

Comparative Study of Spinal Anaesthesia Versus Caudal Anaesthesia in Lower Paediatric Age Group Patients Undergoing Elective Infraumbilical Surgery

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ABSTRACT

Introduction: Regional anaesthesia in children was first studied by August Bier in 1899. Intraoperative blockade of the neuraxis, whether by the spinal or epidural route provides excellent analgesia with minimal physiologic alteration. This study was done with the primary aim to compare spinal anaesthesia with caudal anaesthesia in lower paediatric age group patients undergoing elective infraumbilical surgery for duration of analgesia and hemodynamic stability. We also compared the characteristics of sensory and motor block.

Material and methods: In this study 100 patients who fulfilled the eligibility criteria were chosen and the procedure was explained to the patients attendant. After obtaining written and informed consent, patients were randomized into two equal groups of 50 each. Group S was given spinal anaesthesia- hyperbaric bupivacaine (0.5%) in a dose of 0.5 mg/kg was injected. Group C was given caudal block-0.5% plain bupivacaine 2mg/kg plus normal saline. Postoperatively patients were observed for analgesia, sedation, hemodynamic and complications if any.

Result: The sensory level achieved in all cases of group S was T10 while in group C it was in 93%. Mean onset time, duration and regression of sensory block as well as for motor block was higher in caudal group than spinal group. The time required for first supplement was delayed in caudal group. Cries scale was not the limiting factor in both the groups.

Conclusion: In short surgeries requiring immediate relaxation spinal anaesthesia is preferable while in surgeries with moderately prolonged duration caudal is preferable.

Keywords: Cries Scale, Sensory, Motor, Hemodynamic, Analgesia

INTRODUCTION

Regional anaesthesia in children was first studied by August Bier in 1899. Intraoperative blockade of the neuraxis, whether by the spinal or epidural route, provides excellent analgesia with minimal physiologic alteration. As a supplement to general anaesthesia, local anaesthetics blockade of the neuraxis decreases the total amount of general anaesthetics required for surgery. Regional anaesthetic techniques can ablate the metabolic and stress responses of children to surgery. Spinal anaesthesia is a useful technique in infraumbilical and lower limb orthopaedic surgeries.¹ Infants and children are at an increased risk for GA-related complications.²⁻⁴ Spinal anaesthesia could also be indicated as an alternative to GA, especially in situations such as chronic respiratory disease, potentially difficult airway and malignant hyperthermia.⁵⁻¹⁰ Caudal block is usually combined with general anaesthesia

to obtain efficient postoperative analgesia for paediatric patients undergoing lower abdominal surgeries.¹¹⁻¹² Aims of the study was to compare spinal anaesthesia and caudal anaesthesia in lower paediatric age group patients undergoing elective infraumbilical surgery for Duration of analgesia and Hemodynamic stability. As well as to evaluate the onset, extent and duration of sensory and motor block. Time for first rescue analgesic dose. Post operative complications if any

MATERIAL AND METHODS

The present study was Prospective, Randomised and Comparative done after approval of Institutional Ethics Committee in 100 patients planned for infraumbilical surgeries. ASA physical status I-II, Age group 0-6 years, either gender undergoing infraumbilical surgeries were included in the study. Patients having history of Infection of back, Allergy to drugs, Congenital malformation of the back, Pre-existing neurological or spinal diseases, Coagulation abnormalities, On Anti- Platelet / Anti-Coagulation therapy, Refusal by attendant, Long case (duration more than 90 mins) were excluded. Material used were Boyles machine with oxygen supply, suction apparatus Laryngoscope and ET Tubes of various sizes, Quincke type spinal needle 25 gauge, 24^{1/2} gauge needle, Sterile 2 cc and 5 cc syringes. Bupivacaine 0.5% Heavy- ampoule, Bupivacaine 0.5% vial, Emergency drugs, IV Fluids. After careful pre operative assessment of all patients standard monitors including NIBP, ECG, and pulse oximeter were attached to the patient. The study population was divided into two equal groups of 50 each. Group S underwent Spinal block. Group C underwent Caudal block. Group S patients received spinal anaesthesia via midline approach with patients in lateral position under aseptic precautions. After getting free flow of CSF hyperbaric bupivacaine (0.5%) in a dose of 0.5 mg/kg was

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injected in the subarachnoid space. Group C patients were given caudal block with full aseptic precautions in left lateral position. Drug-0.5% plain bupivacaine 2mg/kg plus normal saline (1ml/kg according to modified armitage formula) was given. After the drug was injected, the following parameters were recorded for Sensory block: Onset, Level, Duration, Regression of sensory block were recorded. For Motor block- Onset, Duration, Regression of motor block was noted. Post-operatively Time of rescue analgesia was noted and Postoperative Pain Assessment was done by the CRIES Scale-The CRIES (Crying Requires oxygen Increased vital signs Expression Sleep) scale is a tool for measuring postoperative pain in the neonates. Careful watch was kept for complications such as headache, backache, pain, infection of back, difficulty in respiration (high spinal) and meningitis.

RESULTS

Table-1 shows the comparison of mean onset time of sensory block between the spinal and caudal groups. The mean onset time of sensory block in the spinal group was 2.76 ± 1.07 , while in the caudal group it was 10.05 ± 2.54 . The difference was found to be statistically significant ($p < 0.05$), showing a higher mean onset time of sensory block in the caudal group in comparison to the spinal group.

Table-2 shows the comparison of mean duration of sensory block between the spinal and caudal groups. The mean duration of sensory block in the spinal group was 72.63 ± 18.18 , while in the caudal group it was 126.14 ± 24.26 . The difference was found to be statistically significant ($p < 0.05$), showing a higher mean duration of sensory block in the caudal group in comparison to the spinal group.

Table-3 shows the comparison of mean regression of sensory block between the spinal and caudal groups. The mean regression of sensory block in the spinal group was 82.54 ± 18.65 , while in the caudal group it was 138.42 ± 22.42 . The difference was found to be statistically significant ($p < 0.05$), showing a higher mean regression of sensory block in the caudal group in comparison to the spinal group.

Table-4 shows the comparison of mean onset time of motor block between the spinal and caudal groups.

The mean onset time of motor block in the spinal group was 4.02 ± 1.25 , while in the caudal group it was 13.32 ± 2.37 . The difference was found to be statistically significant ($p < 0.05$), showing a higher mean onset time of motor block in the caudal group in comparison to the spinal group.

Table-5 shows the comparison of mean duration of motor block between the spinal and caudal groups. The mean duration of motor block in the spinal group was 61.19 ± 16.54 , while in the caudal group it was 111.32 ± 21.18 . The difference was found to be statistically significant ($p < 0.05$), showing a higher mean duration of motor block in the caudal group in comparison to the spinal group.

Table-6 shows the comparison of mean regression of motor block between the spinal and caudal groups. The mean regression of motor block in the spinal group was 71.10 ± 17.02 , while in the caudal group it was 121.67 ± 20.77 . The difference was found to be statistically significant ($p < 0.05$),

Group	No.	Mean \pm SD	't' value	P value
Spinal	59	2.76 ± 1.07	-20.222, df=114	0.000*
Caudal	57	10.05 ± 2.54		

Unpaired 't' test, p value = 0.000, Significant

Table-1: Comparison of mean onset time of sensory block between the two groups (N=116)

Group	No.	Mean \pm SD	't' value	P value
Spinal	59	72.63 ± 18.18	-13.476, df=114	0.000*
Caudal	57	126.14 ± 24.26		

Unpaired 't' test, p value = 0.000, Significant

Table-2: Comparison of mean duration of sensory block between the two groups (N=116)

Group	(N=116)	Mean \pm SD	't' value	P value
Spinal	59	82.54 ± 18.65	-14.613, df=114	0.000*
Caudal	57	138.42 ± 22.42		

Unpaired 't' test, p value = 0.000, Significant

Table-3: Comparison of mean regression of sensory block between the two groups (N=116)

Group	No.	Mean \pm SD	't' value	P value
Spinal	59	4.02 ± 1.25	-26.554, df=114	0.000*
Caudal	57	13.32 ± 2.37		

Unpaired 't' test, p value = 0.000, Significant

Table-4: Comparison of mean onset time of motor block between the two groups (N=116)

Group	No.	Mean \pm SD	't' value	P value
Spinal	59	61.19 ± 16.54	-14.234, df=114	0.000*
Caudal	57	111.32 ± 21.18		

Unpaired 't' test, p value = 0.000, Significant

Table-5: Comparison of mean duration of motor block between the two groups (N=116)

Group	No.	Mean \pm SD	't' value	P value
Spinal	59	71.10 ± 17.02	-14.362, df=114	0.000*
Caudal	57	121.67 ± 20.77		

Unpaired 't' test, p value = 0.000, Significant

Table-6: Comparison of mean regression of motor block between the two groups (N=116)

showing a higher mean regression of motor block in the caudal group in comparison to the spinal group.

DISCUSSION

In paediatric patients outcome is better with regional anaesthesia and complications of GA can be avoided. The patients Age, Gender in both the groups were not the limiting factor for the administration of the technique. Vital parameters (HR, BP, SpO₂ and RR) in both the groups remained comparable. In the present study the mean onset time of sensory block in the spinal group was 2.76 ± 1.07 while in caudal group was 10.05 ± 2.54 the difference was found to be statistically significant showing a higher mean onset time of sensory block in the caudal group in comparison to spinal group. The Sensory level in spinal group achieved

T10 level in all the cases while in the caudal group 93% of the cases achieved T10 level while 7% of cases achieved T8 level which was statistically significant but within clinically acceptable range. A similar study conducted by Charu Pandya et al (2014)¹³ showing onset of sensory block in caudal was delayed then spinal block that was 9 ± 3.5 in caudal and 3 ± 1.2 minutes in spinal and the level of sensory block in spinal anaesthesia reached T6 and the level in caudal anaesthesia is T8. The mean duration of sensory block in Group S was 72.63 ± 18.18 while in the Group C it was 126.14 ± 24.26 . The difference was statistically significant showing the higher mean duration of sensory block in the caudal group as compared to spinal group. Similarly, Charu Pandya et al (2014)¹³ showed duration of analgesia was longer with caudal than spinal. In present study the mean regression of sensory block in the Group S was 82.54 ± 18.65 , while in the Group C it was 138.42 ± 22.42 . The difference was statistically significant, showing a higher mean regression of sensory block in the caudal group in comparison to the spinal group. In the study conducted by Sanjay.S.Bule et al (2017)¹⁴ mean regression of sensory block in spinal was 42.91 ± 10.72 (30-70)min. In our study the mean onset time of motor block in the Group S was 4.02 ± 1.25 , while in the Group C it was 13.32 ± 2.37 . The difference was statistically significant, showing a higher mean onset time of motor block in the caudal group in comparison to the spinal group. No literature correlating to the present study comparing this parameter was found. Gallagher et al (1989)¹⁵ used 0.06 ml/kg plus 0.1 ml (mean dose: 0.3 mg/kg) of hyperbaric 0.5% bupivacaine and reported duration of motor block of 75 min. In our study the mean duration of motor block in the Group S was 61.19 ± 16.54 , while in Group C it was 111.32 ± 21.18 . The difference was statistically significant, showing a higher mean duration of motor block in the caudal group in comparison to the spinal group. In our study the mean regression of motor block in the Group S was 71.10 ± 17.02 , while in Group C it was 121.67 ± 20.77 . The difference was statistically significant, showing a higher mean regression of motor block in the caudal group in comparison to the spinal group. No literature correlating to our study was found. While in our study the mean time for first supplement requirement in the Group S was 89.24 ± 18.33 , while in Group C it was 151.40 ± 20.04 . The difference was statistically significant, showing a higher mean time for first supplement requirement in the caudal group in comparison to the spinal group. The association between Cries Scale and the groups was found to be statistically not significant, showing that the Cries Score is independent of the groups.

CONCLUSION

By the present study we may conclude that, both caudal and spinal techniques are easy, simple and safe anaesthetic technique in paediatric age group. In both the groups age and gender are not limiting factors for the administration of blocks. The changes in the cardiovascular parameters like systolic, diastolic and mean blood pressure, heart rate were comparable in both the groups and were in clinically

acceptable ranges. The respiratory rate and SpO₂ (pulse oximetry) in both the groups was comparable. In the present study the mean onset time of sensory block were higher in caudal group in comparison to spinal group. In the present study the level of sensory block achieved was T10 in all the cases of spinal group while in 93% cases T10 level was achieved in caudal group. In the present study duration of sensory block as well as regression of sensory block were higher in caudal group in comparison to spinal group. The mean onset time of motor block, duration of motor block and regression of motor block were higher in caudal group in comparison to spinal group. Association of Cries scale in both the group was an independent variable and is not the limiting factor. The time for first supplement required was higher in caudal group than in spinal group. So from this study the inference was, in the case of short surgeries which require immediate relaxation like colostomy, anoplasty spinal anaesthesia is preferable, while surgeries with moderately prolonged duration caudal block is preferable.

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