

Original Research Paper

**A COMPARATIVE STUDY TO EVALUATE PRE-INCISION
ULTRASOUNDGUIDED ILIOINGUINAL ILIOHYPOGASTRIC NERVE
BLOCK VERSUS PRE- INCISION INCISIONAL SITE INFILTRATION
FOR POST-OPERATIVE ANALGESIA IN CHILDREN UNDERGOING
UNILATERAL INGUINAL HERNIA REPAIR UNDER GENERAL
ANAESTHESIA**

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ABSTRACT:

Pain management is an important aspect of perioperative paediatric anaesthesia care and is also a significant contributor to patient/parent satisfaction. Paediatric regional anaesthesia delivers improved analgesia as equated to diverse systemic analgesic treatment both intra- operatively and postoperatively. Ropivacaine is a potent anaesthetic. This study was planned to compare the efficacy of ultrasound-guided ilioinguinal iliohypogastric nerve block and pre- incisional site infiltration for post-operative analgesia in children undergoing unilateral inguinal hernia repair under general anaesthesia.

Methodology: This is a prospective experimental randomized controlled study. All patients posted for elective unilateral hernia repair was included based on following inclusion criteria like age between 2 to 7 years. Group B: Pre incisional USG guided ilioinguinal iliohypogastriac nerve block group with 30 participants. Group I: Pre incisional incision site infiltration group with 30 participants. **Discussion:** The current study reiterates the significance and superiority of using USG guided ilioinguinal iliohypogastric nerve block with ropivacaine in providing better post-operative analgesia, reducing the need for additional analgesia and without any complications in comparison to infiltration anaesthesia for inguinal surgery in children. The finding of this study also as certains the potential of using USG guidance for other nerve blocks in paediatric regional anaesthesia. **Conclusion:** we conclude that Ultrasound guided ilioinguinal iliohypogastric nerve block with 0.2% ropivacaine is a better alternative to incisional site infiltration anaesthesia as it provides a better quality post-operative analgesia for longer duration thereby reducing the need for additional analgesia and without any significant hemodynamic alterations and complications for elective unilateral hernia repair among children aged 2 to 7 years.

Key words: Ultrasound guided ilioinguinal iliohypogastric nerve block, incisional site infiltration, 0.2% Ropivacaine, post-operative analgesia, FLACC pain score.

INTRODUCTION:

Pain management is an important aspect of perioperative paediatric anaesthesia care and is also a significant contributor to patient/parent satisfaction. Paediatric regional anaesthesia delivers improved analgesia as equated to diverse systemic analgesic treatment both intra- operatively and postoperatively. In order to provide optimal perioperative pain relief for children,

local anaesthetic should be a part of the initial pain management plan which is accomplished by choosing a regional anaesthetic technique such as neuraxial blockade, peripheral nerve blockade or local infiltration of the wound along with general anaesthesia or sedation. Ultrasound guidance is presently set forth as the method of selection for peripheral nerve blocks. It provides a better safety and are associated with lower incidence of

adverse effects compared to neuraxial blocks. Inguinal hernia repair is a commonly operated day care method in children and is associated with significant extent of post-operative pain as well as discomfort. Ropivacaine is a potent anaesthetic which can provide high-quality postoperative analgesia and provides an added advantage of a good safety profile without any cardiovascular side effects as associated with bupivacaine making it an excellent alternative for regional anesthesia especially in children. This study was planned to compare the efficacy of ultrasound-guided ilioinguinal iliohypogastric nerve block and pre- incisional site infiltration for post-operative analgesia in children undergoing unilateral inguinal hernia repair under general anaesthesia.

METHODOLOGY:

This is a prospective experimental randomized controlled study. All patients posted for elective unilateral hernia repair was included based on following inclusion criteria like age between 2 to 7 years, ASA Grade I and II children posted for elective unilateral inguinal hernia repair and following exclusion criteria like ASA Grade III and IV children posted for bilateral inguinal hernia repair, history of allergy to local anaesthetics, history of coagulopathies, children on chronic analgesic therapy, parent or guardian refusal to participate in the study. Paediatric patients were recruited and enrolled into the study after being screened using exclusion criteria using computerized random number generator and all 60 patients were randomly assigned into either of the following two groups. Informed parental consent was obtained for all the patients. The children were kept nil per oral for 6 hours for solid food and 2 hours for clear fluid. All of the obtaining written consent and ethical committee

clearance patients were randomized into 2 groups. Group B: Pre incisional USG guided ilioinguinal iliohypogastric nerve block group with 30 participants. Group I: Pre incisional incision site infiltration group with 30 participants. After children were given premedication followed by general anaesthesia, according to the group assigned to the patient, either regional anaesthesia in the form of USG guided ilioinguinal iliohypogastric nerve block on incisional site infiltration was administered on the side of surgery. Among the subjects in Group I, incisional site infiltration was administered using 1 mg per kg of 0.2% Ropivacaine after aseptic preparation of the incision site. Variables / outcomes included in this study were hemodynamic variables namely heart rate HR, systolic and diastolic blood pressure (SBP, DBP), mean arterial pressure (MAP) in the intraoperative period for every 5 minutes from the baseline till the end of surgery and duration of surgery was noted for all patients. After the end of surgery reversal was given then extubation was done after resumption of spontaneous respiration thorough suctioning was done for all patients. During the post-operative period also besides heart rate, (HR), systolic and diastolic blood pressure (SBP, DBP) along with mean arterial pressure (MAP) were monitored and recorded after 30 minutes, 60 minutes, 2 hours, 4 hours, 6 hours, 8 hours, 12 hours and 24 hours after the end of surgery. The post-operative pain assessment was done using FLACC pain scale. The post-operative pain assessment was done by an independent observer who was blinded to the group to which patient was randomly allocated during the intra-operative period. Post-operative pain assessment was done 30 minutes, 60 37 minutes, 2 hours, 4 hours, 6 hours, 8 hours, 12 hours and 24 hours after the end of surgery (skin closure).

FLACC scale

Behavioral Observation Pain Rating Scale

Categories	Scoring		
	0	1	2
Face	No particular expression or smile; disinterested	Occasional grimace or frown, withdrawn	Frequent to constant frown, clenched jaw, quivering chin
Legs	No position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, or jerking
Cry	No crying (awake or asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging, or talking to. Distractable	Difficult to console or comfort
Each of the five categories (F) Face; (L) Legs; (A) Activity; (C) Cry; (C) Consolability is scored from 0-2, which results in a total score between 0 and 10.			

If the pain score is equal to 4 or exceeds it, patients were given rescue analgesia. This analgesia was supplemented along with suppository of paracetamol at the dose of 30 mg/kg.

RESULTS:

1. Age distribution between the groups, n = 60

Age group	Group B N (%)	Group I N (%)	Total N (%)
2 to 3 years	4 (13.3)	7 (23.3)	11 (18.3)
4 to 5 years	4 (13.3)	13 (43.3)	27 (45)
6 to 7 years	12 (40)	10 (33.3)	22 (36.7)
Total	30 (100)	30 (100)	60 (100)

Mean age \pm S.D: 4.9 \pm 1.541 years

Minimum age: 2 years

Maximum age: 7 years

Chi square value: 1.037

p value: 0.595

The 2 groups have a very similar population with regards to age

as the difference in age distribution between them was not statistically

significant and hence they are comparable.

2. mean age of the 2 groups (n = 60)

A minor difference was observed in the mean age of the 2

groups as it was not statistically significant.

3. gender distribution (n = 60)

The majority of the participants in both the groups were male

with all subjects in Group B being male and 10% of subjects in Group I being

female but this difference in gender distribution was not statistically

significant.

4. mean weight and height

The difference observed in the mean weight and height between

the 2 groups was minimal and as expected was not significant and therefore the

groups were comparable in terms of anthropometric measures.

5. ASA Grading (n = 60)

Major proportion of subjects in both the groups belonged to ASA grade I and the difference in ASA grading between the groups was not significant.

6. mean duration of surgery (n = 60)

The difference observed in mean duration of surgery between the 2 groups was 2 minutes and though this minor difference was statistically significant, it was clinically not so significant.

7. mean heart rate during intra-operative period (n = 60)

The difference in heart rate between the two groups at the baseline after the block was not significant but the difference in heart rate was significant just at the time of incision, 15 minutes after incision and at the time of extubation with Group I having relatively lower heart rate than Group B.

A significant variation in heart rate was observed in both the groups starting from baseline until extubation. However these changes in HR were not significantly different between the groups.

8. heart rate in the post-operative period n = 60

The difference in post-operative heart rate between the two groups at the baseline till 2 hours of post-operative period was significant however this difference was not significant after 4 hours of post-operative period.

A significant variation in heart rate was observed in both the groups in the post-operative period. However these changes in HR were not significantly different between the groups.

9. mean systolic blood pressure (SBP) during intra-operative period (n = 60)

The difference in SBP between the two groups at the baseline till the time of extubation was not significant

A significant variation in SBP was observed in both the groups starting from baseline until extubation. However these changes in SBP were not significantly different between the groups.

10. mean systolic blood pressure (SBP) during postoperative period (n = 60)

The difference in SBP between the two groups till 24 hours into post operative period was not significant

A significant variation in SBP in the post-operative period was observed in both the groups. However these changes in SBP were not significantly different between the groups.

11. mean diastolic blood pressure (DBP) during intra-operative period (n = 60)

The difference in DBP from baseline till the time of extubation between the two groups was not significant

A significant variation of DBP over time was observed in both the groups from baseline till extubation. However this variation occurred in a similar fashion in the two groups

12. mean diastolic blood pressure (DBP) during postoperative period (n = 60)

The difference in DBP between the two groups till 24 hours into post operative period was not significant

No significant variation in DBP in the post-operative period was observed in both the groups.

13. mean arterial pressure (MAP) in the intra-operative period, n = 60

The difference in MAP from baseline till the time of extubation between the two groups was not significant

A significant variation of MAP over time was observed in both groups from baseline till extubation. However this variation occurred in a similar fashion in the two groups.

14. mean arterial pressure (MAP) in the post-operative period, n = 60

The difference in MAP between the two groups till 24 hours into post operative period was not significant

A significant variation in MAP in the post-operative period was observed in both the groups. However these changes in MAP were not significantly different between the groups.

15. FLACC pain score during post-operative period (n = 60)

A significant difference in FLACC pain score was observed between groups at 4 and 6 hours of post-operative period with Group I having higher median FLACC pain score in comparison to group B, while at 8 hours Group B had a higher median FLACC pain score than group I.

16. mean time to first dose of rescue analgesia between the groups (n = 60)

The difference observed in mean time to first dose of rescue

analgesia between the 2 groups was that group B had a prolonged duration of analgesia and took roughly 150 minutes more than group I for rescue analgesia and this difference was statistically significant.

17. time to first dose of rescue analgesia needed between the groups (n = 60)

Group B needed slightly lower dose of rescue analgesia than group I, however this difference was not statistically significant

18. number of doses of rescue analgesia needed in 24 hours, n = 60

Doses of rescue analgesia needed	Group B N (%)	Group I N (%)	Total N (%)
1 dose	26 (86.7)	20 (66.7)	46 (76.7)
2 doses	4 (13.3)	10 (33.3)	14 (23.3)
Total	30 (100)	30 (100)	60 (100)

Chi-square value: 3.354 p value: 0.067

The majority of the participants in both the groups needed only 1 dose of rescue analgesia in 24 hours and the minor difference in between the Groups was not statistically significant.

DISCUSSION:

The study is done to compare the efficacy of USG guided ilioinguinal iliohypogastric nerve block and incisional site infiltration anaesthesia for elective unilateral hernia repair among children aged 2 to 7 years by comparing the postoperative analgesia using FLACC pain score between 2 groups namely B group who were given USG guided ilioinguinal iliohypogastric nerve block and I group who were administered incisional site infiltration anaesthesia. The study participants were randomly assigned as 30 children to each of the 2 groups in the pre-operative period itself. In addition, both groups were monitored for hemodynamic variations during the intraoperative and post-operative period for any complications. Comparison of pain score: In our study, an objective pain scale in the form of FLACC pain scale used to assess the severity of post-operative pain. The total score was between 0 and 10. The median FLACC pain score in both the groups was 0 till the end of first hour into the post-operative period. At 2 hours, Group B had score of 0 while Group I had a pain score of 1. At 4 hours, a significant difference Group I having higher than Group B. At 6 hours, Group I had higher than Group B. At 8 hours, Group B had than Group I and it was statistically significant. At 12 hour and 24 hour of post-operative period, there was no statistically significant difference in pain score between the groups.

This finding indicate that USG guided ilioinguinal iliohypogastric nerve block provides a better post-operative analgesia for a longer duration than incisional site infiltration anaesthesia for unilateral hernia repair in children. Olanipekunet al¹ in which the post-operative pain score was significantly lower in ilioinguinal/iliohypogastric field group than post-incisional wound infiltration group at 6 hours. In our study, the pain score was significantly lower during the 4 hours only, beyond which at 6 hours there was lower pain score in group B compared to group I but not statistically significant . The differences between olanipekunet al¹ and the current study were use of ilioinguinal/iliohypogastric field block instead of USG guided block in the latter, use of bupivacaine instead of ropivacaine, and use of post-incisional wound infiltration instead of pre-incisional infiltration in the current study. Rescue analgesia: Subjects in group B needed the first dose of rescue analgesia after roughly 7 hours while their counterparts in group I needed rescue analgesia after roughly 4.5 hours. This shows that subjects in group B 82 had a prolonged duration of analgesia and took roughly 150 minutes more than group I and this difference in time to first dose for rescue analgesia was statistically significant. The mean time to first dose of rescue analgesia in our study for USG guided block group versus infiltration group (7 hours vs 4.5 hours). Rescue analgesia in Group I was lower than

the time reported by Ghosh SK et al² for incisional skin infiltration group (8 hrs). This difference is due to the higher concentration of ropivacaine (0.5%) used and infiltration done just before skin closure in Ghosh SK et al². But time for rescue analgesia in group B comparable with Karan et al⁴ (6.9 min) using 0.2% ropivacaine in ilioinguinal-iliohypogastric nerve block.

Subjects in group B needed somewhat lower mean number of doses of rescue analgesia than group I. Prolonged duration of USG 83 guided ilioinguinal iliohypogastric nerve block than incisional site infiltration anaesthesia. This finding coincides with that of Reid et al³ in which the use of USG guided ilioinguinal iliohypogastric nerve block significantly reduced the post-operative analgesia requirements and also resulted in higher proportion of pain-free patients after herniotomy. Kushimoto et al³ reported fever in one patient and wound dehiscence in another child with the administration of post-incisional infiltration of bupivacaine for inguinal herniotomy in children. Chhatrapati et al⁴, Jagannathan et al⁵, Nafie et al and Seyedhejazi et al. Interestingly, Toivonen et al⁶ studied and compared the analgesia provided by ilioinguinal iliohypogastric nerve block with general anaesthesia and with spinal anaesthesia. They reported that only a short extended duration of analgesia was the only advantage with using ilioinguinal iliohypogastric nerve block combined with spinal anaesthesia while use of general anaesthesia with ilioinguinal iliohypogastric nerve block facilitated earlier discharge from hospital even though they included adults who underwent inguinal herniorrhaphy. Karan et al⁵ studied the effects of including dexmedetomidine as adjuvant drug to enhance ropivacaine for inguinal hernia repair in children in using the ilioinguinal iliohypogastric nerve block. They concluded that duration of analgesia was significantly higher, lower pain score and less requirement of 86 rescue analgesia with addition of dexmedetomidine adjuvant for ropivacaine than plain ropivacaine. Dalens et al⁶ studied the efficacy and pharmacokinetics of ropivacaine for ilioinguinal iliohypogastric nerve block in children and concluded that a dose of 3mg/kg given as single shot of ilioinguinal iliohypogastric nerve block provided enhanced post-operative pain relief and the use of ropivacaine for block was well tolerated without any complications. The current study reiterates the significance and superiority of using USG guided ilioinguinal iliohypogastric nerve block with ropivacaine in providing better post-operative analgesia, reducing the

need for additional analgesia and without any complications in comparison to infiltration anaesthesia for inguinal surgery in children. The finding of this study also ascertains the potential of using USG guidance for other nerve blocks in paediatric regional anaesthesia.

SUMMARY & CONCLUSION :

This experimental randomized controlled study done to compare USG guided ilioinguinal iliohypogastric nerve block and incisional site infiltration anaesthesia for elective unilateral hernia repair among children aged 2 to 7 years by comparing Group B (USG guided ilioinguinal iliohypogastric nerve block with 0.2% Ropivacaine) and Group I (pre-incisional site infiltration with 0.2% Ropivacaine) revealed the following important findings:

- No statistically significant difference was observed between the two groups in mean age, gender, height, weight, and ASA grading making them comparable with each other.
- No statistically significant difference was observed in variation of intraoperative and post-operative heart rate, systolic BP, diastolic BP and mean arterial pressure between the groups
- Group B had a lower median pain score than group I at 4 hours and 6 hours and this difference in pain score was statistically significant.
- Higher proportion of subjects in group I needed rescue analgesia than group B, though this difference was not statistically significant.
- The time needed for first dose of rescue analgesia was longer in group B than group I and this was statistically significant.
- Group B needed slightly lower number of doses and cumulative dose of rescue analgesia than group I, however this difference was not statistically significant.
- No complication was reported in both the groups

Based on the above mentioned findings, we conclude that Ultrasound guided ilioinguinal iliohypogastric nerve block with 0.2% ropivacaine is a better alternative to incisional site infiltration anaesthesia as it provides a better quality post-operative analgesia for longer duration thereby reducing the need for additional analgesia and without any significant hemodynamic alterations and complications for elective unilateral hernia repair among children aged 2 to 7 years.

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