, and the sartorius muscle. The needle will be advanced in-plane, from lateral to medial, until the needle-tip will be in the perineural position. An incremental dose of study medication will be deposited anterolateral to the artery following negative aspiration.

Post operatively data regarding surgical date, side operated and the type of post-operative analgesia used will then be documented.

Pain experienced by the patient will be assessed postoperatively by the primary investigator on a daily basis using VAS. (**0-3:- pain relief, 4-10 :- no pain relief)**

Severity of pain will be assessed before surgery and on the DOS, POD1, POD2, and DOD.

Study Duration- January 2021 to December 2021

Method of measurement of outcome of interest

Improvement will be measured clinically using VAS preoperatively and on DOS, POD1, POD2, and DOD. And functional improvement will be assessed on DOS, POD1, POD2, and DOD.

Statistical Analysis

Data was collected by using a structure proforma. Data thus was entered in MS excel sheet and analysed by using SPSS 24.0 version IBM USA. Qualitative data was expressed in terms of percentages and proportions Quantitative data was expressed in terms of Mean and Standard deviation Association between two qualitative variables was seen by using Chi square/ Fischer's exact test Comparison of mean and SD within same groups will be done by using paired t test to assess whether the mean difference between groups is significant or not Comparison of mean and SD between two groups will be done by using unpaired t test to assess whether the mean difference between groups is significant or not Descriptive statistics of each variable was presented in terms of Mean, standard deviation, standard error of mean. A p value of <0.05 was considered as statistically significant whereas a p value <0.001 was considered as highly significant.

RESULTS

Table 1: Demographic information of study subjects

		LIA		LIA+ACB	
		Frequency	Percent	Frequency	Percent
Age group in years	40-50	6	17.6	12	35.3
	51-60	10	29.4	4	11.8
	61-70	18	52.9	18	52.9

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

	Total	34	100	34	100
Gender	Male	16	47.1	10	29.4
	Female	18	52.9	24	70.6
	Total	34	100	34	100
Side	LEFT	18	52.9	22	64.7
	RIGHT	16	47.1	12	35.3
	Total	34	100	34	100

We included 34 patients each in LIA and LIA+ACB group in our study. Majority of the patients i.e. 18(52.9%) in each group were from 61-70 years age group. This is followed by 10(29.4%) from 51-60 years in LIA group and 4(11.8%) from 51-60 years age group. In LIA group, 16(47.1%) were males and 18(52.9%) were females. In LIA+ACB group, 10629.4%) were males and 24(70.6%) were females. Involvement of left side was seen in 52.9% cases in LIA group as against 64.7% in LIA+ACB group. Involvement of right side was seen in 47.1% cases in LIA group as against 35.3% in LIA+ACB group.

Table 2: Comparison of VAS score on post op day (POD) 1 of surgery between LIA and LIA+ACB group

GP		N	Mean	Std. Deviation	t	p	Inference
Rest VAS ON POD1	LIA	34	3.29	0.46	4.885	0.0001	Highly significant
	LIA+ACB	34	2.76	0.43		(<0.01)	
Sit VAS ON POD1	LIA	34	3.76	0.43	3.702	0.0001	Highly significant
	LIA+ACB	34	3.35	0.49		(<0.01)	
Knee flexion VAS ON POD1	LIA	34	4.71	0.46	8.477	0.0001	Highly significant
	LIA+ACB	34	3.88	0.33		(<0.01)	
Knee extension VAS ON POD1	LIA	34	4.29	0.46	8.188	0.0001	Highly significant
	LIA+ACB	34	3.35	0.49		(<0.01)	
Stand VAS ON POD1	LIA	32	4.63	0.49	7.572	0.0001	Highly significant
	LIA+ACB	34	3.76	0.43		(<0.01)	
Walk VAS ON POD1	LIA	32	4.69	0.47	20.905	0.0001	Highly significant
	LIA+ACB	34	3.00	0.00		(<0.01)	

Mean VAS score at rest on day 1 post-operative in LIA group was 3.29±0.46 and that of LIA+ACB group was 2.76±0.43 ($p<0.05$). It means that VAS score at rest on day of surgery was less in LIA+ACB group. Mean VAS score at sitting on day 1 post-operative in LIA group was 3.76±0.43 and that of LIA+ACB group was 3.35±0.49 ($p<0.05$). It means that pain at sitting position on the day of surgery was less in LIA+ACB group. Mean VAS score at knee flexion on day 1 post-operative in LIA group was 4.71±0.46 and that of LIA+ACB group was 3.88±0.33($p<0.05$). It means that pain at knee flexion on the day of surgery was less in LIA+ACB group. Mean VAS score at knee extension on day 1 post-operative in LIA group was 4.29±0.46 and that of LIA+ACB group was 3.35±0.49($p<0.05$). It means that pain at knee extension on the day of surgery was less in LIA+ACB group. Mean VAS score at standing position on day 1 post-operative in LIA group was 4.63±0.49 and that of LIA+ACB group was 3.76±0.43($p<0.05$). It means that pain at standing position on the day of surgery was less in LIA+ACB group. Mean VAS score while walking on day 1 post-operative in

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

LIA group was 4.69±0.47 and that of LIA+ACB group was 3.00±00(p<0.05). It means that pain while walking on the day of surgery was less in LIA+ACB group.

Table 3: Comparison of VAS score on post op day (POD) 2 of surgery between LIA and LIA+ACB group

GP		N	Mean	Std. Deviation	t	p	Inference
Rest VAS ON POD2	LIA	34	2.71	0.46	1.500	0.138	Not significant
	LIA+ACB	34	2.53	0.51		(>0.05)	
Sit VAS ON POD2	LIA	34	3.29	0.46	3.199	0.002	Significant
	LIA+ACB	34	2.88	0.59		(<0.05)	
Knee flexion VAS ON POD2	LIA	34	3.88	0.33	0.000	1.000	Not significant
	LIA+ACB	34	3.88	0.33		(>0.05)	
Knee extension VAS ON POD2	LIA	34	3.41	0.50	0.493	0.624	Not significant
	LIA+ACB	34	3.35	0.49		(>0.05)	
Stand VAS ON POD2	LIA	34	3.65	0.49	0.978	0.332	Not significant
	LIA+ACB	34	3.53	0.51		(>0.05)	
Walk VAS ON POD2	LIA	34	3.06	0.24	1.436	0.156	Not significant
	LIA+ACB	34	3.00	0.00		(>0.05)	

Mean VAS score at rest on day 2 post-operative in LIA group was 2.71±0.46 and that of LIA+ACB group was 2.53±0.51(p>0.05). It means that VAS score at rest on 2 post-operative was almost equal. Mean VAS score at sitting on day 2 post-operative in LIA group was 3.29±0.46 and that of LIA+ACB group was 2.88±0.59(p<0.05). It means that pain at sitting position on the day of surgery was less in LIA+ACB group. Mean VAS score at knee flexion on day 2 post-operative in LIA group was 3.88±0.33 and that of LIA+ACB group was 3.88±0.33(p>0.05). It means that pain at knee flexion on day 2 post-operative was almost equal. Mean VAS score at knee extension on day 2 post-operative in LIA group was 3.41±0.5 and that of LIA+ACB group was 3.35±0.49(p>0.05). It means that pain at knee extension on day 2 post-operative was almost equal. Mean VAS score at standing position on day 2 post-operative in LIA group was 3.65±0.49 and that of LIA+ACB group was 3.53±0.51 (p>0.05). It means that pain at standing position on day 2 post-operative was almost equal. Mean VAS score while walking on day 2 post-operative in LIA group was 3.06±0.24 and that of LIA+ACB group was 3.00±00(p>0.05). It means that pain while walking on day 2 post-operative was almost equal.

Table 4: Comparison of VAS score on day of discharge after surgery between LIA and LIA+ACB group

GP		N	Mean	Std. Deviation	t	p	Inference
Rest VAS ON DOD	LIA	34	2.00	.00	----	---	----
	LIA+ACB	34	2.00	.00		----	
Sit VAS ON DOD	LIA	34	2.76	0.43	-1.008	0.317	Not significant
	LIA+ACB	34	2.82	0.39		(p>0.05)	
Knee flexion VAS ON	LIA	34	3.29	0.46	-0.593	0.556	Not significant
	LIA+ACB	34	3.41	0.50		(p>0.05)	

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

DOD							
Knee extension VAS ON DOD	LIA	34	3.00	.00	---	--	-----
	LIA+ACB	34	3.00	.00		--	
Stand VAS ON DOD	LIA	34	2.76	0.43	-4.312	0.0001	Highly significant
	LIA+ACB	34	2.82	0.39		(<0.01)	
Walk VAS ON DOD	LIA	34	2.76	0.43	-4.312	0.0001	Highly significant
	LIA+ACB	34	2.82	0.39		(<0.01)	

Mean VAS score at sitting on day of discharge in LIA group was 2.76±0.43 and that of LIA+ACB group was 2.82±0.39($p>0.05$). It means that pain at sitting position on the day of discharge was almost equal in both groups. Mean VAS score at knee flexion on day of discharge in LIA group was 3.29±0.46 and that of LIA+ACB group was 3.41±0.5($p>0.05$). It means that pain at sitting position on the day of discharge was almost equal in both groups. Mean VAS score at standing position on day of discharge in LIA group was 2.76±0.43 and that of LIA+ACB group was 2.82±0.39($p<0.05$). It means that pain at standing position on day of discharge was less in LAI group compared to LIA+ACB. Mean VAS score while walking on day of discharge in LIA group was 2.76±0.43 and that of LIA+ACB group was 2.82±0.39 ($p<0.05$). It means that pain at standing position on day of discharge was less in LAI group compared to LIA+ACB.

DISCUSSION

Assessment of pain between LIA and LIA+ACB groups

Mean VAS score at rest on day 1 post-operative in LIA group was 3.29±0.46 and that of LIA+ACB group was 2.76±0.43 ($p<0.05$). It means that VAS score at rest on day of surgery was less in LIA+ACB group. Mean VAS score at sitting on day 1 post-operative in LIA group was 3.76±0.43 and that of LIA+ACB group was 3.35±0.49 ($p<0.05$). It means that pain at sitting position on the day of surgery was less in LIA+ACB group. Mean VAS score at knee flexion on day 1 post-operative in LIA group was 4.71±0.46 and that of LIA+ACB group was 3.88±0.33($p<0.05$). It means that pain at knee flexion on the day of surgery was less in LIA+ACB group. Mean VAS score at knee extension on day 1 post-operative in LIA group was 4.29±0.46 and that of LIA+ACB group was 3.35±0.49($p<0.05$). It means that pain at knee extension on the day of surgery was less in LIA+ACB group. Mean VAS score at standing position on day 1 post-operative in LIA group was 4.63±0.49 and that of LIA+ACB group was 3.76±0.43($p<0.05$). It means that pain at standing position on the day of surgery was less in LIA+ACB group. Mean VAS score while walking on day 1 post-operative in LIA group was 4.69±0.47 and that of LIA+ACB group was 3.00±00($p<0.05$). It means that pain while walking on the day of surgery was less in LIA+ACB group. **(Table 2).**

Mean VAS score at rest on day 2 post-operative in LIA group was 2.71±0.46 and that of LIA+ACB group was 2.53±0.51($p>0.05$). It means that VAS score at rest on 2 post-operative was almost equal. Mean VAS score at sitting on day 2 post-operative in LIA group was 3.29±0.46 and that of LIA+ACB group was 2.88±0.59($p<0.05$). It means that pain at sitting position on the day of surgery was less in LIA+ACB group. Mean VAS score at knee flexion on day 2 post-operative in LIA group was 3.88±0.33 and that of LIA+ACB group was 3.88±0.33($p>0.05$). It means that pain at knee flexion on day 2 post-operative was almost equal. Mean VAS score at knee extension on day 2 post-operative in LIA group was 3.41±0.5 and that of LIA+ACB group was 3.35±0.49($p>0.05$). It means that pain at knee extension on day 2 post-operative was almost equal. Mean VAS score at standing position on day 2 post-operative in LIA group was 3.65±0.49 and that of LIA+ACB group was 3.53±0.51 ($p>0.05$).

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

It means that pain at standing position on day 2 post-operative was almost equal. Mean VAS score while walking on day 2 post-operative in LIA group was 3.06±0.24 and that of LIA+ACB group was 3.00±00(p>0.05). It means that pain while walking on day 2 post-operative was almost equal **(Table 3).**

Mean VAS score at sitting on day of discharge in LIA group was 2.76±0.43 and that of LIA+ACB group was 2.82±0.39(p>0.05). It means that pain at sitting position on the day of discharge was almost equal in both groups. Mean VAS score at knee flexion on day of discharge in LIA group was 3.29±0.46 and that of LIA+ACB group was 3.41±0.5(p>0.05). It means that pain at sitting position on the day of discharge was almost equal in both groups. Mean VAS score at standing position on day of discharge in LIA group was 2.76±0.43 and that of LIA+ACB group was 2.82±0.39(p<0.05). It means that pain at standing position on day of discharge was less in LAI group compared to LIA+ACB. Mean VAS score while walking on day of discharge in LIA group was 2.76±0.43 and that of LIA+ACB group was 2.82±0.39 (p<0.05). It means that pain at standing position on day of discharge was less in LAI group compared to LIA+ACB **(Table 4).**

Zuo W et al[16] reported that ACB + LIA had lower VAS score at rest on POD 0 and POD 1, and there were no significant differences on POD 2. Additionally, there was less morphine consumption on POD 0 and POD 1, lower risk of adverse event rates, such as nausea and vomiting, and better postoperative knee range of motion. With respect to postoperative pain control, this meta-analysis found that the ACB + LIA group had lower VAS score at rest on POD 0 and POD 1. However, this effect of the combination treatment may not have persisted longer than 24 h.

Sankineani et al[17] compared 60 patients each in the ACB + LIA and ACB alone groups, and their results showed that the ACB + LIA group had lower VAS scores on POD 0 and POD 1 with better ROM and ambulatory distance as compared to the ACB alone group.

Sankineani et al[18] compared 100 patients each in the ACB + LIA and ACB alone groups, and the results showed that patients who received ACB + LIA reported significantly lower VAS scores in the immediate postoperative period at 8 h as compared to patients who received ACB alone. However, this effect did not persist longer than 24 h.

Zhou et al[19] compared 20 patients each in the ACB + LIA and ACB alone groups, and their results showedthat patients who received ACB + LIA had lower rest and active pain scores 4–8 h post-operation. However, there were no significant differences in the rest and active VAS pain scores between the two groups.

Kampitak W et al[20] in his study reported that there was no difference in VAS was found during preoperative period between Group A and Group L. The mean VAS at 6, 12, and 18 postoperative hours in Group A were significantly lower than Group L with the differences of 1.21 (95% CI = -2.31 to -0.1, p=0.034), 1.51 (95% CI = -2.76 to - 0.27, p=0.018) and 1.4 (95% CI = -2.45 to -0.34, p=0.01), respectively.

CONCLUSION

- Pain at rest, sitting position, knee flexion, knee extension, standing and walking on the first postoperative day was less in LIA+ACB group compared to LIA group. (p<0.05)
- There is no difference in the pain perceived at rest, knee flexion, knee extension, standing and walking on the day of surgery between two groups on the second postoperative day. (p>0.05)
- There is no difference in the pain perceived at sitting and at knee flexion on the day of discharge between two groups on the second postoperative day. (p>0.05).

Sources of funding: Self-funded
Conflict of interest: Nil

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

REFERENCES

1. Memtsoudis SG, Yoo D, Stundner O, Danninger T, Ma Y, Poultsides L, et al. Subsartorial adductor canal vs.femoral nerve block for analgesia after total knee replacement. Int Orthop. 2015;39:673–80.
2. Memtsoudis SG, Sun X, Chiu YL, Stundner O, Liu SS, Banerjee S, et al. Perioperative comparative effectiveness of anesthetic technique in orthopedic patients. Anesthesiology. 2013;118:1046–58.
3. Chaumeron A, Audy D, Drolet P, Lavigne M, Vendittoli PA. Periarticular injection in knee arthroplasty improves quadriceps function. Clin OrthopRelat Res. 2013;471:2284–95.
4. Chavis SW, Duncan LH. Pain management – Continuum of care for surgical patients. AORN J. 2003;78:382–6. 389-99]
5. Hawker G, Wright J, Coyte P, Paul J, Dittus R, Croxford R, et al. Health-related quality of life after knee replacement. J Bone Joint Surg Am. 1998;80:163–73.
6. Sinatra RS, Torres J, Bustos AM. Pain management after major orthopaedic surgery: current strategies and new concepts. J Am AcadOrthop Surg. 2002;10(2):117–29.
7. Paul JE, Arya A, Hurlburt L, Cheng J, Thabane L, Tidy A. Femoral nerve block improves analgesia outcomes after total knee arthroplasty: a meta-analysis of randomized controlled trials. Anesthesiology. 2010;113(5):1144–62. et al.
8. Chan MH, Chen WH, Tung YW, Liu K, Tan PH, Chia YY. Single-injection femoral nerve block lacks preemptive effect on postoperative pain and morphine consumption in total knee arthroplasty. Acta Anaesthesiol Taiwan. 2012;50(2):54–8.
9. Atkinson HD, Hamid I, Gupte CM, Russell RC, Handy JM. Postoperative fall after the use of the 3-in-1 femoral nerve block for knee surgery: A report of four cases. J OrthopSurg (Hong Kong). 2008;16(3):381–4.
10. Busch CA, Shore BJ, Bhandari R, Ganapathy S, MacDonald SJ, Bourne RB. Efficacy of periarticular multimodal drug injection in total knee arthroplasty. A randomized trial. J Bone Joint Surg Am. 2006;88(5):959–63.
11. Vendittoli PA, Makinen P, Drolet P, Lavigne M, Fallaha M, Guertin MC. A multimodal analgesia protocol for total knee arthroplasty. A randomized, controlled study. J Bone Joint Surg Am. 2006;88(2):282–9.
12. Essving P, Axelsson K, Aberg E, Spännar H, Gupta A, Lundin A. Local infiltration analgesia versus intrathecal morphine for postoperative pain management after total knee arthroplasty: a randomized controlled trial. AnesthAnalg. 2011;113(4):926–33.
13. Andersen KV, Bak M, Christensen BV, Harazuk J, Pedersen NA, Soballe K. A randomized, controlled trial comparing local infiltration analgesia with epidural infusion for total knee arthroplasty. Acta Orthop. 2010;81(5):606–10.
14. Thorsell M, Holst P, Hyldahl HC, Weidenhielm L. Pain control after total knee arthroplasty: a prospective study comparing local infiltration anesthesia and epidural anesthesia. Orthopedics. 2010;33(2):75–80.
15. Toftdahl K, Nikolajsen L, Haraldsted V, Madsen F, Tonnesen EK, Soballe K. Comparison of peri- and intraarticular analgesia with femoral nerve block after total knee arthroplasty: a randomized clinical trial. Acta Orthop. 2007;78(2):172–9.
16. Zuo W, Guo W, Ma J, Cui W. Dose adductor canal block combined with local infiltration analgesia has a synergistic effect than adductor canal block alone in total knee arthroplasty: a meta-analysis and systematic review. Journal of orthopaedic surgery and research. 2019 Dec;14(1):1-8.
17. Sankineani SR, Reddy ARC. Eachempati Krishna Kiran et al. comparison of adductor canal block and IPACK block (interspace between the popliteal artery and the capsule of the posterior knee) with adductor canal block alone after total knee arthroplasty: a

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

prospective control trial on pain and knee function in immediate postoperative period. Eur J OrthopSurgTraumatol. 2018;28(7):1391–5.
18. Sankineani SR, Reddy ARC, Kumar KSA, et al. Comparative analysis of influence of adductor canal block and multimodal periarticular infiltration versus adductor canal block alone on pain and knee range of movement after total knee arthroplasty: a prospective non-randomised study. Musculoskelet Surg. 2018;102(2):173–7.
19. Zhou M, Ding H, Ke J. Adductor canal block in combination with posterior capsular infiltration on the pain control after TKA. Ir J Med Sci. 2017;187(2):1–7.
20. Kampitak W, Tanavalee A, Ngarmukos S, Amarase C, Songthamwat B, Boonshua A. Comparison of adductor canal block versus local infiltration analgesia on postoperative pain and functional outcome after total knee arthroplasty: a randomized controlled trial. Malaysian orthopaedic journal. 2018 Mar;12(1):7.