International Journal of Recent Advances in Multidisciplinary Topics
Volume 4, Issue 4, April 2023
https://www.ijramt.com | ISSN (Online): 2582-7839

Caudal Anaesthesia and its Impact on Caecal Intubation Rate During Colonoscopy

Olufemi Oladele Adejumo[1*], Olayinka Eyelade[2], Akere Adegboyega[3], Ibeji Uchenna[4]
[1]*Consultant, Anaesthetist & Critical Care, University College Hospital, Ibadan, Nigeria*
[2]*Consultant/Lecturer, Anesthetist & Pain Physician, UCH/University of Ibadan College of Medicine, Ibadan, Nigeria*
[3]*Consultant, Gastro-enterologist/Endoscopist, University College Hospital, Ibadan, Nigeria*
[4]*Resident Anaesthetist, University College Hospital, Ibadan, Nigeria*

***Abstract*: A caudal epidural block is a potential alternative anesthesia strategy for patients scheduled for colonoscopies. The study aims to evaluate the analgesic efficacy of caudal anesthesia and its impact on the cecal intubation rate during ambulatory colonoscopy. A total of 56 participants were selected for the study and divided into two groups; A and B. Observational analyses of both genders were done between 09-04-15 and 08-04-16. The study's participants were aged 30 to 60, with BMI <18.5 to >30. The Ethics Committee approved the study at University College Hospital, Ibadan, Nigeria. Each participant provided written informed consent following an explanation of the study's goals. At two positions, Lateral decubitus and prone, caudal anesthesia was given, and its effect was assessed using a pain assessment scale. There was no statistically significant difference between groups A and B of colonoscopists. The study's findings show that the mean caudal block onset time was 11.71 4.26 and 13.50 4.85, respectively, with a p-value of 0.15. Group A had 61.5% of first and second attempts at insertion compared to group B's 80%. The mean caecal intubation time was statistically significantly different in both groups (A versus B): 21.213.50 vs. 12.576.69 (p=0.03). The association between the analgesic efficiency of caudal anesthesia and the cecal intubation rate was also significant. Caudal anesthesia is effective and safe during colonoscopy, but its onset time accelerates the cecal intubation time in group A compared to group B. Future studies are required to identify the potential impact of anesthesia on CIR.**

***Keywords*: Colonoscopy, Ceacal intubation rate, Anaesthesia, Endoscopy.**

1. Introduction

Colonoscopy is advantageous in the diagnosis, treatment, and colorectal cancer screening programs [1], [2]. Cecum intubation is typically done during colonoscopies in the US [3]. The Cecal Intubation Rate (CIR) is a significant indicator of the effectiveness of a colonoscopy [1], [4]. Age, gender, bowel preparation quality, and specific colon disorders, including diverticular and inflammatory bowel disease, influence the Cecal Intubation Rate [1]. It frequently results in pain from embarrassment, anxiety, and other types of mental, bodily, and emotional distress [5]. There are several ways to compose the trinomial of colonoscopy, pain, and fear. Several recommendations advocate for sedoanalgesia [5], [6]. One of the most significant measures of the quality of endoscopic procedures is the cecal intubation rate. Cecal intubation is inserting the endoscope's tip deeply enough into the cecum to reach the appendiceal opening [7], [8].

The anesthesia is administered as an epidural injection in the lower back area [9]-[11]. A caudal gives up to 4 hours of postoperative pain relief in that location and enables the anaesthesiologists to use less general anaesthetic throughout the procedure [9]. By suppressing nervous system signals, anesthesia works. Anesthesia prevents the brain from getting pain signals [12].

A. Aims and Objectives

This study aims to evaluate the analgesic efficacy of caudal anesthesia and its impact on the cecal intubation rate during colonoscopy. However, the impact of caudal anesthesia on the cecal intubation rate during colonoscopy is the novelty of this study. This rare association has not been addressed earlier in the scientific literature. This advancement will add value to the medical sciences and diagnostic research field.

Type of Study: Prospective randomized study.

Abbreviations:

Cecal Intubation Rate (CIR); Electrocardiography (ECG); Post Anaesthetic Discharge Scoring System (PADSS); Numerical Rating Scale (NRS); Statistical Package for Social Sciences (SPSS); Body Mass Index (BMI); Continuous Quality Improvement (CQI).

2. Materials and Methods

The purpose of this prospective randomized trail Consort study was to evaluate the effectiveness of caudal anaesthetic during ambulatory colonoscopy using the Likert scale and the way it impacted CIR, to compare the caudal anaesthesia's sensory block's onset times, and to measure the degree of patient satisfaction after caudal anesthesia for an ambulatory colonoscopy. This study follows the 2010 CONSORT guidelines.

A. Ethics

The Ethics Committee, Institution Ethical Review Board of College of Medicine, University of Ibadan approved

*Corresponding author: olufemi523oladele@outlook.com

Prospective Consort study at University College Hospital, Ibadan, Nigeria; UI/UCH under Ethics Committee Assigned Number (UI/EC/13/0367). IRB Research approval number 13/0367. The procedures followed the ethical standards of the University College Hospital, Ibadan, Nigeria and with the Helsinki Declaration of 1975, revised in 2000.

B. Study Design

Selection and Description of Participants: A total of 56 participants were recruited for the study and divided into two groups. During the call-back period, 40 out of 56 participants responded. Patients of both genders (male and female) were affiliated with the Department of Anesthesia at University College Hospital in Ibadan, Nigeria. Observational analyses of both genders were done between April 9, 2015, to April 8, 2016. They aged between 30 to 60 (< 50, 50-60, and >60were included, while patients with fewer ages were excluded from the study group), with BMI <18.5 to >30. When the colonoscope was inserted, two patients from group A were excluded because their NRS was ≥ 4, and three patients from group B were excluded because of inadequate intestinal preparation. Patients with a history of lower abdominal surgery, allergies to the medication used in the trial (fentanyl-lidocaine), pregnancy, a febrile condition, or an infection at the injection site were excluded from participation. Patients with neurological diseases, blood disorders, hypovolemia, sacral abnormalities, or traumas were also excluded. At two positions, Lateral decubitus and prone, caudal anesthesia was given. Its effect was assessed using a pain assessment scale.

C. Procedure

The study included 56 consecutive adult patients with an ASA physical status of I or II who had been scheduled for a day-case colonoscopy. Each participant provided written informed consent following an explanation of the study's goals and the use of the pain evaluation tool. Baseline measurements of the equipment (including the anaesthetic machine, airway, and resuscitation devices) were noted, including pulse rate, blood pressure, respiration rate, SpO2, and pain score. For anxiolysis, intravenous midazolam was administered to all participants at a dose of 0.025 mg/kg body weight, and peripheral venous access was preferably made on the left forearm. Upon entering the endoscopy room, the physician who was blind to the study drugs immediately placed all participants for caudal block, either in lateral decubitus or prone [13].

Technique for Caudal Epidural Anesthesia: Sacral hiatus was identified and indicated in each patient while in lateral decubitus or prone posture. To maintain the anus and genitalia protected from povidone-iodine while asepsis was being controlled, a dry gauze swab was put in the anal cleft. As part of the aseptic technique and to maintain the patient's dignity, the investigator was dressed in scrubs and a gown, and a sterile drape was placed from the buttock to the ankle. Depending on the patient's physical behaviours, a 19–21G hypodermic needle was employed to inject one millilitre of 2% lidocaine to anesthetize the surrounding skin at the coccyx region. A "pop" was heard as the needle penetrated the sacrococcygeal ligaments and entered the sacral canal after being inserted at a 45-degree angle to the skin between the two cornua and close to the vertex of the sacral hiatus. The number of sacral canal needle implantation attempts was counted.

All patients received a single injection of local anaesthetic with 19.4 ml. The injection was given slowly and included many test aspirations. By palpating the area with the other hand to examine for subcutaneous swelling and discomfort, the subcutaneous or periosteal injection was ruled out or confirmed. In such cases, the needle is taken out and put back in. The time between LA injection and the completion of two or three segmental blocks was used to determine the caudal block's onset time and the duration of the sensory block. When enacting the caudal block, the intensity of the block was measured by an impartial observer using pinpricks every 1 minute for the first 10 minutes and every 2 minutes for the following 20 minutes, recording only the greatest sensory level. Every five minutes for 20 minutes after caudal injection, 20 minutes following colonoscopy, and one hour after, a modified Bromage Score was evaluated and recorded (1=total block; impossible to move feet or knee, 2=almost complete block; able to move feet only, 3=partial block; merely able to move the knee, 4=detectable weakness of hip flexion, 5=no detectable weakness of hip flexion while reclining with full flexibility of knees). Moreover, the association between the analgesic efficiency of caudal anesthesia and the cecal intubation rate was analysed and found to be significant [13].

Intra-Procedural Stage: The patient was examined while lying in the lateral decubitus posture. In the first 10 minutes, the assisting anesthetist (independent observer) monitored the cardio-respiratory system, including blood pressure, pulse rate, respiratory rate, arterial oxygen saturation (Sp02), and continuous 5-lead electrocardiography (ECG) monitoring. The assisting anesthetist measured the pain level using the Likert scale. The procedure's duration is measured from the place of endoscopic insertion to the point at which the terminal ileum is reached, and the caecal intubation is the time it takes to get to the caecum.

Post-Procedural: In the recovery side room, skilled nurses performed post-procedural cardiorespiratory monitoring until patients were declared clinically fit for discharge. Once the patient's hip flexion strength returned, the perineal sensation returned, the foot's plantar flexion contracted, and they could walk normally, the patient's motor block was deemed resolved. Following a colonoscopy, the Post Anaesthetic Discharge Scoring System (PADSS) was employed to assess the patient's recovery profiles. A decision to discharge the patient was made when two consecutive PADSS results were equal to or higher than 9. The patient's level of satisfaction was assessed immediately following the colonoscopy for those who could understand, and for others through a phone call from their homes within 24 hours of discharge, using a *5-point Likert scale* with 1 denoting "very dissatisfied," 2 denoting "dissatisfied," 3 denoting "neutral," 4 denoting "content," and 5 denoting "extremely satisfied."

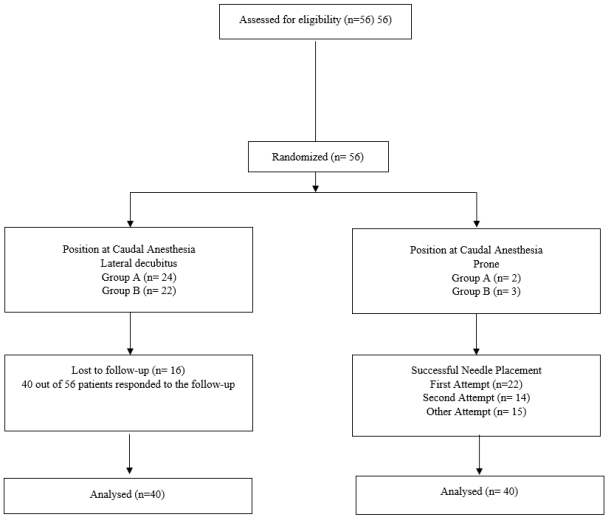

Fig. 1. CONSORT 2010 flow diagram

D. Technical Information

The tool for measuring the level of satisfaction was changed from yes/no to a 5-point Likert Scale as well as a Numerical Rating Scale (NRS). The pain intensity was assessed using a unidimensional scale. After being validated, this pain measuring tool was proven effective in this sub region's acute pain management.

E. Data Analysis

The data was statistically analysed using the Statistical Package for Social Sciences (SPSS) for Windows version 22.0, Chicago, II. The means and standard deviations of continuous variables were estimated. Statistical correlations were found using the Chi-square (X2) test for categorical factors such gender and ASA, PADSS, pain intensity (median test), and sedation score. For continuous variables like BMI, hemodynamic changes, and procedure duration, the t-test was used, and a p-value <0.05 was regarded as significant.

3. Results

In this study, 56 patients were involved; three patients in group B were excluded due to inadequate bowel preparation, while two patients in group A were excluded due to NRS of greater than or equal to 4 at the time of colonoscope insertion. The analysis comprised data from 51 patients. Table 1 demonstrates that group A's mean age (years) was 58.812.4, comparable to group B's mean age (55.212.7, p=0.29). The mean body mass index (BMI) for group A was 24.343.71, similar to group B's value of 23.255.10 with a p-value of 0.11. Most patients in groups A (84.6%) and B (72.0%) go through interventional colonoscopy or polypectomy with biopsy. The most frequent symptoms in all groups are rectal bleeding, stomach pain, and unusual bowel habits. The lateral decubitus position was the most typical for the caudal block. Even though group A had 61.5% of first and second attempts at effective caudal needle insertion compared to group B's 80%, there was no statistically significant difference between the two groups. Table 2 shows that the mean caudal block onset time in groups A and B was 11.71 4.26 and 13.50 4.85, respectively, with a p-value of 0.15, indicating no statistically significant difference [13].

Table 1
Demographic and Pre-anaesthetic data [13]

Parameter	Group A (N=26) (%)	Group B (N=25) (%)
Age (years)		
<50	8(30.8)	14(56.0)
50-59	4(15.4)	5(20.0)
≥60	14(53.8)	6(24.0)
Gender:		
Male	7(24)	15(61.5)
Female	19(76)	10(38.5)
Body mass index		
Normal	14(53.8)	14(56.0)
Over-weight	12(46.2)	11(44.0)
Obese	0(0.0)	0(0.0)
Position at Caudal Anesthesia:		
- Lateral decubitus	24(92.3)	22(88.0)
- Prone	2(7.7)	3(12.0)
Successful needle placement:		
First Attempt	14(53.8)	8(32.0)
Second Attempt	2(7.7)	12(48.0)
Other	10(38.5)	5(20.0)
Indication for colonoscopy:		
Surveillance Colonoscopy		
- Rectal bleeding	14(53.8)	12(48.0)
- Abdominal pain	6(23.1)	9(36.0)
- Abnormal bowel habit	11(42.3)	16(64.0)
Interventional Colonoscopy		
- Polypectomy	12(46.1)	12(48.0)
- Biopsy	22(84.6)	18(72.0)

Both group A and group B individually assessed the block's height. Although both groups achieved sensory block at the S3 segment prior to colonoscopy, group A (76.9%) and group B (80%) had 20 patients whose anesthesia had progressed to the S2 segment. In groups A and B, respectively, six patients (23.1%) and one (4%) patient showed no anesthesia development from the baseline S3 segment block (no rostral spread); in group B, four (16%) patients acquired sensory level T12, which was the maximum sensory level at the end of colonoscopy. In groups A and B, sensory blockage began to subside an hour after the colonoscopy when the anaesthetic effect regressed to the S5 section.

Furthermore, the association between the analgesic efficiency of caudal anesthesia and the cecal intubation rate was significant. The mean caecal intubation time was statistically significantly different in both groups (A versus B): 21.213.50 vs. 12.576.69 (p=0.03). This demonstrated that group B accessed the caecum more quickly than group A managed. When comparing groups, A and B, there was no statistically significant difference in the extent of the sensory block: 38.50 9.73 vs. 35.79. The procedural time (A versus B) was statistically significantly different: 34 vs. 28.00; shorter in group B possibly due to quicker caecal intubation, as shown in Table 2.

Figure 2 and Table 3, respectively, indicate the mean and median pain scores (NRS). Group A's initial median pain level

Table 2
Clinical data of patients in Groups A and B [13]

Variables	Group A (N=26)	Group B (N=25)	t-test	p-value
Caudal Anesthesia Onset time (minutes)	11.7±4.3	13.5±4.9	1.46	0.15
Caecal intubation time(minutes)	21.2±3.5	12.6±6.7	2.22	0.03*
Procedural duration (Minutes)	34.2±9.9	28.0±8.7	2.49	0.02*
Duration of sensory block (minutes)	38.5±9.7	35.8±10.8	0.99	0.33

Key: N – Number of patients, * - Significant at 0.05

Table 3
Median NRS at different procedural stages in both groups [13]

Procedural Stages	Group	Median score	≤ median score N (%)	>median score N (%)	P-value
Pre-procedure	**A**	3	12(46.2)	14(53.8)	0.592
	B	0	13(52.0)	12(48.0)	
Insertion	**A**	0	17(68.0)	9(32.0)	0.114
	B	0	21(84.0)	4(16.0)	
Splenic flexure	**A**	2	14(53.8)	12(46.2)	0.285
	B	3	12(48.0)	13(52.0)	
Hepatic Flexure	**A**	5	10(38.5)	16(61.5)	0.031
	B	3	17(68.0)	8(32.0)	

* Significant at < 0.05

of 3 was compared to group B's initial median pain score of 0, p=0.592. When compared to group B, which also had zero pain during colonoscopy insertion, group A's median pain score was zero (p=0.114). The median pain score while navigating the splenic flexure was 2 in group A compared to 3 in group B, p=0.285. Group A had a median pain score of 5, which was substantially greater than group B's score of 3 at the hepatic flexure (p=0.031). At the hepatic flexure, approximately 61.5% of patients in group A and 32.0% in group B reported pain scores higher than the median. According to Table 5, more patients in group A than group B received rescue analgesia (34.62% of patients in group A and 16% of patients in group B), although there was no statistically significant difference between the groups (p=0.23).

In groups A and B, the pre-anesthesia mean arterial blood pressure was similar at baseline (93.615.4 vs. 87.713.3, p=0.69). More than 80% of patients in all groups had SpO2 levels greater than 96%, and two patients with SpO2 levels of over 90-95% received oxygen support via a nasal prong during the surgery, as indicated in Table 4. As shown in Table (4), group A had a mean heart rate of 79.4 beats per minute at baseline, 97.4 beats per minute at minute 20, 81.7 beats per minute at minute 30, and 84.5 beats per minute in the PACU, while group B had a mean heart rate of 75.3 beats per minute at baseline, 98.9 beats per minute at minute 20, 78.5 beats per minute at minute 30, and 77.1 beats per minute in the PACU. Although all groups A and B's mean heart rates were within acceptable ranges, there was a statistically significant difference between them: 80.513.6 and 96.37.2, p=0.03. In comparison to group B, which had blood pressure readings of 87.713.3 at baseline, 87.713.1 at the 15th minute, 89.415.0 at the 30th minute, and 88.323.4 in the PACU, group A's mean and standard deviation were 93.615.4 at baseline, 92.520.6 at 15th minute, 87.514.1 at 30th minute, and 83.927.8 in the PACU. At the 20th minute, there was a statistically significant difference in the mean arterial pressure between groups A and B: 89.820.6 and 84.416.4, respectively, with a p-value of 0.035.

A 250 ml intravenous infusion of 0.9% saline was used to treat a case of hypotension that affected one patient (4%) in group B. Within 24 hours of being approached by phone, one patient from each group reported having back pain. Only a small amount of sedation was used throughout the groups throughout the surgery, as shown in Table 5. Two patients (7.7%) from group A and three patients (12%) from group B both had observable hip flexion weakness (modified Bromage 4). As seen in Table 5, this explains why they experienced difficulty standing right after a colonoscopy.

According to Table 6, nineteen of the twenty-five patients in group B (76%) indicated pleasure, as opposed to ten of the twenty-six (38.5%) patients in group A. The PADSS score at 20 minutes varies from 8 to 12, as shown in Table (6), during observation in the recovery room. Close observation was necessary for 7 patients (27.0%) in group A and 8 (32.0%) in group B. Despite not being discharged, 73% of patients in group A and 84% of patients in group B had PADSS scores at 40 minutes that indicated they were ready for discharge. All patients had a PADSS score of greater than or equal to 9 by the hour after the colonoscopy was completed, as indicated in Table 7.

Table 4
Haemodynamics- Intra and Post-procedural [13]

Variables	Group A (n=26) Mean±	Group B (n=26) Mean±	p-value
Haemodynamics			
Heart rate:			
Baseline	79.4±12.8	75.3±12.9	0.93
@ 15mins	80.5±13.6	96.3±7.2	0.03*
@ 20mins	97.4±2.5	98.9±1.0	1.55
@ 30mins	81.7±8.1	78.5±13.2	0.07
PACU	84.5±12.7	77.1±13.3	0.67
Blood pressure			
Baseline	93.6±15.4	87.7±13.3	0.694
@ 15mins	92.5±20.6	87.7±13.1	0.055
@ 20mins	89.8±20.6	84.4±16.4	0.035*
@ 30mins	87.5±14.1	89.4±15.0	0.676
PACU	83.9±27.8	88.3±23.4	0.970

Key: N-Number of patient
PACU- Post-anesthesia care unit
* Significant at 0.05

Table 5
Rescue Analgesia, Sedation score and Modified Bromage score [13]

Variable	A N=26 (%)	B N=25 (%)
Rescue Analgesia:		
Intravenous midazolam and fentanyl	9(34.6)	4(16.0)
Modified Bromage score (post colonoscopy):	N=26(%)	N=25(%)
5	24(92.3)	22(88)
4	2(7.7)	3(12)
Sedation score (Ramsay):		
I	3(11.5)	0(0.0)
II	2(7.7)	0(0.0)
III	4(15.4)	4(16.0)

Table 6
Patient satisfaction [13]

Variables	A N=26 (%)	B N=25 (%)	p-value
Dissatisfied	0(0.0)	2(8.0)	0.003*
Neutral	16(61.5)	4(16.0)	
Satisfied	10(38.5)	19(76.0)	

* - Significant at 0.05

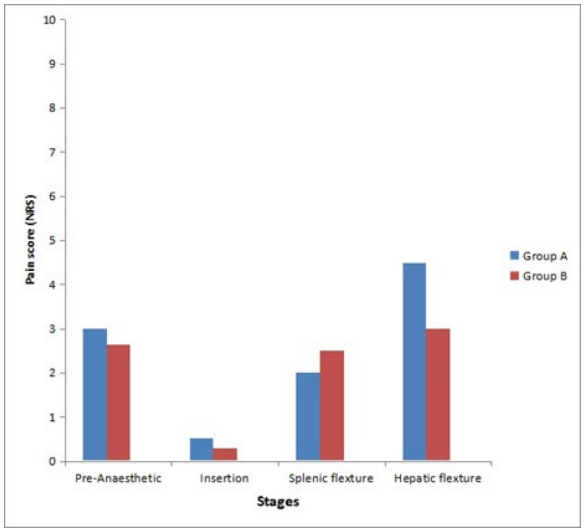

Fig. 2. Mean NRS at different procedural stages [13]
Key: NRS-Numerical Rating Scale

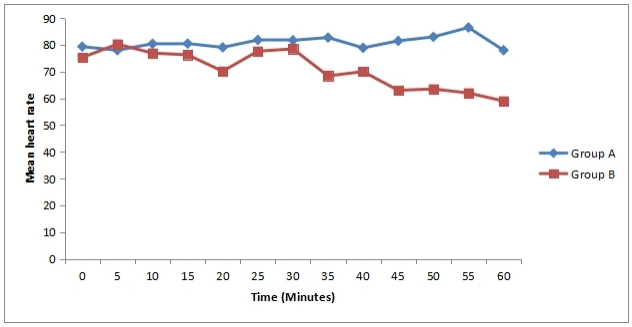

Fig. 3. Intra-procedural mean heart rate [13]

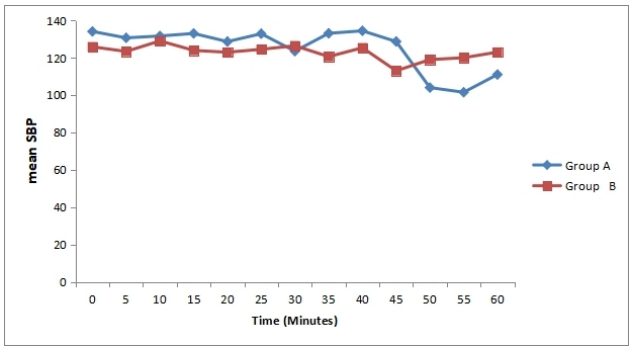

Fig. 4. Intra-procedural mean SBP [13]
Key: SBP-Systolic blood pressure

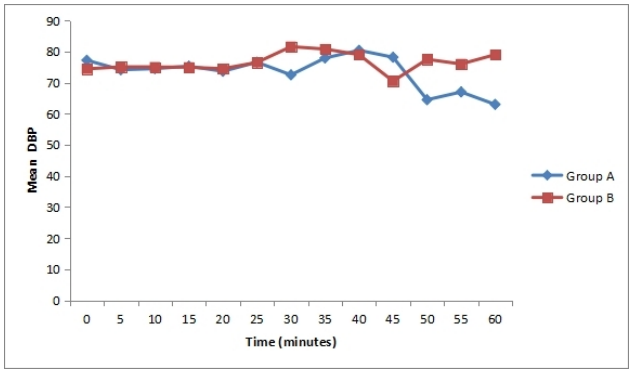

Fig. 5. Intra-procedural mean DBP [13]
Key: DBP-Diastolic blood pressure

Table 7
Recovery profile [13]

Time (minute)	PADSS	Group A N-26 (%)	Group B N-25 (%)	Cause A	Cause B	Outcome
20	7	0(0.0)	0(0.0)			
	8	7(27.0)	8(32.0)			
	9	8(30.7)	16(64.0)			
	10	11(42.3)	1(4.0)			
	12	0(0.0)	0(0.0)			
40	7	0(0.)	0(0.0)			
	8	7(27.0)	4(16.0)			
	9	13(50.0)	14(56.0)			
	10	5(19.2)	7(28.0)			
	12	1(3.8)	0(0.0)			
60	7	-	-			
	8	0(0.0)	0(0.0)			
	9	6(23.1)	6(24.0)			
	10	6(23.1)	10(40.0)			
	12	14(53.8)	9(36.0)			

Key: N- Number of patients
PADSS- Post-anaesthetic discharge scoring system33
PADSS: less or equal to 8- Patient requires close observation
Greater than 9- Ready for discharge
* - Significant at 0.05

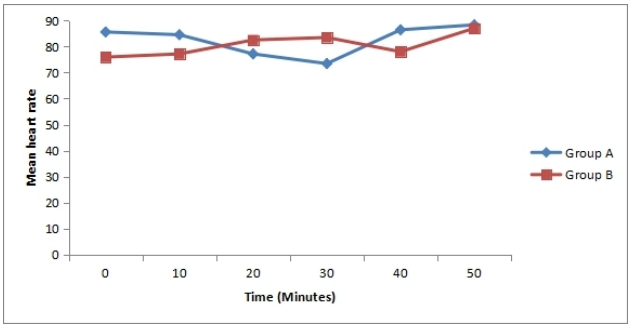

Fig. 6. Post-procedural mean heart rate [13]

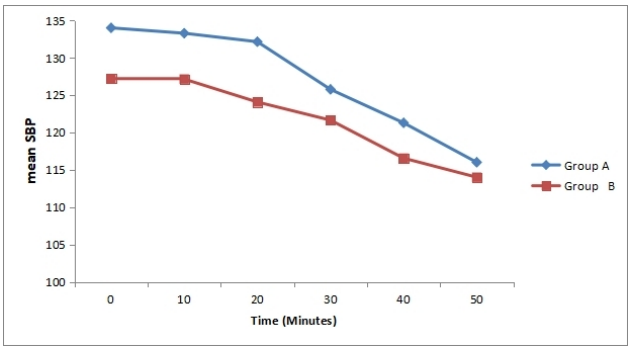

Fig. 7. Post-procedural mean SBP [13]
Key: SBP-Systolic blood pressure

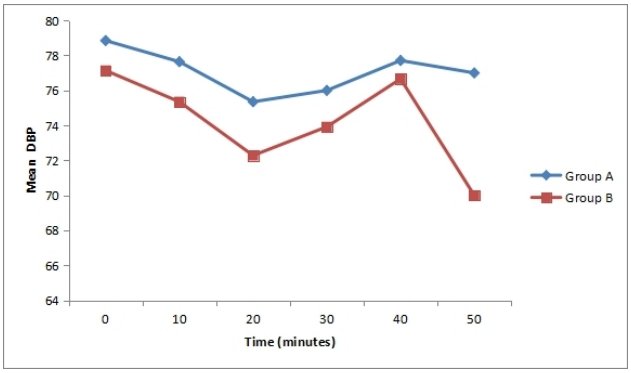

Fig. 8. Post-procedural mean DBP [13]
Key: DBP-Diastolic blood pressure

4. Discussion

The MultiSociety Task Force on Colorectal Cancer in the US developed numerous quality indicators for the Continuous Quality Improvement (CQI) approach for colonoscopy in 2002 [14]. Colonoscopy has gradually taken the place of barium enemas, it is now crucial for diagnosing, treating, and following colorectal ailments or cancers [15]. A strategic planning conference of the American Society for Gastrointestinal Endoscopy (ASGE) gave rise to the Clinical Outcomes Research Initiative (CORI) [16], which deemed it a primary focus to assess endoscopy's efficacy in clinical practice settings. Even with intravenous analgesics and anesthesia, the patient may feel excruciatingly agonizing discomfort during the endoscopic navigation process, particularly along the anorectal canal and sigmoid colon [13]. The experience of the patient during medical operations, especially endoscopic treatments, is crucial [5].

In order to render the examination more practical, the structure of endoscopes has been modified, enhancing the CIR, decreasing the Cecal Intubation Rate, and minimizing patient discomfort during the examination [7]. The CIR would, however, expose a physician's endoscopic skills and serve as a quality indicator. In more than 90% of the cases, competent colonoscopists have been proven to intubate the cecum [7]. When the colonoscope tip is moved close enough to the ileocecal valve to allow visibility of the entire cecal caput [17], [18], comprising the portion of the medial cecal wall between the ileocecal valve and appendiceal orifice, this is referred to as cecal intubation [18]. A typical method for surgical anesthetic is the caudal epidural block [19, 20]. It is optimal for managing postoperative pain to utilize the widely used caudal block technique and in treating both acute and chronic pain, which effectively puts local anesthetics into the caudal region of the body [21-23]. Therefore, current studies have focused on finding novel local anesthetics with prolonged analgesic action and minimum toxicity [24]. According to recent studies, Low-dose caudal analgesia is the optimum option for treating postoperative pain, and the duration of the caudal block's insertion concerning the surgery does not influence how long the analgesia would last [25].

The study's reduced caecal intubation time and overall caecal intubation rate of 96.2% demonstrated the efficiency of caudal anaesthesia in ambulatory colonoscopy. Based on the satisfaction of the post-operative patients and the requirement for rescue analgesia [26], found a similar success rate of 95.9%. According to another study [27], it was stated that at the University College Hospital, separate investigations found that 95% and 99% of caudal space injections of local anaesthetics were successful, as determined by the ensuing adequate analgesia. Given the rising prevalence of day case procedures, it has become more important to create standards for evaluating patients' readiness for returning home [28]. The Post Anaesthetic Discharge Scoring System (PADSS) was used in this investigation. At discharge, every patient in both groups had a score of 9 or higher.

5. Conclusion

Considering the outcomes of this study, it can be concluded that caudal anesthesia is effective and safe during ambulatory colonoscopy. Moreover, the impact of caudal anesthesia is significant on the caecal intubation rate during colonoscopy procedures. However, the onset time of caudal anesthesia accelerates the cecal intubation time in group A. However, as discussed earlier, the caecal intubation rate reduces in group B as the caudal anesthesia onset time increases. Future studies are required to identify the potential impact of anesthesia on CIR.

References

[1] A. Akere and K. Akande, "Cecal intubation rate during colonoscopy at a tertiary hospital in South-West Nigeria: How frequent and what affects completion rate?," *Nigerian Journal of Clinical Practice,* vol. 20, no. 3, pp. 303-306, 2017.

[2] S. J. Winawer, "Colorectal cancer screening," *Best practice & research Clinical gastroenterology,* vol. 21, no. 6, pp. 1031-1048, 2007.

[3] N. Powell *et al.*, "Images of the terminal ileum are more convincing than cecal images for verifying the extent of colonoscopy," *Endoscopy,* vol. 43, no. 03, pp. 196-201, 2011.
[4] R. M. Valori *et al.*, "A new composite measure of colonoscopy: the Performance Indicator of Colonic Intubation (PICI)," *Endoscopy,* vol. 50, no. 01, pp. 40-51, 2018.
[5] L. Trevisani, A. Zelante, and S. Sartori, "Colonoscopy, pain and fears: Is it an indissoluble trinomial?," *World journal of gastrointestinal endoscopy,* vol. 6, no. 6, p. 227, 2014.
[6] R. W. Hall, "Anesthesia and analgesia in the NICU," *Clinics in perinatology,* vol. 39, no. 1, pp. 239-254, 2012.
[7] M. Matyja, A. Pasternak, M. Szura, M. Pędziwiatr, P. Major, and K. Rembiasz, "Cecal intubation rates in different eras of endoscopic technological development," *Videosurgery and Other Miniinvasive Techniques,* vol. 13, no. 1, pp. 67-73, 2018.
[8] A. Schmidt, P. Bauerfeind, C. Gubler, M. Damm, M. Bauder, and K. Caca, "Endoscopic full-thickness resection in the colorectum with a novel over-the-scope device: first experience," *Endoscopy,* vol. 47, no. 08, pp. 719-725, 2015.
[9] B. Dalens, "Regional anesthesia in children," *Anesthesia & Analgesia,* vol. 68, no. 5, pp. 654-672, 1989.
[10] R. Cluff, A.-K. Mehio, S. P. Cohen, Y. Chang, C. N. Sang, and M. P. Stojanovic, "The technical aspects of epidural steroid injections: a national survey," *Anesthesia & Analgesia,* vol. 95, no. 2, pp. 403-408, 2002.
[11] M. Martin-Flores, "Epidural and spinal anesthesia," *Veterinary Clinics: Small Animal Practice,* vol. 49, no. 6, pp. 1095-1108, 2019.
[12] M. T. Alkire and J. Miller, "General anesthesia and the neural correlates of consciousness," *Progress in brain research,* vol. 150, pp. 229-597, 2005.
[13] O. Adejumo, O. Eyelade, T. Adigun, and A. Akere, "Caudal Anaesthesia in Ambulatory Colonoscopy: Lidocaine Only vs. Lidocaine/fentanyl Combination," *J Anesth Clin Res,* vol. 8, p. 764, 2017.
[14] D. K. Rex, "Quality in colonoscopy: cecal intubation first, then what?," vol. 101, ed: LWW, 2006, pp. 732-734.
[15] G. Dafnis, "The introduction and development of colonoscopy within a defined population in Sweden," *Scandinavian journal of gastroenterology,* vol. 35, no. 7, pp. 765-771, 2000.
[16] G. C. Harewood and D. A. Lieberman, "Colonoscopy practice patterns since introduction of medicare coverage for average-risk screening," *Clinical Gastroenterology and Hepatology,* vol. 2, no. 1, pp. 72-77, 2004.
[17] D. K. Rex, D. G. Hewett, M. Raghavendra, and N. Chalasani, "The impact of videorecording on the quality of colonoscopy performance: a pilot study," *Official journal of the American College of Gastroenterology| ACG,* vol. 105, no. 11, pp. 2312-2317, 2010.
[18] D. G. Hewett and D. K. Rex, "Cap-fitted colonoscopy: a randomized, tandem colonoscopy study of adenoma miss rates," *Gastrointestinal endoscopy,* vol. 72, no. 4, pp. 775-781, 2010.
[19] M.-C. Tsai, L.-T. Kao, H.-C. Lin, C.-Z. Lee, and S.-D. Chung, "Chronic prostatitis/chronic pelvic pain syndrome is associated with previous colonoscopy," *Canadian Urological Association Journal,* vol. 11, no. 9, p. E367, 2017.
[20] S.-C. Kao and C.-S. Lin, "Caudal epidural block: an updated review of anatomy and techniques," *BioMed research international,* vol. 2017, 2017.
[21] P. Kendigelen, A. C. Tutuncu, S. Emre, F. Altindas, and G. Kaya, "Pudendal versus caudal block in children undergoing hypospadias surgery: a randomized controlled trial," *Regional Anesthesia & Pain Medicine,* vol. 41, no. 5, pp. 610-615, 2016.
[22] L. Animaw, T. Woldegiorgis Abate, D. Endeshaw, and D. Tsegaye, "Fatigue and associated factors among adult cancer patients receiving cancer treatment at oncology unit in Amhara region, Ethiopia," *Plos one,* vol. 18, no. 1, p. e0279628, 2023.
[23] A. S. Endeshaw *et al.*, "Review of clinical evidence of caudal block for postoperative analgesia in children with ketamine added local anesthetics," *Annals of Medicine and Surgery,* p. 103480, 2022.
[24] K. R. Bagshaw *et al.*, "Pain management via local anesthetics and responsive hydrogels," *Therapeutic delivery,* vol. 6, no. 2, pp. 165-176, 2015.
[25] K. Sivashankar and S. Dass, "Caudal analgesia for postoperative pain relief IN children," *Medical Journal Armed Forces India,* vol. 52, no. 4, pp. 242-244, 1996.
[26] S.-Y. Wong *et al.*, "Caudal epidural block for minor gynecologic procedures in outpatient surgery," *Chang Gung Medical Journal,* vol. 27, no. 2, pp. 116-121, 2004.
[27] C. Adebamowo, J. Ladipo, and O. Ajao, "Randomized comparison of agents for caudal anaesthesia in anal surgery," *Journal of British Surgery,* vol. 83, no. 3, pp. 364-365, 1996.
[28] L. Truong, J. Moran, and P. Blum, "Post anaesthesia care unit discharge: a clinical scoring system versus traditional time-based criteria," *Anaesthesia and intensive care,* vol. 32, no. 1, pp. 33-42, 2004.