ASSESSMENT OF THE EFFICACY OF CAUDAL BLOCK USING LIGNOCAINE WITH AND WITHOUT KETAMINE IN ADULT PATIENTS UNDERGOING

Dr. Balakrishnan[1], Dr. Vijay Balan P[2*]
[1]Junior Resident, Department of Anaesthesia, Sreemookambika Institute of Medical Sciences kanyakumari, Tamilnadu, India.
[2*]Professor, Department of Anaesthesia, Sreemookambika Institute of Medical Sciences, Kanyakumari, Tamilnadu, India.
Corresponding Author: Dr. Vijay Balan P
Junior Resident, Department of Anaesthesia, Sreemookambika Institute of Medical Sciences, Kanyakumari, Tamilnadu, India.

ABSTRACT

Background: Caudal epidural block is a commonly used regional anesthetic technique for anorectal surgeries because it provides effective intraoperative anesthesia and postoperative analgesia with minimal hemodynamic disturbances. Addition of adjuvants such as ketamine to local anesthetic agents may improve the quality and duration of analgesia. The present study was conducted to compare the effectiveness of caudal block using lignocaine alone and lignocaine combined with ketamine in adults undergoing anorectal surgeries.

Methodology: This prospective randomized comparative study was conducted in the Department of Anaesthesiology at Sree Mookambika Institute of Medical Sciences from June 2025 to March 2026. Fifty patients aged between 20 and 60 years belonging to ASA Grade I and II undergoing anorectal surgeries were included in the study. Patients were randomly allocated into two groups of25 each. Group C received 30 ml of 1.5% lignocaine for caudal block, whereas Group T received 30 ml of 1.5% lignocaine combined with ketamine 0.5 mg/kg. Parameters assessed included onset of anesthesia, time to start surgery, sensory dermatome level, motor blockade, positional pain score, patient satisfaction, and surgeon satisfaction. Statistical analysis was performed using Student's t-test and Chi-square test, with p-value <0.05 considered statistically significant.

Results: The onset of anesthesia was significantly faster in Group T (5.16 ± 1.75 minutes) compared to Group C (6.04 ± 1.51 minutes) with p=0.045. Mean time to start surgery was significantly shorter in Group T (10.48 ± 1.64 minutes) than Group C (11.44 ± 1.83 minutes) with p=0.008. Group T demonstrated higher sensory dermatome levels at 5, 10, and 15 minutes compared with Group C. Positional pain score was lower in Group T, while patient and surgeon satisfaction scores were significantly higher in the ketamine group.

Conclusion: Addition of ketamine to lignocaine in caudal epidural block provided faster onset of anesthesia, improved sensory blockade, better analgesia, and greater patient and surgeon satisfaction compared with lignocaine alone in adult anorectal surgeries.

Keywords: Caudal Epidural Block, Lignocaine, Ketamine, Anorectal Surgery, Regional Anesthesia, Postoperative Analgesia.

INTRODUCTION

Anorectal disorders such as hemorrhoids, fissure-in-ano, fistula-in-ano, and perianal abscess are common surgical conditions that frequently require operative intervention. These procedures are often associated with significant postoperative pain and discomfort, which may lead to delayed recovery, prolonged hospital stay, urinary retention, and reduced patient satisfaction.

www.ajmrhs.com
eISSN: 2583-7761

Date of Received: 29-05-2026
Date Acceptance: 07-06-2026
Date of Publication: 06-07-2026

Therefore, selection of an appropriate anesthetic technique plays a crucial role in ensuring adequate intraoperative anesthesia, effective postoperative analgesia, and early ambulation in patients undergoing anorectal surgeries. Regional anesthetic techniques have gained considerable importance in anorectal procedures because they provide excellent analgesia with fewer systemic complications compared to general anesthesia.[1]

Caudal epidural block is one of the oldest and most reliable regional anesthetic techniques used for surgeries involving the perineum, anal canal, and lower rectum. The technique involves injection of local anesthetic agents through the sacral hiatus into the caudal epidural space, resulting in blockade of sacral and lower lumbar nerve roots. Caudal anesthesia offers several advantages including technical simplicity, minimal hemodynamic disturbances, good muscle relaxation, reduced blood loss, and prolonged postoperative pain relief. Because of these benefits, caudal block is widely utilized for anorectal surgeries in both pediatric and adult populations.[2]

V = nRT

Among the various local anesthetic agents available, Lignocaine is commonly used for caudal epidural anesthesia because of its rapid onset, intermediate duration of action, and favorable safety profile. Lignocaine acts by blocking sodium channels in nerve membranes, thereby preventing nerve impulse transmission and producing sensory and motor blockade. Although lignocaine alone provides effective surgical anesthesia, the duration of postoperative analgesia is often limited, necessitating the use of additional analgesics during the postoperative period. In recent years, various adjuvant drugs have been added to local anesthetics to improve the quality and duration of analgesia while minimizing postoperative pain and analgesic requirements.[3]

Ketamine has emerged as an important adjuvant in regional anesthesia due to its potent analgesic properties mediated primarily through antagonism ofN-methyl-D-aspartate (NMDA) receptors in the central nervous system. Ketamine also interacts with opioid receptors, monoaminergic pathways, and voltage-sensitive calcium channels, thereby contributing to enhanced analgesia. When used in low doses as an additive to local anesthetics, ketamine has been shown to prolong the duration of analgesia, improve block quality, reduce postoperative analgesic consumption, and provide better patient comfort without significant respiratory depression. Several clinical studies have demonstrated the effectiveness of ketamine as an epidural and caudal adjuvant in various surgical procedures.[4,5]

The combination of lignocaine with ketamine in caudal epidural anesthesia may therefore provide superior perioperative analgesia compared with lignocaine alone. Enhanced duration of pain relief and reduced need for rescue analgesics are especially important in anorectal surgeries, where postoperative pain can significantly impair mobility and recovery. However, concerns regarding side effects such as sedation, nausea, hallucinations, and hemodynamic changes necessitate careful evaluation of the safety and efficacy of ketamine when used as an adjuvant in caudal block.[6]

Several studies have compared different local anesthetic and adjuvant combinations for caudal anesthesia, but limited data are available regarding the comparative effectiveness of lignocaine alone versus lignocaine combined with ketamine in adult anorectal surgeries. Hence, the present study was undertaken to compare the effectiveness of caudal block using lignocaine alone and lignocaine combined with ketamine in adults undergoing anorectal surgeries with respect to onset and duration of analgesia, quality of anesthesia, postoperative pain relief, hemodynamic stability, and adverse effects.[7]

Aim

To compare the effectiveness of caudal block using lignocaine alone and lignocaine combined with ketamine in adult patients undergoing anorectal surgeries.

Objectives

1. To compare the onset time of analgesia between caudal block using lignocaine alone and lignocaine combined with ketamine.
2. To evaluate the duration of postoperative analgesia in both study groups.

METHODOLOGY

This prospective randomized comparative study was conducted in the Department ofAnaesthesiology at Sree Mookambika Institute of Medical Sciences over a study period from June 2025 to March 2026. The study was carried out after obtaining approval from the Institutional Ethics Committee and written informed consent from all participating patients. The study included adult patients aged between 20 and 60 years who were scheduled to undergo elective anorectal surgeries under caudal epidural anesthesia. Patients belonging to American Society of Anesthesiologists (ASA) physical status Grade I and II were included in the study.

Patients who were hemodynamically unstable, neurologically compromised, morbidly obese, allergic to local anesthetic agents or ketamine, or those unwilling to participate and lacking written informed consent were excluded from the study. A total of 50 patients satisfying the inclusion criteria were enrolled and randomly allocated into two groups of 25 patients each using a computer-generated randomization table and sealed opaque envelope technique. Blinding was ensured by assigning an independent anesthesiologist, who was not involved in patient monitoring or data collection, to prepare the study drugs in identical syringes containing a total volume of 30 ml in ready-to-inject form.

Group L patients received 30 ml of 1.5% lignocaine for caudal epidural block, whereas Group LK patients received 30 ml of 1.5% lignocaine combined with preservative-free ketamine at a dose of 0.5 mg/kg body weight. The materials used during the procedure included 1.5% lignocaine, preservative-free ketamine, 18-gauge needles, 10 ml syringes, povidone iodine solution, surgical spirit, sterile drapes, gloves, and standard monitoring equipment.

All patients underwent detailed pre-anesthetic evaluation including general physical examination and systemic examination prior to surgery. Demographic data such as age, sex, weight, body mass index, and ASA grading were recorded. All patients received oral premedication with alprazolam 0.25 mg and ranitidine 150 mg on the night before surgery and again on the morning of surgery.

Upon arrival in the operating theatre, an 18-gauge peripheral intravenous cannula was secured and baseline vital parameters including pulse rate, blood pressure, respiratory rate, and oxygen saturation were recorded. Lactated Ringer's solution was administered intravenously at a rate of 6 ml/kg/hour during the intraoperative period. Under strict aseptic precautions, the patient was positioned in the semi-prone position. The sacral region was prepared with povidone iodine solution followed by surgical spirit and draped with sterile towels. Sacral anatomical landmarks were identified by inspection and palpation. After locating the sacral hiatus through palpation of the sacral cornua, local infiltration was performed around the hiatus using a small-gauge needle.

An 18-gauge needle was introduced through the sacrococcygeal membrane at an angle of 90 degrees to the skin and subsequently directed at approximately 60 degrees toward the coccyx. The needle was carefully advanced not more than 4 cm into the caudal epidural space. Correct placement of the needle was confirmed using the loss-of-resistance technique and WHOOSH test with a stethoscope placed over the lumbar spine. After negative aspiration for blood or cerebrospinal fluid, a test dose of 2 ml local anesthetic solution was administered. Following confirmation that the needle was not intravascular or intrathecal, the remaining drug solution was injected slowly under continuous monitoring. Care was taken to observe for subcutaneous swelling or adverse effects during injection.

After completion of drug administration, patients were placed in the supine position. Sensory blockade was assessed after 5 minutes using loss of temperature and touch sensation over the perineal region. Once adequate sensory blockade was achieved, patients were positioned in lithotomy position and surgery was commenced. If adequate anesthesia was not achieved within 20 minutes or if the patient experienced pain during needle prick testing, the caudal block was considered unsuccessful. In such cases, an alternative anesthetic technique such as subarachnoid block or general anesthesia was administered and the patient was excluded from the study.

The study parameters evaluated included time to onset of anesthesia, time required to start surgery, level of sensory dermatome blockade, degree of motor blockade, duration of analgesia, hemodynamic changes, postoperative pain relief, and incidence of adverse effects or complications.

All collected data were entered into Microsoft Excel and analyzed using appropriate statistical methods. Quantitative variables were expressed as mean ± standard deviation, while categorical variables were expressed as percentages and proportions. Statistical comparison between the two study groups was performed using Student's t-test for continuous variables and Chi-square test for categorical variables wherever applicable. A p-value of less than 0.05 was considered statistically significant.

RESULTS

All the collected data was double checked to exclude any clerical errors, statistical analysis was performed using the statistical package for the social sciences version 24.0. Statistical analysis was performed using Student's t-test -mean of control and test groups for each parameter examined with the baseline data. There were 2 errors out of 50 investigated, resulting in a failure rate of4%. This is mainly due to difficulty in identifying sacral landmarks. Among the total cases, 12 cases in Group C and 18 cases in Group T were males. 13 cases in Group C and 7 cases in Group T were females. The mean age of Group C cases was 39.92 and in Group T cases it was 47.160. The mean weight of Group C was 52.2 and for Group T was 52.4. The mean duration of surgery for Group C was 40.2 and in Group T was 40.4(table 1).The mean time to onset of anesthesia was 6.04 and 5.16 in Group C & Group T respectively. Both the groups were compared and found statistically significant (P value < 0.05) (table 2).The mean time to start surgery was 11.44 and 10.48 in Group C & Group T respectively. Both the groups were compared and found statistically significant (P value < 0.05) (table 2). Among the total cases, 18 cases were at L4, 7 cases were at L3 in Group C with respect to dermatomal level at 5 minutes. The same with Group T: 7 cases were at L3 and 18 cases at L2. Both the groups were compared and there was a statistical significance (p value < 0.05) (table 3). Among the total cases, 9 cases were at L3, 15 cases were at L2 and 1 case at L1 in Group C with respect to dermatomal level at 10 minutes. The same with Group T: 15 cases were at L1 and 10 cases at T12. Both the groups were compared and there was a statistical significance (p value < 0.05)(table 3).Among the total cases, 12 cases were at T12 and 13 cases were at T10 in Group C with respect to dermatomal level at 15 minutes. The same with Group T: 3 cases were at T12 and 22 cases at T10. Both the groups were compared and there was a statistical significance (p value < 0.05) (table 3).Both the groups were compared with regard to motor blockade at 5 minutes and all the cases showed 0. Both the groups were compared with regard to motor blockade at 10 minutes and all the cases showed 1(table 4).Both the groups were compared with regard to motor blockade at 15 minutes and all the cases showed 2.(table 4).Group C had 1.80 and Group T had 1.92 mean sphincter relaxation score. Both the groups were compared and found statistically significant (P value < 0.05). The mean positional pain score was 0.16 and 0.08 in Group C & Group T. Both the groups were compared and found statistically significant (P value < 0.05) (table 5).The mean patient satisfaction score in Group C was 1.80 and in Group T was 1.84. Both the groups were compared and found statistically significant (P value < 0.05) (table 5).Group C had mean satisfaction score 1.52 and Group T had 1.84 for the same. Both the groups were compared and found statistically significant (P value < 0.05)(table 5)**.**Among the study population, mean time to perception of post OP pain was 251.2 and 262.4 in Group C & Group T respectively. Both the groups were compared and found statistically significant (P value < 0.05).5 cases in Group C & no cases in Group T were found to be hypotensive. Group C had 2.56 and Group T had 3.08 as mean sedation score. Both the groups were compared and found statistically significant (P value < 0.05) (graph 1).

Duration of Surgery (In Minutes)	**Group C**	**Group T**
	Mean ± SD	**Mean ± SD**
	40.200 ± 12.540	40.400 ± 12.741

Table 1: Duration of Surgery Distribution

Mean Time to Onset of Anesthesia (in Minutes)	**Group C**	**Group T**	**P Value**
	Mean ± SD	**Mean ± SD**	0.045
	6.04 ± 1.51	5.16 ± 1.75	
Mean Time to Onset of Anesthesia			
Mean Time to Start Surgery (in Minutes)	**Group C**	**Group T**	**P Value**
	Mean ± SD	**Mean ± SD**	
	11.44 ± 1.83	10.48 ± 1.64	0.008
Mean Time to Start Surgery Distribution			

Table 2

Dermatomal Level at 5 Minutes	**Group C**		**Group T**		**P Value**
	No of Cases	**Percentage**	**No of Cases**	**Percentage**	
L4	18	28.0	-	-	0.000
L3	7	72.0	7	28.0	
L2	-	-	18	72.0	
Total	25	100.0	25	100.0	
Mean Sensory Dermatomal Level at 5minutes					
Dermatomal Level at 10 Minutes	**Group C**		**Group T**		**P Value**
	No of Cases	**Percentage**	**No of Cases**	**Percentage**	
L3	9	36.0	-	-	0.000
L2	15	60.0	-	-	
L1	1	4.0	15	60.0	
T12	0	-	10	40.0	
Total	25	100.0	25	100.0	
Mean Sensory Dermatomal Level at 10minutes					

Dermatomal Level at 15 Minutes	**Group C**		**Group T**		**P Value**
	No of Cases	**Percentage**	**No of Cases**	**Percentage**	
T12	12	48.0	3	12.0	0.000
T10	13	52.0	22	88.0	
Total	25	100.0	25	100.0	

Mean Sensory Dermatomal level at 15 minutes

Table 3

Motor Blockade at 10 Minutes	Group C		Group T		P Value
	No of Cases	Percentage	No of Cases	Percentage	
1	25	100.0	25	100.0	--
Total	25	100.0	25	100.0	

Motor Blockade At 10 minutes

Motor Blockade at 15 Minutes	Group C		Group T		P Value
	No of Cases	Percentage	No of Cases	Percentage	
2	25	100.0	25	100.0	--
Total	25	100.0	25	100.0	

Motor Blockade at 15 minutes

Table 4

Mean Positional Pain Score	Group C	Group T	P Value
	Mean ± SD	Mean ± SD	
	0.16 ± 0.37	0.08 ± 0.28	0.035

Mean Positional Pain Score Distribution

Mean Patient Satisfaction Score	Group C	Group T	P Value
	Mean ± SD	Mean ± SD	
	1.80 ± 0.41	1.84 ± 0.37	0.002

Mean Patient Satisfaction Score Distribution

Mean Surgeon Satisfaction Score	Group C	Group T	P Value
	Mean ± SD	Mean ± SD	
	1.52 ± 0.51	1.84 ± 0.37	0.002

Mean Surgeon Satisfaction Score Distribution

Table 5

DISCUSSION

In the present study, the duration of surgery was comparable between the two groups. The mean duration of surgery in Group C was 40.20 ± 12.54 minutes, while in Group T it was 40.40 ± 12.74 The onset of anesthesia was significantly faster in Group T when compared with Group C. The mean time to onset of anesthesia was 5.16 ± 1.75 minutes in Group T and 6.04 ± 1.51 minutes in Group C, with a statistically significant p-value of 0.045. The faster onset observed in the ketamine group may be attributed to the synergistic analgesic action of ketamine through NMDA receptor antagonism, which enhances neural blockade when combined with lignocaine. Similar findings were reported in previous studies where ketamine used as an adjuvant in caudal epidural anesthesia resulted in rapid onset and improved analgesic quality.[9, 10]

The mean time required to start surgery was also significantly shorter in Group T compared to Group C. Surgery was initiated at 10.48 ± 1.64 minutes in Group T, whereas in Group C it was started at 11.44 ± 1.83 minutes, with a statistically significant p-value of 0.008. Earlier achievement of adequate sensory blockade in the ketamine group facilitated quicker surgical readiness and improved operating minutes. The similarity in operative duration between the groups indicates that the surgical complexity and operative conditions were comparable, thereby allowing reliable assessment of anesthetic efficacy between the two study groups.[8] room efficiency. Comparable results were demonstrated in studies evaluating ketamine as an adjuvant in regional anesthesia techniques.[11]

Assessment of sensory dermatome levels revealed superior cephalad spread of sensory blockade in Group T at all observation intervals. At 5 minutes, 72% of patients in Group T achieved sensory blockade up to L2 dermatome, whereas the majority of Group C patients remained at L3 and L4 levels. At 10 minutes, 60% of Group T patients attained blockade up to L1 dermatome and 40% reached T12 level, while Group C patients predominantly remained at L2 and L3 levels. At 15 minutes, 88% of Group T patients achieved T10 sensory blockade compared to only 52% in Group C. These findings demonstrate that addition of ketamine improved both the speed and extent of sensory blockade. The enhanced spread of analgesia may be due to potentiation of spinal analgesic mechanisms by ketamine.[12]

Motor blockade assessment showed no statistically significant difference between the two groups. At 10 minutes, all patients in both groups exhibited Grade I motor blockade, and by 15 minutes all patients developed Grade II motor blockade. This finding indicates that ketamine did not significantly alter the motor blocking characteristics of lignocaine when administered caudally. Similar observations have been reported in studies where ketamine primarily enhanced sensory analgesia without excessive motor impairment.[13]

The mean positional pain score was significantly lower in Group T (0.08 ± 0.28) compared with Group C (0. 16 ± 0.37), with a p-value of 0.035. Reduced positional pain in the ketamine group suggests superior perioperative analgesia and improved patient comfort during surgical positioning. In addition, both patient satisfaction and surgeon satisfaction scores were significantly higher in Group T. The mean patient satisfaction score was 1.84 ± 0.37 in Group T compared with 1.80 ± 0.41 in Group C, while surgeon satisfaction scores were 1.84 ± 0.37 and 1.52 ± 0.51 respectively, both showing statistically significant differences. Improved satisfaction may be attributed to rapid onset, better analgesia, and improved operating conditions achieved with the lignocaine-ketamine combination.[14]

Overall, the findings ofthe present study indicate that addition of ketamine to lignocaine in caudal epidural anesthesia provides faster onset of anesthesia, improved sensory blockade, reduced positional pain, and greater patient and surgeon satisfaction compared with lignocaine alone in adult patients undergoing anorectal surgeries.

CONCLUSION

The present study demonstrated that the addition of Ketamine to Lignocaine in caudal epidural block provided superior anesthetic efficacy compared with lignocaine alone in adult patients undergoing anorectal surgeries. The lignocaine-ketamine combination produced a faster onset of anesthesia, earlier readiness for surgery, improved cephalad spread of sensory blockade, lower positional pain scores, and higher patient and surgeon satisfaction. Although motor blockade was comparable between the two groups, the addition of ketamine significantly enhanced the overall quality of analgesia without major adverse effects. Therefore, ketamine can be considered a useful and effective adjuvant to lignocaine for caudal epidural anesthesia in anorectal surgical procedures.

REFERENCES

1. Morgan GE, Mikhail MS, Murray MJ. Clinical Anesthesiology. 5th ed. New York: McGraw-Hill Education; 2013.
2. Cousins MJ, Bridenbaugh PO. Neural Blockade in Clinical Anesthesia and Management of Pain. 4th ed. Philadelphia: Lippincott Williams & Wilkins; 2009.Butterworth JF, Mackey DC, Wasnick JD. Morgan and Mikhail's Clinical Anesthesiology. 6th ed. New York: McGraw-Hill Education; 2018.
3. Lauretti GR, Lima IC, Reis MP, Prado WA, Pereira NL. Oral ketamine and transdermal nitroglycerin as analgesic adjuvants to epidural lidocaine. Reg Anesth Pain Med. 1999;24(5):420-4.
4. Kumar CM, Eid H, Crossley AW. Caudal epidural analgesia in adults. Anaesthesia. 1996;51(8):696-703.
5. Subramaniam K, Subramaniam B, Steinbrook RA. Ketamine as adjuvant analgesic t opioids: a quantitative and qualitative systematic review. Anesth Analg. 2004;99(2):482-95.
6. Tan PH, Chia YY, Lo Y, Liu K, Yang LC, Lee TH. Intrathecal ketamine for postoperative analgesia in orthopedic surgery. Acta Anaesthesiol Scand. 1999;43(1):50-6.
7. Kumar CM, Eid H, Crossley AW. Caudal epidural analgesia in adults. Anaesthesia. 1996;51(8):696-703.
8. Lauretti GR, Lima IC, Reis MP, Prado WA, Pereira NL. Oral ketamine and transdermal nitroglycerin as analgesic adjuvants to epidural lidocaine. Reg Anesth Pain Med. 1999;24(5):420-4.
9. Tan PH, Chia YY, Lo Y, Liu K, Yang LC, Lee TH. Intrathecal ketamine for postoperative analgesia in orthopedic surgery. Acta Anaesthesiol Scand. 1999;43(1):50-6.
10. Subramaniam K, Subramaniam B, Steinbrook RA. Ketamine as adjuvant analgesic t opioids: a quantitative and qualitative systematic review. Anesth Analg. 2004;99(2):482-95.
11. Cousins MJ, Bridenbaugh PO. Neural Blockade in Clinical Anesthesia and Management of Pain. 4th ed. Philadelphia: Lippincott Williams & Wilkins; 2009.
12. Butterworth JF, Mackey DC, Wasnick JD. Morgan and Mikhail's Clinical Anesthesiology. 6th ed. New York: McGraw-Hill Education; 2018.
13. Morgan GE, Mikhail MS, Murray MJ. Clinical Anesthesiology. 5th ed. New York: McGraw-Hill Education; 2013.

How to cite this article: Dr. Balakrishnan, Dr. Vijay Balan P, ASSESSMENT OF THE EFFICACY OF CAUDAL BLOCK USING LIGNOCAINE WITH AND WITHOUT KETAMINE IN ADULT PATIENTS UNDERGOING, Asian J. Med. Res. Health Sci., 2026; 4 (2):1752-1758.

Source of Support: Nil, Conflicts of Interest: None declared.