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A COMPARATIVE STUDY OF USG GUIDED TRANSVERSE ABDOMINIS PLANE BLOCK VERSUS CAUDAL BLOCK WITH 0.2% INJ ROPIVACAINE FOR POST OPERATIVE ANALGESIA IN PAEDIATRIC PATIENTS UNDERGOING LOWER ABDOMINAL SURGERY.

Anaesthesiology

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ABSTRACT

Background: Post operative pain management is one of the most important issues influencing the outcome of surgery, and usually it is an unmet criteria in children. Regional anaesthesia technique significantly relieves pain in post-operative period. Regional blocks with the help of ultrasound have been of great importance for post-operative pain relief. Caudal block is the most common block and TAP block is being used recently. **Objective:** To study and compare the duration of postoperative analgesia in TAP and Caudal block, the amount of rescue analgesia required in the first 24hrs postoperatively and incidence of any side effects to 0.2% inj ropivacaine and/or procedure. **METHOD:** 40 children posted for elective lower abdominal surgery by simple random sampling technique will be allocated into two groups GroupA (TAP group) and GroupB (Caudal group). GroupA patients received USG TAP block and GroupB patients received USG Caudal block. 1ml/kg 0.2% inj Ropivacaine is used in both the blocks. Assessment of pain is done by FLACC score at 0, 2, 4, 6, 8, 12, 16, 20, 24 hours post operatively. Duration of regional anaesthesia will be defined from the time of drug administration to the time of FLACC score more than four. Once FLACC is four, rescue analgesia is given. **Results:** TAP block showed longer duration (720mins) of post operative analgesia when compared to caudal block (456mins). Number of doses of rescue analgesia required by caudal block was significantly more than TAP block. Incidence of urinary retention was significantly more in caudal group. **Conclusion:** USG TAP block is better mode of post operative analgesia when compared to caudal block.

KEYWORDS

Caudal block; TAP block; Post operative analgesia

INTRODUCTION

The term 'pain' is derived from the Latin word 'poena' meaning "punishment, penalty". The International Association for the Study of Pain (IASP) defines pain as "unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage"¹ Post operative pain management is one of the most important issues influencing the outcome of surgery. Postoperative pain when poorly controlled, results in harmful acute effects such as adverse physiological responses and chronic effects like delayed long term recovery and chronic pain². Similar to postoperative pain management in adults, the goals of postoperative analgesia in children are pain eradication, expedient recovery to daily activities, and prevention of progression of acute postsurgical pain to chronic pain or hyperalgesia³. Paediatric patients require adequate pain relief to prevent adverse effects, allow the children to mobilize earlier and improve the functional recovery and sleep. Regional anaesthesia in children has become increasingly popular over the past few decades. A variety of peripheral and central nerve blocks have been developed to ensure that peri-operative pain can be effectively controlled⁴. Regional anaesthesia technique significantly relieves pain in post-operative period. Caudal block is the oldest and most commonly used regional anaesthesia technique⁵. Transverse abdominis plane (TAP) block is also being used since past few years. Ultrasound guided block is the emerging safe and reliable technique in practice of caudal blocks in paediatrics⁶. The success rate and safety of TAP block has also markedly increased with ultra-sound guidance. This study was conducted to compare the efficacy of the ultrasound guided TAP block with that of ultrasound guided caudal epidural block using 0.2% inj Ropivacaine for post-operative pain relief in paediatric patients undergoing lower abdominal surgeries

MATERIALS AND METHOD

A Prospective interventional study was conducted among 40 paediatric patients undergoing lower abdominal surgery. 40 children satisfying the inclusion criteria were included in the study, after obtaining informed consent from the parents/guardian of the patients. They were randomly allocated into two groups of 20 patients in each. Group A (n=20) Received USG-guided TAP Block and Group B (n=20) Received USG-guided Caudal Epidural Block with 1ml/kg of 0.2% inj ropivacaine.

Methodology:

Age and weight of the patient was recorded preoperatively. All children were fasted 8hrs for solid, 6hrs for milk and 2 hrs for clear liquid.

Procedure: All patients were sedated before shifting to OT with inj

midazolam 0.05mg/kg. After shifting patient on OT table, monitors attached (pulse oximeter, ECG, NIBP) IV fluids started, oxygen inhalation started using nasal prongs at 4l/min. Once baseline values of heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure and Spo2 were recorded, Patient was pre-medicated with inj glycopyrolate 0.004mg/kg or inj atropine 0.01mg/kg, inj ketamine at 1-2mg/kg and inj fentanyl 1-2mcg/kg.

Group A (n=20): USG Transversus abdominis plane block Patient is in supine position, under Ultrasound guidance sub-coastal TAP block is given with 1ml/kg 0.2% inj ropivacaine. The linear ultrasound probe connected to a portable ultrasound unit was placed in mid axillary level in the transverse plane to the lateral abdominal wall midway between the lower costal margin and the highest part of iliac crest. A 22G needle attached with syringe fixed with 0.2% ropivacaine (1ml/kg) was inserted in plane with the ultrasound probe and advanced until it reached the plane between transversus abdominis and internal oblique muscle, after careful aspiration to exclude vascular puncture, the local anaesthetic solution was injected, leading to separation between the internal oblique and transversus abdominis muscle, which appeared as a hypo echoic space in ultrasound. 46

Group B (n=20): USG Caudal block Patient is in lateral decubitus position; under ultrasound guidance caudal block is given with 1ml/kg 0.2% inj ropivacaine. Sacral hiatus is palpated, the linear ultrasound probe connected to portable ultrasound machine is placed transversely in midline to obtain the transverse view of sacral hiatus. The 2 sacral cornua are identified as 2 hyperechoic reversed U-shaped structures (frog eye appearance). Between the sacral cornua are the sacrococcygeal ligament and dorsal bony surface of sacrum appearing as 2 hyperechoic bands. The sacral hiatus is the hypoechoic area. A 22G needle is then inserted into the sacral hiatus (between the two cornua) until a pop is felt. Then the probe is rotated to obtain longitudinal view by 90degree. The needle is then advanced into the sacral canal under ultrasound vision. 1ml/kg of 0.2% inj ropivacaine is injected in this region. Intra operative heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were recorded every 5 minutes. After completion of the surgical procedure, patient was transferred to PACU (post anaesthesia care unit). Postoperative FLACC pain score was assessed at 0,2,4,6,8,10,12,16,20 and 24hrs. If two coupled observations separated by a 5min waiting period yielded FLACC pain scale score anytime to be more than 3, rescue analgesia with IV PARACETAMOL was administered to achieve FLACC score of 3 (or) less. The primary outcome measures were the time to first rescue analgesia (in minutes from the time of caudal (or) TAP block injection to first registration of FLACC pain score >3. Secondary outcome measures included FLACC Scale score

and intra operative hemodynamic variables. Complications like PONV, urinary retention, respiratory depression, apnea etc are recorded. Collected data was analysed by IBM SPSS2.0 version software. Quantitative and qualitative data analysis was done by t-test and chi-square test respectively.

RESULTS:

Table 1: FLACC SCORE-Comparison in two groups of patients studied

FLACC SCORE	CAUDAL	TAP	Total	Z Value	P Value
0hrs	0.00±0.00	0.00±0.00	0.00±0.00	0.000	1.000
2hrs	0.05±0.22	0.00±0.00	0.03±0.16	-1.000	0.317
4hrs	1.4±1.14	0.7±0.73	1.05±1.01	-2.127	0.033*
6hrs	2.85±1.09	1.4±0.88	2.13±1.22	-3.917	<0.001**
8hrs	2.4±1.19	1.9±0.97	2.15±1.1	-1.345	0.179
10hrs	2.1±1.21	2.45±1	2.28±1.11	-1.195	0.232
12hrs	1.8±1.11	2.7±0.98	2.25±1.13	-2.874	0.004**
16hrs	2.35±0.99	2.75±1.41	2.55±1.22	-0.758	0.449
20hrs	2.65±0.99	2.25±1.07	2.45±1.04	-1.209	0.227
24hrs	3.05±1.15	2.4±0.94	2.73±1.09	-1.667	0.096+

FLACC score at 4th hour was statistically moderately significant, at 6th hour and 12th hour were strongly significant

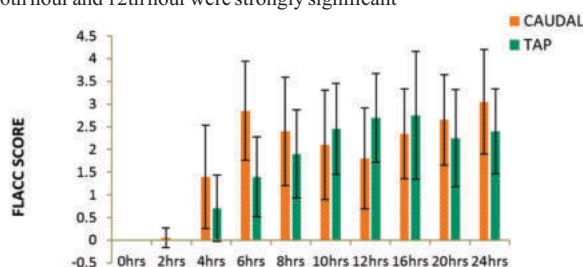


Table 2: NO. OF RESCUE ANALGESIC DOSES-Comparison in two groups of patients studied

No. Of Rescue Analgesic Doses	Caudal	Tap	Total
1	7(35%)	19(95%)	26(65%)
2	11(55%)	1(5%)	12(30%)
3	2(10%)	0(0%)	2(5%)
Total	20(100%)	20(100%)	40(100%)

P<0.001**, Significant, Fisher Exact Test

Number of rescue analgesic dose required showed statistical significance.

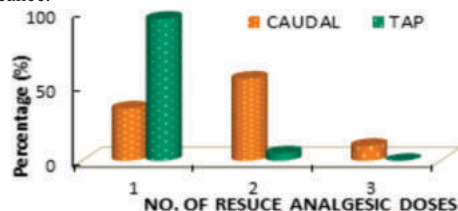


Table 3: TIME OF FIRST ANALGESIA IN MINS

Time Of First Analgesia In Mins	Caudal	Tap	Total
<600	15(75%)	3(15%)	18(45%)
>600	5(25%)	17(85%)	22(55%)
Total	20(100%)	20(100%)	40(100%)
Mean ± Sd	456±120.63	780±273.92	618±265.63

P<0.001**, Significant, Student t Test

Time of first analgesic dose in caudal block was 456±120.63mins while TAP block was 780±273.92. They showed strong statistical significance

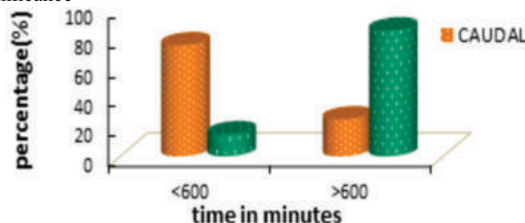
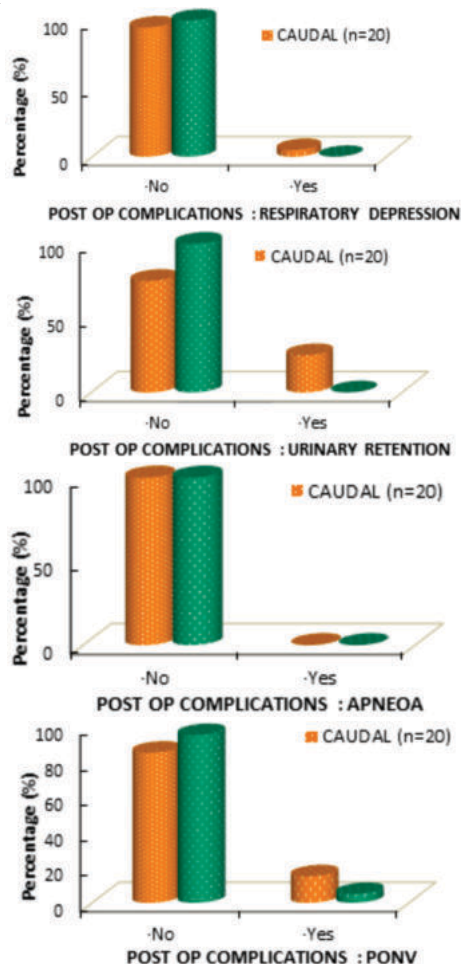


Table 4: POST OP COMPLICATIONS

Post Op Complications	Caudal (N=20)	Tap (N=20)	Total (N=40)	P Value
Respiratory Depression				
No	19(95%)	20(100%)	39(97.5%)	1.000
Yes	1(5%)	0(0%)	1(2.5%)	
Apnea				
No	20(100%)	20(100%)	40(100%)	1.000
Yes	0(0%)	0(0%)	0(0%)	
Urinary Retention				
No	15(75%)	20(100%)	35(87.5%)	0.047*
Yes	5(25%)	0(0%)	5(12.5%)	
Ponv				
No	17(85%)	19(95%)	36(90%)	0.604
Yes	3(15%)	1(5%)	4(10%)	

Chi-Square Test/Fisher Exact Test



DISCUSSION

Pain relief in children undergoing surgery in intra-operative and post-operative period is often unmet critical need. Adequate management of acute pain is essential to prevent transition to chronic pain. Studies have shown good evidence that regional anaesthesia provides good quality, post-operative pain relief^{6,9,10,11,12}. Regional blocks with the help of ultrasound have been of great importance for post-operative pain relief in paediatric age group recently with lesser complications during procedure due to precise localisation of nerve. Reduced post-operative pain, pain scores, opioid consumption and post-operative nausea vomiting are few of the benefits of regional block¹³.

In 2014, Dalia M. Fawzy et al¹⁴ conducted a study where in Thirty-nine patients were divided into two groups: group A (caudal; n = 19 patients) received a single caudal dose of isobaric bupivacaine 0.25% (1.25 ml/kg) and group B (TAP block; n = 20 patients) received isobaric bupivacaine 0.25% (0.3 ml/kg). The results showed Group B had a significantly longer time to first analgesia dose than group A. Our study showed the duration of analgesic effect in post-operative period was found to be significantly longer in TAP block than caudal block.

Robert B Bryskin et al¹⁵ conducted a double blinded study to compared TAP block and caudal block in paediatric patients and concluded that TAP block provided superior analgesia compared with the caudal block at 6 to 24 hours after block placement, as demonstrated by a statistically significant decrease in cumulative opioid requirement.

In our study, were the duration analgesia for caudal group with 0.2% plane ropivacaine was 456 ± 120.63 min. And for TAP block it was found to be 780 ± 273.92 mins. The duration of post operative pain relief was longer in TAP block when compared to caudal block. This can be because of the high vascularity of the caudal space; the absorption of local anaesthetic into systemic circulation is more in caudal block, resulting in faster clearance of the local anaesthetic. Transversus Abdominis Plane is a relatively avascular fascial plane. The local anaesthetic drug volume deposited in the caudal space has to spread over a larger area to achieve the level of blockade whereas the drug volume injected in TAP spreads in a narrow fascial plane between two muscles

Neha Kanojia et al¹⁶ in the year 2015 compared USG guided TAP block with Caudal block for lower abdominal surgeries in children of age group 1-12yrs demonstrated lower mean VAS scores in both the groups for first 3-4 hours postoperatively, similar to our study. After 3-4 hours, there was a rise in the number of patients with mean VAS score >3 in Caudal group compared to group TAP. In the year 2022, Mukesh singh rautela et al¹⁷ conducted a study to compare TAP block, Caudal block and local infiltration for post operative analgesia. The primary outcome was the efficacy of postoperative analgesia using modified objective pain score (MOPS). Results showed that the MOPS was statistically better in Group TAP compared to group CB and group LI at 8 and 24 h postoperatively. Different observational pain scores were considered in different studies. In our study we considered FLACC scoring for pain. The FLACC scores were comparable in the immediate post op period 2hrs in both groups. This gives an impression that both caudal and TAP block provides Immediate post op pain relief. FLACC score was significantly higher at 4 to 6 hour in caudal block group requiring administration of analgesics. In 2021 Bindu Ganesh et al¹⁸ conducted a study on 50 children of age group 2- 7 years undergoing lower abdominal surgeries. Group T received ultrasound guided TAP block and Group C received caudal block. The study result showed rescue analgesic requirement was significantly less in Group T compared to Group C. V. Rajesh Kumar Kodali et al¹⁹ in 2020, conducted a study were in Sixty-two children undergoing inguinal hernia repair received TAP block (Group A) or caudal block (Group B) after randomization. The children were analyzed by comparing the post operative pain scores and duration of analgesia. They concluded that children who received TAP block had prolonged duration of analgesia and lower pain scores compared to those who received caudal analgesia. In our study, there was a significant difference seen in the number of rescue dose of analgesia were in caudal group required more analgesic dose than TAP block in first 24hrs. Harsha Shanthanna et al²⁰ in 2014, did A Systematic Review and MetaAnalysis of Caudal Block as Compared to Non-caudal Regional Techniques for Inguinal Surgeries in Children. Their study showed that caudal block had significantly higher chances of urinary retention when compared non caudal regional techniques. Our study results showed significantly higher incidence of urinary retention in caudal group when compared to TAP group.

CONCLUSION

From the study conducted, we conclude that administration of ultrasound guided Transversus abdominis plane block for children undergoing lower abdominal surgery increases the duration of post operative analgesia when compared to caudal block. And has no/minimal adverse effects. Hence, ultrasound guided Transversus abdominis plane block can be used as an alternative for safe and prolonged post operative analgesia in children undergoing lower abdominal surgery.

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