

Comparison of Ilioinguinal/Iliohypogastric Block versus Caudal Block for Postoperative Analgesia in Children undergoing Inguinal Hernia Repair**Felitia Maria Silva¹, Vaishnavi Vishwas Kulkarni², Minakshi Chole³, Sachin Totawar⁴**¹Junior Resident, Department of Anaesthesiology, Dr. SCGMC, Nanded²Professor and Head, Department of Anaesthesiology, Dr. SCGMC, Nanded³Assistant professor, Department of Anaesthesiology, Dr. SCGMC, Nanded⁴Associate professor, Department of Anaesthesiology, Dr. SCGMC, Nanded

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Conflict of interest: Nil

Abstract:

Introduction: Inguinal hernia is a common pediatric condition, where Open herniotomy remains the standard procedure due to its safety, efficacy, and minimal recurrence risk. Effective pain management is crucial for recovery, parental satisfaction, and surgical outcomes. Postoperative analgesia is typically provided through intravenous opioids or regional techniques like caudal or ilioinguinal/iliohypogastric nerve blocks. However, opioids in children may lead to side effects such as nausea, vomiting, itching, drowsiness, and respiratory depression. Peripheral nerve blocks using local anaesthetics are an effective option for both surgical anaesthesia and pain control in inguinal hernia procedures. The primary objective of this study is to compare the postoperative analgesic efficacy of the Ilioinguinal/Iliohypogastric nerve block and the caudal block in children undergoing unilateral inguinal hernia repair.

Methods: The present quasi experimental was conducted in the tertiary care hospital amongst 70 paediatric male patients with ASA grade 1 and 2, between age 1 year to 8 years undergoing unilateral inguinal herniotomy during Feb.2023 to July 2024. Selected samples were equally divided into Ilioinguinal/Iliohypogastric nerve block Group (35) and Caudal block Group (35). Duration of analgesia was monitored in both ilioinguinal/iliohypogastric nerve block and caudal block patients. After giving General anaesthesia, patient was either given Ilioinguinal/Iliohypogastric nerve block or Caudal block depending on the study group.

Results: The mean duration of analgesia was longer in the Caudal Block group (8 ± 1.75 hours) compared to the Ilioinguinal/Iliohypogastric Block group (6 ± 2.25 hours), however the difference was not statistically significant. Ilioinguinal/Iliohypogastric Block group generally had higher pain scores than the Caudal Block group at 2, 4, and 6 hours postoperatively, with significant p-values. At 8 and 10 hours, the Caudal group had slightly higher scores, though the differences remained statistically significant. These findings suggest that the Caudal Block was more effective in managing postoperative pain during the early postoperative period. The requirement for rescue analgesia by each study participant within 24 hours postoperatively was slightly higher in the Ilioinguinal/Iliohypogastric Block group compared to the Caudal Block group. In the Ilioinguinal/Iliohypogastric Block group, 5 rescue analgesia given to each participant out of 35 participants and while in the Caudal Block group, 4 rescue analgesia given to each participant within first 24 hours. This, suggests that the Caudal Block may have provided slightly better or more sustained postoperative analgesia.

Conclusion: Overall, the study concludes that while both the Ilioinguinal/Iliohypogastric Block and Caudal Block are effective and safe regional anesthesia techniques in pediatric surgery, the Caudal Block offers more postoperative analgesia.

Keywords: Caudal Block, Ilioinguinal Block, Iliohypogastric Block, Rescue Analgesia, Inguinal Hernia, Herniotomy.

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Introduction

Inguinal hernia is a common pediatric condition, occurring in approximately 2% of infant males [1]. It is also very difficult to differentiate restlessness or crying due to pain from that of hunger or fear in children. Inadequate treatment of post-operative pain in children and newborns cause impairments in pulmonary, cardiovascular, neuroendocrinal,

gastrointestinal, immunological, and metabolic function [2]. Open herniotomy remains the standard procedure due to its safety, efficacy, and minimal recurrence risk. Effective pain management is crucial for recovery, parental satisfaction, and surgical outcomes. Postoperative analgesia is typically provided through intravenous opioids or

regional techniques like caudal or ilioinguinal/iliohypogastric nerve blocks. However, opioids in children may lead to side effects such as nausea, vomiting, itching, drowsiness, and respiratory depression [3]. Effective analgesia is essential not only for enhancing comfort but also for minimizing stress responses and potential complications associated with inadequate pain control in children [4].

Peripheral nerve blocks using local anaesthetics are an effective option for both surgical anaesthesia and pain control in inguinal hernia procedures providing effective pain relief while reducing reliance on systemic opioids, thereby decreasing the risk of opioid-related side effects such as respiratory depression, nausea, and sedation [5,6]. Caudal anaesthesia and ilioinguinal/iliohypogastric nerve blocks are two prominent regional anaesthesia techniques employed to manage perioperative pain in pediatric patients undergoing inguinal hernia repair. [7] Both caudal anaesthesia and II/IH blocks have demonstrated efficacy in providing analgesia for pediatric inguinal hernia surgeries. The choice between these techniques depends on various factors, including the patient's anatomy, the anaesthesiologist's expertise, and the specific surgical context.

The primary objective of this study is to compare the postoperative analgesic efficacy of the II/IH nerve block and the caudal block in children undergoing unilateral inguinal hernia repair. Effective analgesia is defined as a pain-free period following surgery, measured using the FLACC pain score, with a score of 4 or more indicating the need for rescue analgesia.

Material and Methods

The present quasi experimental was conducted in the tertiary care hospital amongst paediatric male patients with ASA grade 1 and 2, between age 1 year to 8 years undergoing unilateral inguinal herniotomy during Feb.2023 to July 2024. Sample size was determined by purposive sampling based on previous studies. Selected samples were equally divided into Ilioinguinal/Iliohypogastric nerve block Group (35) and Caudal block Group (35) and studied with consideration of inclusion and Exclusion criteria.

Inclusion Criteria: male patients aged from 1 yr to 8 yrs, ASA grade 1 or 2 patients, undergoing unilateral inguinal herniotomy and parents accepting the procedure by written consent.

Exclusion Criteria: Bilateral inguinal hernia, known allergy to drug used in the study, Pre-existing coagulopathy, Emergency surgery, Patient who are unfit for surgery for any reason, Parent refusal, Congenital anomaly of spine, Infection at the site of puncture.

Pre anaesthetic evaluation: Patients were included in the study after thorough pre-anaesthetic evaluation including history of underlying medical illness, previous history of surgery, anaesthetic exposure and hospitalization were taken. Vital signs- Heart rate, respiratory rate, oxygen saturation, blood pressure, temperature. Height and weight. Examination of cardiovascular system, respiratory system, central nervous system and examination of spine and airway assessment-by Mallampati grading.

Thorough Pre anaesthetic evaluation was done. Before taking the patient into operation theatre, Baseline parameters like Heart rate, oxygen saturation and blood pressure were monitored. If there was no IV access, IV line was secured under the effect of sevoflurane (2%). If there was IV-line, premedication and induction was given. Premedication was given with inj. Glyco-pyrolate 0.004 mg/kg, Inj.midazolam 0.02 mg/kg, Inj fentanyl 2mcg/kg. Patients were induced with inj. propofol 2 mg/kg and scoline 2mg/kg. Then the patient was intubated with an appropriate size Endotracheal Tube and muscle relaxant Inj. Atracurium 0.5 mg/kg or inj. Vecuronium 0.1 mg/kg was given. Anaesthesia was maintained with spontaneous or assisted controlled ventilation with 50% O₂, 50% N₂O and with 1-2% sevoflurane. preoperative judicious fluid management was done according to holiday segar formula using dextrose containing lactose ringer solution. Intraoperative monitoring includes 3 lead ECG, ETCO₂, oxygen saturation, non-invasive blood pressure. Caudal block or hernia block was given prior to surgery following induction of anaesthesia.

Caudal block: After giving General anaesthesia, under all aseptic precautions caudal block was given 0.75 ml/kg of 0.25% concentration of bupivacaine.

Anatomical landmark guided ilioinguinal-iliohypogastric nerve block: Ilioinguinal and iliohypogastric nerve arise from the first lumbar spinal nerve root (L1, hernia block is given according to the landmarks explained by van Bahr & Sethna & besde, using a double pop technique which consist of drawing a line from ASIS to umbilicus which subsequently divide into 4 equal parts. The site of puncture is at the junction of lateral 1/4th and the medial 3/4th. With the patient in supine position, after part scrubbing, painting and draping, 23G short beveled needle(preferably blunt needle to appreciate loss of resistance) was inserted perpendicular to the skin at the above described point and slowly advanced deep to external oblique muscle (1st pop) and internal oblique muscle (2nd pop). Drug was then injected above transverse abdominis muscle where the nerves and their branches run. After negative aspiration of blood, 0.3ml/kg of 0.25% concentration of bupivacaine was given.

Intraoperative monitoring of hemodynamic parameters was done every 15 minutes till the end of surgery. After performing the block, sevoflurane was discontinued, neuromuscular blockade was reversed with inj. neostigmine (0.05mg/kg) and inj. Glycopyrrolate (0.008 mg/kg) and the child was extubated after return of adequate muscle power & airway reflex.

Postoperative period: After surgery child was shifted to the post anaesthesia case unit for continuous monitoring of vital signs and assessment of pain. Patients were monitored every 15 minutes in postop till the patient is shifted to ward. Duration of analgesia (=time interval from block given to requirement of first rescue analgesia) was monitored in both ilioinguinal/iliohypogastric nerve block and caudal block patients. In the ward, the requirement

of number of rescue analgesics for first 24 hrs every 2 hourly was monitored. Any complications like nausea, vomiting, urinary retention and hematoma were also monitored. All parameters recorded, analysed statistically and results concluded. Duration of postoperative analgesia and pain free period measured. Pain free period is the time interval between completion of surgery and first dose of rescue analgesia given. Assessment of post operative analgesia was done by using FLACC score. Each of the five categories listed in the table has a scoring category given to it, such as zero, one, or two points. The total number of points awarded can range from 0 to 10. FLACC score more than or equal to 4 was given rescue analgesia with injection paracetamol 15mg/kg IV.

Results

Table 1: Duration of Analgesia (Hours) Among the Study Populations.

Parameter	Ilioinguinal/Ilio- Hypogastric Block (N=35)	Caudal Block (N=35)	P Value
Mean $\pm$ SD	6 $\pm$ 2.25	8 $\pm$ 1.75	0.120

p value = 0.120, Statistical Non-Significant.

Table 01 presents the comparison of the duration of analgesia (in hours) between the Ilioinguinal/Iliohypogastric Block and Caudal Block groups, each consisting of 35 participants.

The mean duration of analgesia was 6 $\pm$ 2.25 hours in the Ilioinguinal/Iliohypogastric group and 8 $\pm$ 1.75 hours in the Caudal group, indicating a longer analgesic effect in the Caudal Block group. However, the p-value of 0.120 shows that this difference was not statistically significant.

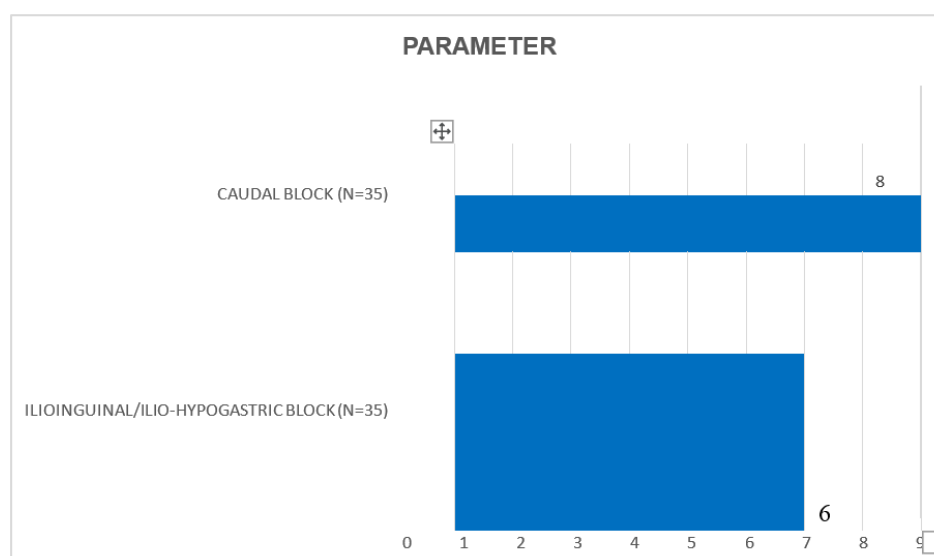


Chart 1: Duration of Analgesia (Hours) among the Study Populations

Table 2: Distribution of the Study Participants according to the FLACC Score. (Noted Time-Immediately after Shifting in Recovery Room)

Sr. No.	FLACC Score	Ilioinguinal/Ilio- Hypogastric Block (N=35) Mean $\pm$ SD	Caudal Block (N=35) Mean $\pm$ SD	P Value
1	2 HR	1.25 $\pm$ 1.50	0.83 $\pm$ 0.75	0.001
2	4 HR	2.62 $\pm$ 1.25	1.98 $\pm$ 0.60	0.001
3	6 HR	*4.05 $\pm$ 1.0	2.68 $\pm$ 0.40	0.021
4	8 HR	3.8 $\pm$ 0.75	*4.1 $\pm$ 0.30	0.031
5	10 HR	3.6 $\pm$ 0.50	3.8 $\pm$ 0.25	0.001

p value < 0.05, Statistically Significant.

Table 02 compares the FLACC (Face, Legs, Activity, Cry, Consolability) pain scores at various postoperative time intervals between the Ilioinguinal/Iliohypogastric Block and Caudal Block groups. FLACC score value became more than 4 after 6 hours in ilioinguinal/iliohypogastric nerve block (4.05 ± 1.0) and after 8 hours in caudal block group (4.1 ± 0.30). FLACC score more than or equal to 4 was given rescue analgesia with 15mg/kg paracetamol IV. At 2 hours, the mean FLACC score was higher in the Ilioinguinal/Iliohypogastric group (1.25 ± 1.50) than in the Caudal group (0.83 ± 0.75), with a significant p-value of 0.001. Similarly, at 4 and 6 hours, pain

scores remained significantly higher in the Ilioinguinal/Iliohypogastric group (2.62 ± 1.25 and 4.05 ± 1.0) compared to the Caudal group (1.98 ± 0.60 and 2.68 ± 0.40), with p-values of 0.001 and 0.021, respectively. At 8 hours, the trend reversed slightly, with a slightly higher mean score in the Caudal group (4.1 ± 0.30) versus the Ilioinguinal/Iliohypogastric group (3.8 ± 0.75), which was still statistically significant ($p = 0.031$). By 10 hours, the Caudal group continued to show a higher pain score (3.8 ± 0.25) than the Ilioinguinal/Iliohypogastric group (3.6 ± 0.50), again with a significant p-value of 0.001, indicating notable differences in postoperative pain perception over time between the two groups.

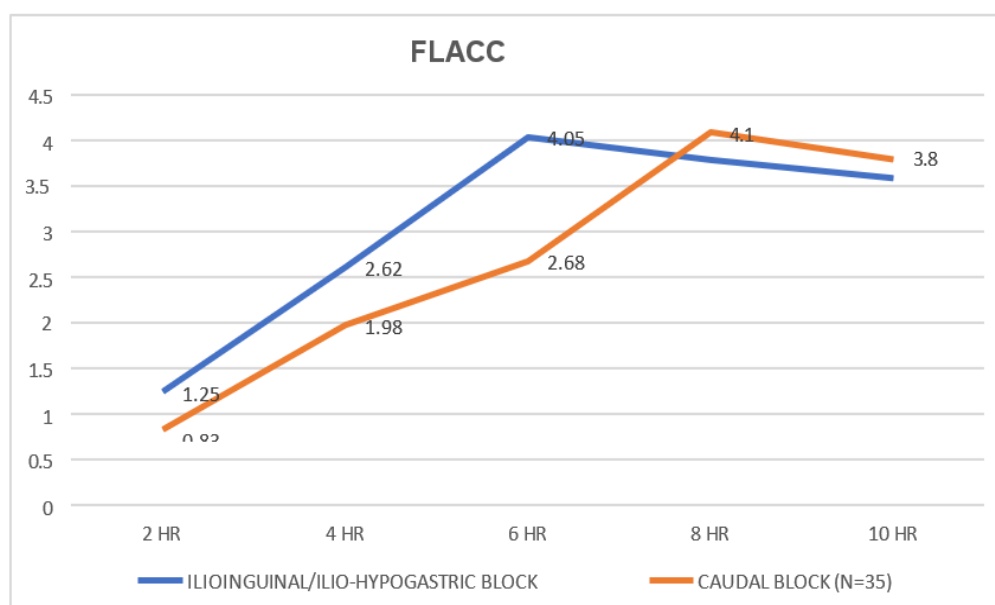


Chart 02: Distribution of the Study Participants According to the FLACC Score. (Noted Time-Immediately after Shifting in Recovery Room)

Table 03: Distribution of the Study Participants According to the Heart Rate. (Unpair-T Test)

Sr No	Heart Rate	Ilioinguinal/Ilio- Hypogastric Block (N=35) Mean $\pm$ SD	Caudal Block (N=35) Mean $\pm$ SD	P Value
Baseline HR		105.5 $\pm$ 5.0	101.5 $\pm$ 7.5	0.431
After Induction				
1	At 0 Min	102.75 $\pm$ 6.5	100.0 $\pm$ 4.5	0.118
2	At 15 Min	102.50 $\pm$ 7.5	100.0 $\pm$ 5.0	0.291
3	At 30 Min	101.5 $\pm$ 5.0	99.50 $\pm$ 4.0	0.987
4	At 1 HR	100.50 $\pm$ 2.5	98.0 $\pm$ 2.5	0.878
5	At 2 HR	98.0 $\pm$ 2.0	96.0 $\pm$ 4.5	0.132
6	At 4 HR	99.0 $\pm$ 2.5	96.7 $\pm$ 4.0	0.098
7	At 6 HR	108.5 $\pm$ 1.75	104.50 $\pm$ 2.50	0.700
8	At 8 HR	104.5 $\pm$ 5.0	110.50 $\pm$ 3.50	0.410

Table 03 outlines the comparison of heart rate trends between the Ilioinguinal/Iliohypogastric Block and Caudal Block groups at various time intervals, using the unpaired t-test. The baseline heart rate was slightly higher in the Ilioinguinal/Iliohypogastric group (105.5 ± 5.0 bpm) compared to the Caudal

group (101.5 ± 7.5 bpm), but the difference was not statistically significant ($p = 0.431$). Following induction, heart rates remained relatively similar between groups at 0, 15, 30 minutes, and 1, 2, and 4 hours postoperatively, with all p-values above 0.05, indicating no significant difference. At 6 hours, the

Ilioinguinal/Iliohypogastric group showed a slightly higher heart rate (108.5 ± 1.75 bpm) than the Caudal group (104.5 ± 2.5 bpm), and at 8 hours, the Caudal group exhibited a higher mean (110.5 ± 3.5 bpm vs.

104.5 ± 5.0 bpm), though neither difference was statistically significant. Overall, heart rate remained comparable between the two groups throughout the observation period.

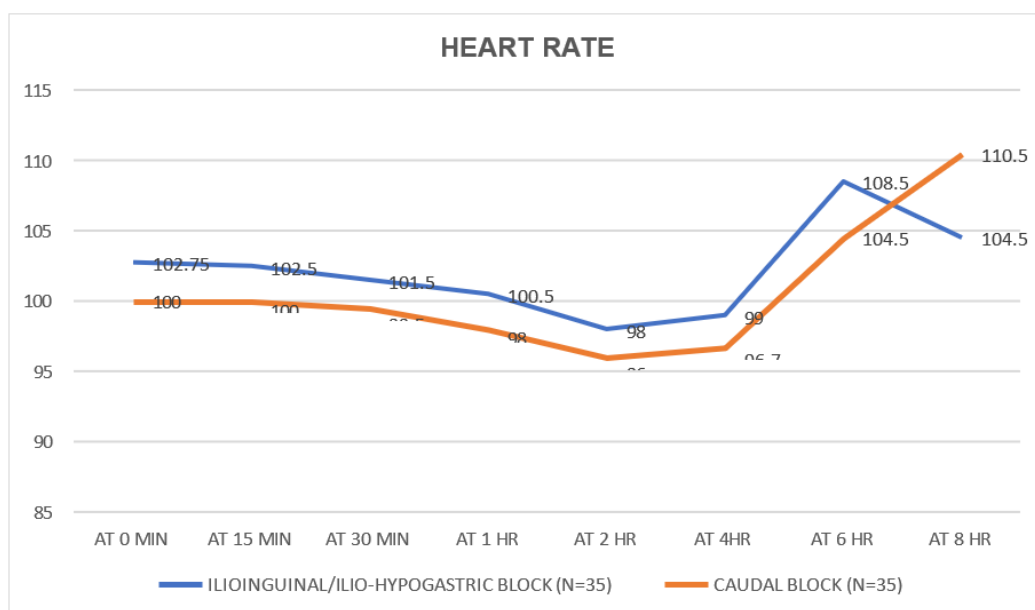


Chart 03: Distribution of the Study Participants according to the Heart Rate. (Unpair-T Test)

Table 4: Distribution of the Study Participants According to Number of the Rescue Analgesia.

Time	Ilioinguinal/Ilio- Hypogastric Block (N=35)	Caudal Block (N=35)	P Value
Within 24 Hrs	5	4	0.01

p value = 0.01, Statistically Significant.

Table 4 shows the number of rescue analgesia given to each study participant within 24 hours postoperatively. In the Ilioinguinal/Iliohypogastric Block group, 5 rescue analgesia given to each participant out of 35 participants and while in the Caudal Block group, 4 rescue analgesia given to

each participant within first 24 hours. Although the difference in numbers is small, the p-value of 0.01 indicates a statistically significant difference between the two groups, suggesting that participants in the Caudal Block group may have experienced slightly better analgesic effectiveness within the first 24 hours.

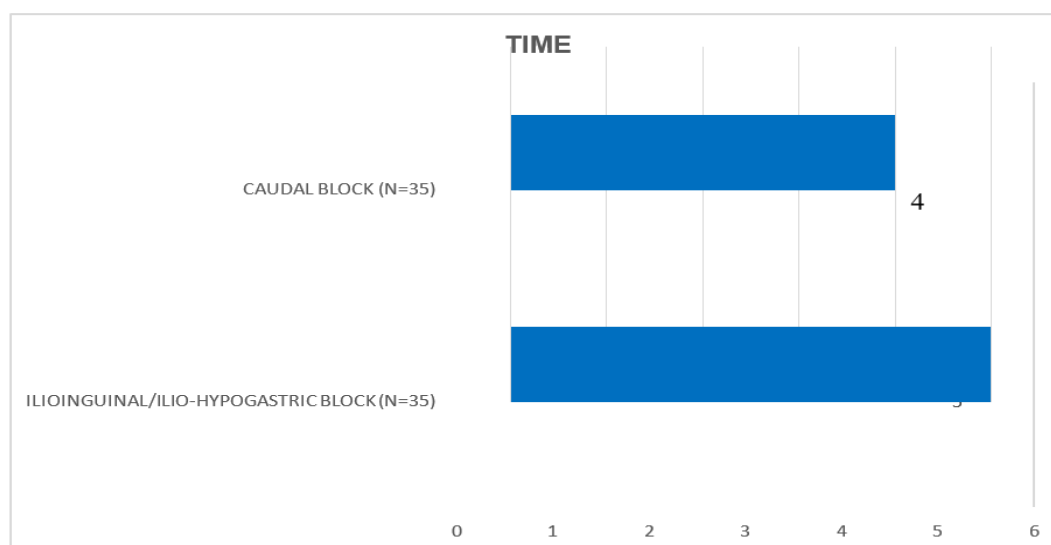


Chart 4: Distribution of the Study Participants according to Number of the Rescue Analgesia.

Table 5: Distribution of the Study Participants according to the Postoperative Complications.

Sr. No.	Complications	Ilioinguinal/Ilio-Hypogastric Block (N=35)	Caudal Block (N=35)	P Value
1	Incidence of nausea/vomiting Within 24 hours	06	03	0.001
2	Incidence of urinary retention within 24 hours	00	01	0.441
3	Hematoma	00	01	0.01

Table 5 outlines the distribution of postoperative complications among participants in the Ilioinguinal/Iliohypogastric Block and Caudal Block groups. Nausea and vomiting within 24 hours were reported in 6 participants from the Ilioinguinal/Iliohypogastric group compared to 3 in the Caudal group, with a statistically significant p-value of 0.001, indicating a higher incidence in the former. Urinary retention occurred in 1 patient from the Caudal group and none from the Ilioinguinal/Iliohypogastric group, but this difference was not statistically significant ($p = 0.441$). Additionally, one case of hematoma was noted in the Caudal group, while none occurred in the Ilioinguinal/Iliohypogastric group, with a significant p-value of 0.01. These findings suggest a slightly higher occurrence of some minor complications in the Caudal group, though only nausea/vomiting showed a significant difference favoring the Caudal technique.

Discussion

Demographic profile and duration of surgery: In the present study, the age, weight, and duration of surgery were compared between the ilioinguinal/iliohypogastric block group and the caudal block group, each comprising 35 patients. The mean age was slightly lower in the ilioinguinal/iliohypogastric block group (4.75 ± 1.75 years) compared to the caudal block group (5.75 ± 2.75 years), but the difference was not statistically significant ($p = 0.450$). Similarly, the mean weight was 14.80 ± 4.75 kg in the ilioinguinal/iliohypogastric group and 16.25 ± 3.75 kg in the caudal group ($p = 0.565$), again showing no significant difference. The duration of surgery was comparable between both groups, with a mean of 45.50 ± 15.50 minutes in the ilioinguinal/iliohypogastric group and 42.50 ± 12.75 minutes in the caudal block group ($p = 0.350$). These results suggest that the study groups were demographically and surgically well-matched.

A previous study by Urvi Desai et al. (2022) examined demographic characteristics in two groups: Group C ($n=45$) and Group H ($n=55$). The mean age was 3.28 ± 2.06 years for Group C and 3.88 ± 1.77 years for Group H, with a p-value of 0.119, indicating no statistically significant difference. The weight for Group C was 11.93 ± 4.01 kg and for Group H was 13.39 ± 4.07 kg, with a p-value of 0.075. The duration of surgery was

44.00 ± 11.56 minutes for Group C and 46.18 ± 30.18 minutes for Group H, showing no significant difference with a p-value of 0.648. In this study, a p-value less than 0.05 was considered statistically significant. [8]

In the present study, the ASA (American Society of Anesthesiologists) physical status distribution was assessed among 35 patients in each group. In the ilioinguinal/iliohypogastric block group, 31 patients were classified as ASA Grade I and 4 as ASA Grade II, while in the caudal block group, 30 were ASA I and 5 were ASA II. The difference between the two groups was not statistically significant, with a p-value of 0.213, indicating comparable baseline health status among the participants in both groups.

A previous study conducted by Yusuf Yimer et al. (2020) at Minilik II Hospital also examined the ASA physical status distribution in pediatric inguinal surgeries, comparing a Caudal Block (CB) group ($n=35$) and an Ilioinguinal/Ilio-hypogastric (IL/IH) group ($n=35$). For ASA Grade I, the CB group had 29 (41.4%) participants, while the IL/IH group had 28 (40.0%) participants. For ASA Grade II, the CB group included 6 (8.6%) participants, and the IL/IH group had 7 (10%). The study reported a p-value of 0.75, indicating no statistically significant difference in ASA distribution between the two groups. [9] Both the present study and the study by Yusuf Yimer et al. demonstrated no statistically significant difference in ASA grade distribution between the caudal and ilioinguinal/iliohypogastric block groups.

Flacc Score: In the present study, pain levels were assessed using the FLACC score at various intervals postoperatively. FLACC score value became more than 4 after 6 hours in ilioinguinal/iliohypogastric nerve block (4.05 ± 1.0) and after 8 hours in caudal block group (4.1 ± 0.30). FLACC score more than or equal to 4 was given rescue analgesia with 15mg/kg paracetamol IV. At 2, 4, and 6 hours, the ilioinguinal/iliohypogastric block group showed significantly higher FLACC scores compared to the caudal block group ($p = 0.001$, 0.001, and 0.021, respectively), indicating more pain. However, at 8 and 10 hours, the trend reversed, with the caudal block group showing slightly higher FLACC scores ($p = 0.031$ and 0.001). These findings suggest that the caudal block provided superior early postoperative analgesia, while the

ilioinguinal/iliohypogastric block offered better pain control during the later hours.

King S et al. (2012) also assessed FLACC scores in their study, comparing Group C (Caudal) and Group H (Ilioinguinal/Ilio-hypogastric). Unlike the present study, their findings indicated no statistically significant differences in FLACC scores between the two groups at any measured time point. At 0 minutes, Group C had a mean FLACC score of 1.13 ± 2.05 and Group H had 1.25 ± 1.85 , with a p-value of 0.757. This lack of significance continued at 15 minutes (1.18 ± 1.92 for Group C, 1.49 ± 2.10 for Group H, $p=0.443$) and 30 minutes (1.18 ± 1.95 for Group C, 1.40 ± 2.51 for Group H, $p=0.628$). Similarly, at 1 hour (0.98 ± 1.92 vs. 0.91 ± 1.88 , $p=0.858$), 2 hours (0.91 ± 1.93 vs. 0.45 ± 1.15 , $p=0.146$), 3 hours (0.42 ± 0.97 vs. 0.38 ± 1.16 , $p=0.853$), and 4 hours (0.44 ± 1.01 vs. 0.31 ± 0.96 , $p=0.495$), all p-values were greater than 0.05, suggesting no statistically significant difference in pain levels between the two block types. [10] While the present study demonstrated significant time-dependent differences in FLACC scores between the two groups, particularly favoring caudal blocks in the early hours and ilioinguinal/iliohypogastric blocks in the later period, the previous study by King S et al. found no such variations.

Heart rate: In the present study, heart rate variations were monitored at multiple intervals to assess hemodynamic stability between the ilioinguinal/iliohypogastric block and caudal block groups, each consisting of 35 participants. At baseline, the mean heart rate was slightly higher in the ilioinguinal/iliohypogastric group (105.5 ± 5.0 bpm) compared to the caudal group (101.5 ± 7.5 bpm), but the difference was not statistically significant ($p = 0.431$). Throughout the postoperative period, including up to 8 hours, there were minor fluctuations in heart rate between the two groups, but none reached statistical significance, with p-values consistently above 0.05. This indicates that both block techniques maintained comparable and stable heart rate profiles across the perioperative period.

Seyedhejazi M et al. (2008) also examined heart rate in their study, comparing a Caudal Block (Group C) and an Ilioinguinal/Ilio-hypogastric (Group H) group. At 0 minutes, Group C had a mean heart rate of 102.31 ± 20.17 beats/min, and Group H had 98.20 ± 14.84 beats/min, with a p-value of 0.244, indicating no significant difference. This pattern of no significant difference continued for the earlier time points: 15 minutes (100.56 ± 21.37 vs. 95.04 ± 14.84 , $p=0.132$), 30 minutes (97.31 ± 20.55 vs. 96.44 ± 18.31 , $p=0.823$), and 1 hour (96.60 ± 19.54 vs. 90.98 ± 13.70 , $p=0.095$). However, statistically significant differences emerged at later time points. At 2 hours, the heart rates were 92.16 ± 15.16 for Group C and 88.25 ± 10.50 for Group H ($p=0.133$),

which was not significant. But, at 3 hours, Group C had 91.67 ± 13.33 and Group H had 86.20 ± 9.67 , with a significant p-value of 0.020. This significance was also observed at 4 hours, with Group C at 91.73 ± 12.83 and Group H at 86.47 ± 9.31 ($p=0.020$). The study considered a p-value <0.05 as statistically significant. [11]

While the present study found no statistically significant differences in heart rate at any time point between the two groups, the study by Seyed Hejazi et al. observed significant differences emerging at later time intervals, favoring more stable heart rates in the ilioinguinal/iliohypogastric group. The discrepancy may be due to differences in sample size, methodology, or duration and timing of monitoring. Overall, both studies confirm early postoperative hemodynamic stability with either technique, but the previous study suggests a potential divergence in heart rate response over time, which was not evident in the current study.

Systolic and diastolic blood pressure: Systolic blood pressure remained stable across all time points in both groups, with no statistically significant differences observed (all p-values >0.05), indicating comparable hemodynamic responses. However, diastolic blood pressure showed a significant difference at later time points. While both groups had similar DBP at baseline and during the early postoperative period, statistically significant differences emerged at 6 and 8 hours postoperatively, with higher DBP in the caudal block group ($p = 0.01$ and $p = 0.001$, respectively). These findings suggest that while systolic stability was maintained, diastolic pressure responses varied slightly between the two block techniques during the late postoperative period.

Seyedhejazi M et al. (2008) also examined heart rate in their study, comparing a Caudal Block (Group C) and an Ilioinguinal/Ilio-hypogastric (Group H) group. At 0 minutes, Group C had a mean heart rate of 102.31 ± 20.17 beats/min, and Group H had 98.20 ± 14.84 beats/min, with a p-value of 0.244, indicating no significant difference. This pattern of no significant difference continued for the earlier time points: 15 minutes (100.56 ± 21.37 versus 95.04 ± 14.84 , $p=0.132$), 30 minutes (97.31 ± 20.55 versus 96.44 ± 18.31 , $p=0.823$), and 1 hour (96.60 ± 19.54 versus 90.98 ± 13.70 , $p=0.095$). However, statistically significant differences emerged at later time points. At 2 hours, the heart rates were 92.16 ± 15.16 for Group C and 88.25 ± 10.50 for Group H ($p=0.133$), which was not significant. But, at 3 hours, Group C had 91.67 ± 13.33 and Group H had 86.20 ± 9.67 , with a significant p-value of 0.020. This significance was also observed at 4 hours, with Group C at 91.73 ± 12.83 and Group H at 86.47 ± 9.31 ($p=0.020$). The study considered a p-value <0.05 as statistically significant. [11]

Both the present and previous studies highlight a shared pattern—early postoperative hemodynamic parameters (whether heart rate or blood pressure) remain stable and similar between caudal and ilioinguinal/iliohypogastric blocks, while differences tend to emerge later.

Rescue analgesia: In the present study, the need for rescue analgesia within 24 hours postoperatively was compared between the ilioinguinal/iliohypogastric block group and the caudal block group, each consisting of 35 participants. In the Ilioinguinal/Iliohypogastric Block group, 5 rescue analgesia given to each participant out of 35 participants and while in the Caudal Block group, 4 rescue analgesia given to each participant within first 24 hours. Although the absolute difference in numbers was minimal, the p-value was reported as 0.01, indicating a statistically significant difference. This suggests a slight advantage of the caudal block in reducing the need for additional postoperative pain relief.

Silvani P et al. (2006) investigated the requirement for rescue analgesia in their study, comparing a Caudal Block (Group C) and an Ilioinguinal/Iliohypogastric (Group H) group. At 0 minutes, no participants in either group required rescue analgesia. At 15 minutes, 2 (4.4%) participants in Group C and 1 (1.8%) in Group H needed rescue analgesia, with no statistically significant difference ($p=0.444$). This trend of no significant difference continued throughout the entire observation period. Specifically, at 30 minutes, 5 (11.1%) in Group C and 6 (7.3%) in Group H required rescue analgesia ($p=0.445$). At 1 hour, 1 (2.2%) in Group C and 3 (5.5%) in Group H needed it ($p=0.412$). By 2 hours, 1 (2.2%) in Group C and 1 (1.8%) in Group H required rescue analgesia ($p=0.886$). At 3 hours, no participants in Group C but 2 (3.6%) in Group H needed rescue analgesia ($p=0.196$). Finally, at 4 hours, no participants in Group C and 1 (1.8%) in Group H required rescue analgesia ($p=0.363$). In this study, a p-value <0.05 was considered statistically significant. [12]

While the present study found a statistically significant difference in rescue analgesia needs, favoring the caudal block, the earlier study by Silvani et al. found no such difference. This discrepancy may be attributed to differences in observation duration, sample size, analgesic protocols, or statistical power. The current findings suggest a potential analgesic benefit with caudal block in the first 24 hours, whereas previous evidence supports equivalence between the two techniques. Further studies with larger populations and standardized protocols would help clarify this difference in analgesic efficacy.

Complications: In the present study, postoperative complications were assessed in two groups—

ilioinguinal/iliohypogastric block and caudal block, each with 35 participants. The incidence of nausea and vomiting within 24 hours was higher in the ilioinguinal/iliohypogastric block group (6 patients) compared to the caudal block group (3 patients), and this difference was statistically significant ($p = 0.001$). Urinary retention was reported in one patient in the caudal block group and none in the ilioinguinal group, though this difference was not statistically significant ($p = 0.441$). Additionally, a hematoma was noted in one patient from the caudal block group, with no cases in the ilioinguinal group ($p = 0.01$). These findings suggest a slightly higher complication rate associated with the caudal block, particularly for urinary retention and hematoma, although nausea/vomiting was more prominent in the ilioinguinal group.

Amar Parkash Kataria et al. (2020) reported on postoperative complications in their study. They noted that one patient in Group A (the specific block type for Group A is not detailed in the provided text) experienced retching and vomiting in the postoperative period. For all other patients in their study, both the intraoperative and postoperative periods were uneventful without any other side effects or complications. [13]

Compared to the previous study, the present study reported a higher and more detailed incidence of postoperative complications. While Kataria et al. observed a single case of vomiting and otherwise uneventful recoveries, the present study detected multiple instances of nausea/vomiting, a case of urinary retention, and one hematoma—especially in the caudal group. These differences may reflect variations in sample size, monitoring protocols, or reporting criteria. Nevertheless, both studies affirm that complications following these regional blocks are generally infrequent and minor, supporting the safety of both techniques for pediatric anesthesia.

Conclusion

Overall, the study concludes that while both the Ilioinguinal/Iliohypogastric Block and Caudal Block are effective and safe regional anesthesia techniques in pediatric surgery, the Caudal Block offers more postoperative analgesia. Further, large-scale studies may help solidify these findings and guide optimal regional anesthesia strategies in pediatric populations.

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