Section: Miscellaneous

Original Research Article

COMPARISON OF POSTOPRATIVE ANALGESIA USING ROPIVACAINE HYDROCHLORIDE WITH DEXAMETHASONE VERSUS ROPIVACAINE HYDROCHLORIDE WITH FENTANYL CITRATE IN ADDUCTOR CANAL BLOCK FOR PATIENT UNDER GOING KNEE SURGERIES

Brinda Raiyani[1], Namrata Vasoya[2], Parth Shah[3]

[1]Senior Resident, PDU Government Medical College, Rajkot, Gujarat, India.
[2]Senior Resident, C U Shah Medical College and SRSH Hospital, Gujarat, India.
[3]Associate Professor, M K Shah Medical College and Research Centre Ahmedabad, Gujarat, India.

Received *: 04/08/2026*
Received in revised form *: 01/09/2026*
Accepted *: 13/09/2026*

Corresponding Author:
Dr. Brinda Raiyani,
Senior Resident, PDU Government Medical College, Rajkot, Gujarat, India.
Email: brindabraiyani@gmail.com

DOI: 10.70034/ijmedph.2026.4.212

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (4); 1374-1379

ABSTRACT

Background: Effective postoperative pain management is crucial for patients undergoing knee surgeries, facilitating early mobilization and recovery. Adductor canal block (ACB) provides sensory blockade with preservation of quadriceps strength. Ropivacaine, a long-acting local anesthetic, is commonly used in ACB. Adjuvants like dexamethasone and fentanyl citrate are added to prolong analgesia and improve block quality. **Aims and Objectives:** To compare the efficacy and duration of analgesia between Ropivacaine Hydrochloride with Dexamethasone versus Ropivacaine Hydrochloride with Fentanyl Citrate in adductor canal block for postoperative pain management in patients undergoing knee surgeries.

Materials and Methods: This observational prospective comparative study was conducted on 60 patients undergoing knee surgeries under spinal anesthesia. Patients were divided into two groups: Group A (n=30) received 20ml of 0.2% Ropivacaine with 2ml Dexamethasone (total 22ml), and Group B (n=30) received 20ml of 0.2% Ropivacaine with Fentanyl Citrate 1mcg/kg diluted to 2ml (total 22ml). Postoperative pain was assessed using Visual Analogue Scale (VAS) at 0, 1, 2, 3, 4, 5, 6, 9, 12, 15, 18, 21, and 24 hours. Time to first rescue analgesia, total analgesic requirements, complications, and patient satisfaction were recorded.

Results: Duration of analgesia was significantly longer in Group A (651.6 ± 21.78 minutes) compared to Group B (474.2 ± 41.94 minutes) ($p<0.001$). VAS scores were significantly lower in Group A at 9 hours (1.77 ± 0.96 vs 4.40 ± 0.80, $p<0.001$) and 21 hours (2.67 ± 1.04 vs 4.13 ± 0.88, $p<0.001$). In Group A, 83.33% patients required only one rescue analgesic dose, while 80% of patients in Group B required two doses ($p=0.0001$). Pruritus was observed in 2 patients (6.67%) in Group B, with no complications in Group A.

Conclusion: Both combinations provided effective postoperative analgesia; however, Ropivacaine with Dexamethasone demonstrated significantly prolonged duration of analgesia, reduced rescue analgesic requirements, and fewer side effects compared to Ropivacaine with Fentanyl Citrate. Dexamethasone appears to be a superior adjuvant for enhancing the quality and longevity of analgesia in adductor canal block for knee surgeries.

Keywords: Adductor Canal Block, Dexamethasone, Fentanyl Citrate, Knee Surgery, Postoperative Analgesia, Ropivacaine, Visual Analogue Scale.

INTRODUCTION

The International Association for the Study of Pain defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage." Different categories of pain can be defined. These include acute pain, chronic pain, neuropathic pain, nociceptive pain and inflammatory pain. Nociceptive pains are often regarded as key feature of acute postoperative pain. For an anaesthesiologist, pain management is a crucial part of delivering a safe and balanced anaesthesia.[1]

With advancement in technologies & detailed anatomical knowledge has led to increased knee related surgeries. Such procedures include total knee arthroplasty(TKA), anterior cruciate ligament (ACL) reconstruction, knee arthroscopy, high tibial osteotomy, meniscal repair etc. While these surgeries aim to restore function and relive pain, effective post operative pain management remains a crucial component of patient recovery and overall surgical success.

Osteoarthritis of knee is a common condition especially affecting the elderly population. Total Knee Arthroplasty (TKA) is the present gold standard treatment for management of severe OA Knee. As recent advances and safe surgical procedure in our country has led to TKA a common surgical procedure. TKA is associated with extensive tissue damage and excruciating pain. Good strategy for post-operative pain management without affecting the patient's ability to mobilise and minimal side effects of treatment is required for more rapid functional recovery Leading to early mobilization and recovery.[2]

Postoperative pain management modalities include the use of oral or intramuscular nonsteroidal anti-inflammatory drugs, opioid analgesics, intravenous or epidural patient-controlled analgesia, neuraxial analgesia (epidural analgesia), peri- articular injection, and peripheral nerve blocks. Among these modalities, peripheral nerve blocks offer effective postoperative pain control and functional outcomes.[3]

Systemic analgesics have adverse effects such as nausea, vomiting, sedation, and drowsiness. Hence, multimodal analgesia techniques are being widely used, which include a combination of systemic and regional analgesia.

Among regional techniques, epidural anaesthesia is most widely used but may have adverse effects such as hematoma formation, urinary retention, and motor blockade of the nonoperative leg. Therefore, to avoid these side effects, the peripheral nerve block technique is introduced. The femoral nerve block provides effective analgesia in the lower limb surgeries but is associated with quadriceps weakness and delayed ambulation, as the femoral nerve has both sensory and motor components. Hence, adductor canal block is being used since it results in blockade of the saphenous nerve which is purely sensory. Thus leading to early mobilization and less side effects.[4]

With the development of the ultrasound technique, the adductor canal can be visualized easily in the middle third of the thigh. It extends from the apex of the femoral triangle to the opening in the adductor magnus and the adductor hiatus. It is a trough-like space, the roof being formed by sartorius and floor by the medial vastus and adductor magnus. This canal is traversed by the saphenous nerve, which is a branch of the femoral nerve. The blockade of this nerve provides analgesia with preservation of quadriceps muscle strength, hence facilitating the early ambulation.[5]

Bupivacaine is a well-established long-acting regional anaesthetic, which like all amide anaesthetics has been associated with cardiotoxicity when used in high concentration or when accidentally administered intravascularly. Ropivacaine is a long-acting regional anaesthetic that is structurally related to Bupivacaine. It is a pure S(-) enantiomer, developed for the purpose of reducing potential toxicity and improving relative sensory and motor block profiles.[6]

Peripheral nerve blocks (PNB) with local anesthetics (LAs) are the most commonly used for limb surgery, with the advantages of increasing analgesic effect and reducing post anesthesia care unit stay. While the analgesic duration can be prolonged by increasing the LA dose, the side effects and risk of potential neurotoxicity can also be increased. Adjuvant analgesic strategies are a technically simple method that can be used to extend the analgesic duration and decrease the potential risk of side effects by reducing the LA dose.[7]

Many LA adjuvants, including opioids, epinephrine, corticosteroids, α2-adrenergic receptor (α2AR) agonists, and magnesium sulfate, have demonstrated the synergistic analgesic effects of LAs to improve the quality of Peripheral nerve block.[7]

Fentanyl citrate is a synthetic opioid agonist that belongs to the phenyl piperidine derivative class. It is significantly stronger, with a potency that is 75-125 times greater than other opioids. Fentanyl improves cardiovascular stability and provides effective pain relief after surgery without significant adverse effects. Due to its significant lipid solubility, it exhibits rapid action, Fentanyl is commonly utilized as a pain- relieving supplement to local anaesthetic drugs. It functions by obstructing nerve fibres that transmit pain signals in the dorsal horn of the spinal cord, namely in the substantia gelatinosa, both before and after they reach the synapse.[8]

The precise mechanism of action of dexamethasone added to local anesthetics is described as direct effect of glucocorticoids on nerve conduction and induction of perineural vasoconstriction. Dexamethasone produces analgesia by inhibition of sub- stance P release in nociceptive pathway along

myelinated C fibers and activation of α-2 adrenoceptors in the locus coeruleus. When used in nerve blocks, it produces analgesic effect by enhancement of hyperpolarisation of activated cation channel.[9]

As discussed earlier, due to the ease of visualizing the Adductor Canal Block (ACB) and its proven effectiveness in providing significant postoperative pain relief, we have decided to conduct a comprehensive study. This study aims to compare the efficacy and safety of Ropivacaine when used in combination with two different adjuvants: Dexamethasone and Fentanyl Citrate. Both of these adjuvants are being evaluated for their potential to enhance the analgesic effects of the Adductor Canal Block in patients undergoing knee surgeries. Our goal is to assess the overall impact of these combinations on postoperative analgesia, with a focus on optimizing pain management and ensuring patient safety during the recovery process.

MATERIALS AND METHODS

Type of Study:

Observational Prospective Comparative study

Study duration:

The study was conducted from August 2023 – march 2025.

Method of collection of data:

- All the patients who fulfilled the inclusion criteria and underwent Knee surgeries at SMS Multispecialty Hospital, Chandkheda, Ahmedabad, were enrolled for the study.
- Following approval from the Ethical Committee, informed and written valid consent was taken from each patient at the time of enrolment into the study.
- The study was conducted on 60 patients who were scheduled to undergo Knee surgeries under spinal anaesthesia.
- All patients were thoroughly assessed before surgery and screened for any associated medical illness like hypertension, diabetes mellitus, asthma, ischemic heart disease, chronic obstructive pulmonary disease, epilepsy, any liver or renal disorder, major disease in past, any eventful previous anaesthesia exposure or post-operative anaesthetic complications, drug allergy, family history.
- Routine investigations like haemoglobin, blood sugar, serum creatinine, blood urea, bleeding time, clotting time, coagulation profile and electrocardiogram were carried out and documented.
- Patients were also assessed for vitals like temperature, Heart rate (HR), Blood pressure(BP), Respiratory rate(RR) and spo2. Thorough systemic examination was done in every patient.
- The airway assessment was done by Malampatti grading. Lumbar spine examination was done in every patient.
- Thorough pre-operative evaluation and pre-operative fitness of all the patients were done.
- All selected patients were explained about the purpose, procedure and side effects of the study drug and informed written consent was taken. They also explained about assessment of pain with the help of visual analogue scale.
- Patients were advised to stay nil by mouth for 6 hours on the day of surgery.
- On the day of surgery, the patient was brought to the pre anaesthetic room and base line vital parameters (pulse, blood pressure, respiratory rate, spo2 and temperature) were recorded.
- After entering into the operation room, multipara monitors were attached to the patient which included electrocardiogram (ECG) leads, non-invasive blood pressure cuff and pulse oximeter. Baseline temperature, HR, BP, RR, and Spo2 were recorded. IV line was secured with 18 G or 20 G intravenous line on forearm and IV Ringer lactate was started.
- Under all aseptic and anti-septic precaution patient will received spinal anaesthesia with 0.5% Bupivacaine heavy in sitting position via 25G Quinke's Spinal needle through L3-L4 intervertebral space.
- Achieving the desired motor and sensory block, the operative procedure was started and patients' vitals were monitored and complications, if any were managed. Intraoperative anaesthetic technique was the same and standardized for both groups of the patients.
- At the end of operation patient was positioned supine with the knee slightly flexed and externally rotated for Adductor canal block.
- 6-12 MHz frequency linear ultrasound transducer probe was placed transversely on the medial thigh, at the midpoint between the inguinal crease and the medial condyle of femur to visualize femoral artery that is located deep to the sartorius muscle. The nerves was visualized anterolateral to the artery. The needle was inserted from lateral to medial using an in plane technique. Once the needle enters the Adductor canal, the needle tip is made to lie immediately lateral to the femoral artery. An aspiration test is performed and then a Local anaesthetic agent was injected.
- The patients were divided into two groups and accordingly they received local anaesthetic agent after successfully identifying adductor canal using ultrasound.
- 1) Group A: Local anaesthetic solution with Inj. Ropivacaine hydrochloride 0.2% 20 ml + Inj. Dexamethasone 2ml = Total volume of 22ml

- 2) Group B: Local anaesthetic solution with Inj. Ropivacaine hydrochloride 0.2% 20 ml +Inj. Fentanyl citrate 1mcg/kg diluted in NS of total 2 ml =Total volume of 22ml
- Patients' pulse, Systolic blood pressure, Diastolic blood pressure, spo2, respiratory rate, visual analogue scale, complications (if any) were observed at 0 min ,1 hour, 2 hour, 3 hour, 4 hour, 5 hour, 6 hour, 9 hour, 12 hour, 15 hour, 18 hour, 21 hour, 24 hour post-operatively.

Outcomes Measured

Primary Outcome

- Assessment of postoperative pain using visual analogue scale pain score
- Secondary outcome:
- To evaluate the time to first rescue analgesic administration. 2. To assess complications.

Primary Outcome Measures

- Postoperative pain was assessed at 0 min ,1 hour, 2 hour, 3 hour, 4 hour, 5 hour, 6 hour, 9 hour, 12 hour, 15 hour, 18 hour, 21 hour, 24 hour from the time of administration of the block using visual analogue scale pain score.
- Visual Analogue Score
- The pain VAS is a continuous scale comprised of vertical (VVAS) line or a usually 10 centimetres (100 mm) in length.
- For pain intensity, the scale is most commonly anchored by worst imaginable pain (score of 10) and no pain (score of 0). To avoid clustering of scores around a preferred numeric value, and verbal descriptors and numbers at intermediate points are not recommended.
- Visual Analog Scale For Pain
- Secondary outcome measures:

1. Time to first rescue analgesia: Rescue analgesia (Inj. Diclofenac sodium 75 mg) will be given to all patients when VAS score≥4 & total number of analgesic doses required in 24 hours will be recorded.
2. Assess for complications: Patients were observed for signs of complications if any.

- Hypotension
- Hypertension
- Bradycardia
- Nausea and vomiting
- Hematoma
- Dry Mouth
- Any toxic/allergic drug reaction to drug
- Pruritis

Statistical Analysis:

The data was entered and cleaned using MS-Excel and analyzed statistically using SPSS-25. Quantitative variables were expressed as mean value + standard deviation or median. Qualitative data was expressed as percentages (%) and proportion. Appropriate statistical test was used to infer association between 2 variables and a p value of < 0.05 was considered statistically significant.

Ethical considerations:

The protocol was presented before the ethical committee for approval. After due approval from the ethical committee, the study was initiated. Before including any patient for the participation in the study, a voluntary written consent for participation was obtained from either the patient and/or his/her legally acceptable representative.

Information obtained from patients was kept confidential and was only used for scientific reasons and no personal identity of the participant was disclosed at any point in time. There was no additional risk to patients as a result of their participation in the study. Participation in the study was purely voluntary in nature.

Funding details:

No funding was required. The investigations were done as a part of routine investigation.

RESULTS

Distribution of patients according to gender, age, weight, ASA grading, preoperative vitals including SBP, DBP, Pulse Rate, Spo2 was comparable across both groups, and the differences between the two groups were not statistically significant

In post-operative hour 9 VAS was significantly high in GROUP B and at hour 12 VAS was significantly high in GROUP A ($p < 0.001$). After giving rescue analgesia VAS remain low and statistically not significant during post-operative hour 15 and 18. VAS score is significantly high in GROUP B at post-operative hour 21($p < 0.001$).

Table 1: Comparison of post-operative pain using Visual analogue scale(VAS) among two groups

VAS at different time intervals	Group		P value
	Group A (Mean ± SD)	Group B (Mean ± SD)	
0 hour	00.00 ± 0.00	00.00 ± 00.00	-
1hour	0.23 ± 0.42	0.37 ± 0.6	0.3125
2 hour	0.33 ± 0.603	0.43 ± 0.76	0.5707
3 hour	0.4 ± 0.757	0.633 ± 0.84	0.2637
4 hour	0.633 ± 0.795	0.933 ± 0.964	0.1937
5 hour	0.867 ± 0.846	0.97 ± 0.95	0.6591
6 hour	1.167 ± 1.035	1.3 ± 0.94	0.6093
9 hour	1.767 ± 0.955	4.4 ± 0.8	**0.0001**
12 hour	4.4 ± 0.8	2.77 ± 0.56	**0.0001**
15 hour	2.6 ± 0.661	2.87 ± 0.76	0.1474
18 hour	3.267 ± 0.772	3.23 ± 0.72	0.8484
21 hour	2.667 ± 1.043	4.13 ± 0.88	**0.0001**
24 hour	2.633 ± 0.605	2.93 ± 0.85	0.1244

**p value < 0.05 statistically significant; Independent samples t-test applied*

In GROUP A 83.33% Patients Required only one rescue analgesic dose and 16.66% patients required two analgesic dose. whereas 20% of patients require one and 80% of patients required two rescue analgesic dose in GROUP B. This difference between the two groups was statistically significant (p = 0.0001).

Table 2: Comparison of the number of doses of analgesia required between two groups

Number of doses of analgesia	Group A (n%)	Group B (n%)
1	25(83.33)	6(20)
2	5(16.66)	24(80)
Total	30(100)	30(100)
Chi square : 24.093; p = 0.0001		

**p value < 0.05 statistically significant; Chi-square test applied*

Total duration of Analgesia is statistically significant and longer in GROUP A (651.6 ± 21.78) then GROUP B (474.2 ± 41.94) (p <0.05).
Complication (Pruritus) was found to be present in two (02) patients in group B as compared to no patient was found to have Pruritus in group A.

DISCUSSION

Pain control is of prime importance in improving the quality of patient care. Regional nerve block techniques offer superior postoperative pain relief and facilitates early ambulation and discharge. Acute postoperative pain following Total Knee Arthroplasty is maximum during the first 24 hours. ACB block is effective and easy to perform with least complications.
We conducted this randomized prospective study to Compare efficacy and safety of Ropivacaine with Dexamethasone or with Fentanyl Citrate as adjuvant in Adductor Canal Block for postoperative pain relief and improving functional outcomes in Patient Under Going Knee Surgeries done under spinal anaesthesia.
This is a discussion of the findings of our study with those of previous studies to check for generalizability of results.

Duration of Analgesia

In our study we compared the efficacy of Dexamethasone and Fentanyl citrate with Ropivacaine hydrochloride as local anaesthetic agent in adductor canal block for post operative analgesia. It was observed that duration of analgesia was was stastically significant among this group with longer mean duration in Dexamethasone group 651.6 ± 21.78 Minutes and 474.2 ± 41.94 Minutes in Fentanyl group. (p<0.01). VAS score was not statistically significant in post-operative hour 0 to 6. As Fentanyl and Dexamethasone are equally effective in pain relief during first 6 hour. In post-operative hour 9 mean VAS was significantly high in GROUP B and at hour 12 VAS mean was significantly high in GROUP A.
Hassan Z, et al,[10] found that duration of analgesia was 7.6+1.20 hours in patients receiving 20ml of 0.2% Ropivacaine + Fentanyl 1mcg/kg, 5.4+1.52 hours in 20ml of 0.2% Ropivacaine + 0.25mcg/kg of Dexmedetomidine and 4.3+1.70 hours 20ml of 0.2% Ropivacaine + 2ml of Normal Saline in adductor canal block. Median VAS score of Fentanyl group was statistically significantly lower than median VAS score of Dexmedetomidine group and median VAS score of Dexmedetomidine group was statistically significantly lower than Ropivacaine with normal saline group. This result was similar to our study in case of Ropivacaine 0.2% 20ml + Fentanyl (1mcg/kg).
Similar study done by Wang C, et al,[11] observed that addition of 8mg Dexamethasone To 10 ml of Ropivacaine (0.5%) in adductor canal block have longer duration of sensory block (23.42±3.35 hour) compared to 10 ml 0.5% Ropivacaine with 2 ml normal saline (14.67±2.96). The mean NRS score was lower in the Dexamethasone group compared with that in the control group, with significant differences between the groups at 6, 12, 18 and 24 h after block placement, in the resting state as well as with movement. As also seen in our study that addition of Dexamethasone to to Ropivacaine in Adductor canal block prolong the duration of analgesia also Mean VAS Score Was Significantly lower in Dexamethasone group.
Another study done by Apte V, et al,[12] compared 0.2% Ropivacaine (15ml), with Dexamethasone 4mg and Fentanyl 50mcg in PENG block and found that Dexamethasone provides a prolonged duration of analgesia (655.334±35.457 Minutes) compared to Fentanyl (458.334±27.518 Minutes). Which was similar in our study as addition of Dexamethasone gives longer duration of analgesia compared to Fentanyl.

Rescue Analgesia

In our study requirement of rescue analgesic was noted when VAS score was score reached >4. In first 24 hours higher proportion (80%) of patient required two dose of Inj. Diclofenac sodium 75 mg as Rescue analgesia in Fentanyl group. In Dexamethasone group 83.33% patients required only one dose of Rescue analgesia. This difference was stastically significant. (p = 0.0001)
In similar study by Hassan Z, et al,[10] observed that Total consumption of analgesia (Injection Tramadol 1mg/kg, IV) over a period of 24 hours in

Ropivacaine with normal saline Group was 200+28.76mg, Dexmedetomidine Group was 142+41.53mg and in Fentanyl Group it was 108.9+30.64mg Total quantity of rescue analgesia consumed was maximum in Ropivacaine with normal saline Group followed by Dexmedetomidine Group and was least in Fentanyl Group among the three study groups (P value <0.001).

Another study done by Ahmad S, et al,[1] Total consumption of analgesia (Injection Tramadol 1mg/kg, IV) over a period of 24 hours in Ropivacaine with Normal Saline Group was 200+28.76mg and in Ropivacaine with Fentanyl Group it was 108.9+30.64mg. Total quantity of rescue analgesia consumed was more in Ropivacaine with Normal saline Group as compared to Fentanyl Group. (P value <0.001)

Similar study done by Wang C, et al,[11] Morphine consumption during the first 24 h was significantly lower in the Dexamethasone with Ropivacaine group 4.23±1.80 vs. 8.42±2.44 mg in the Ropivacaine with 2 ml normal saline group. (P<0.05)

Another study done by Agrawal M, et al,[4] Total number of analgesia dosage in 24 h was 1.79±1.760 in Ropivacaine Group and 3.57±0.626 in Normal Saline group.

Complications

Pruritus as a complication was present in two (02) patients in group B as compared to none in group A.

Similar study done by Wang C, et al,[11] found that the use of dexamethasone as an adjuvant to local anesthetic for peripheral nerve block appears safe. Adverse effects with a single dose of dexamethasone are probably extremely rare and minor in nature.

Another study done by Apte V, et al,[12] found that there were no observed side effects in Dexamethasone group as well as in Fentanyl group.

CONCLUSION

In conclusion, our observational prospective comparative study comparing Ropivacaine Hydrochloride with Dexamethasone versus Ropivacaine Hydrochloride with Fentanyl Citrate in Adductor Canal Block for postoperative pain management in knee surgeries provides valuable insights.

We found that both combinations offered comparable analgesic efficacy in the postoperative period; however, Dexamethasone significantly prolonged the duration of analgesia. Additionally, pain relief and functional outcomes were better in the Ropivacaine Hydrochloride with Dexamethasone group, with a delayed need for the first rescue analgesia. This suggests that Dexamethasone may be a superior adjunct for improving both the quality and longevity of postoperative analgesia in knee surgery patients.

REFERENCES

1. Shabir Ahmad Shabir, Zarqa Hassan, Rayees Najib, Rukhsana Najeeb, Umar Qayum, Study of adductor canal block using ropivacaine alone and in combination with addative (fentanyl) for post-oprative analgesia in patient undergoing knee arthroscopic, Scholars Journals of Applied Medicine Science 2021;9(7): 1124-1129
2. Pinedo-Villanueva R, Khalid S, Wylde V, Gooberman-Hill R, Soni A, Judge A. Identifying individuals with chronic pain after knee replacement: a population-cohort, cluster-analysis of Oxford knee scores in 128,145 patients from the English National Health Service. BMC Musculoskelet Disord. 2018;19(1):354
3. Koh IJ, Choi YJ, Kim MS, Koh HJ, Kang MS, In Y. Femoral Nerve Block versus Adductor Canal Block for Analgesia after Total Knee Arthroplasty. Knee Surg Relat Res. 2017;29(2):87-95
4. Agrawal M. Adductor canal block with 0.5% Ropivacaine for postoperative pain relief in lower limb surgeries performed under spinal anesthesia. Bali J Anaesthesiol 2020;4:49-52.
5. Manickam B, Perlas A, Duggan E, Brull R, Chan VW, Ramlogan R. Feasibility and efficacy of ultrasound-guided block of the saphenous nerve in the adductor canal. Reg Anesth Pain Med 2009;34:578-80
6. Kuthiala G, Chaudhary G. Ropivacaine: A Review Of Its Pharmacology And Clinical Use. Indian J Anaesth 2011;55:104-10
7. Xuan C, Yan W, Wang D, Li C, Ma H, Mueller A, Wang J. The facilitatory effects of adjuvant pharmaceutics to prolong the duration of local anesthetic for peripheral nerve block: a systematic review and network meta-analysis. Anesth Analg. 2021;133(3):620-629
8. Thacker A, Kheskani D, Panchal D, Chhanwal H. Walking epidural in labor analgesia: A comparative study of Ropivacaine with Fentanyl and without Fentanyl. Journal of Obstetric Anaesthesia and Critical Care. 2023;13(1):45- 50
9. Kataria S, Mitra S, Saroa R, Jindal S, Gupta R. A randomized double blinded trial comparing dexmedetomidine with dexamethasone as an adjunct to ropivacaine in ultrasound guided interscalene block for arthroscopic shoulder surgery. Asian J Anesthesiol. 2019;57(1):10-18
10. Hassan Z, Qayoom U, Shabir S. An observational study of adductor canal block using ropivacaine alone and with additives (dexmedetomidine / fentanyl) for post operative analgesia in patients undergoing knee arthroscopic surgeries. JCHR 2024;14(1):1-9.
11. Wang CJ, Long FY, Yang LQ, Shen YJ, Guo F, Huang TF, Gao J. Efficacy of perineural dexamethasone with ropivacaine in adductor canal block for post-operative analgesia in patients undergoing total knee arthroplasty: A randomized controlled trial. Exp Ther Med. 2017;14(4):3942-3946
12. Apte VY, Mehta S, Adate K, Pathan A, Valake K. A comparative study of 0.2% Ropivacaine with Dexamethasone versus Fentanyl in PENG block. Indian J Clin Anaesth 2024;11(4):458-463.