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A STUDY ON COMPARISON OF BUPIVACAINE AND CAUDAL MIDAZOLAM FOR POST-OPERATIVE ANALGESIA AMONG MALE CHILD AGED BELOW 10 YEARS

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ABSTRACT Pain is an unpleasant sensory and emotional experience. Studies have been conducted for achieving analgesia requirement of adults but the response in children are not well known. This study evaluates efficacy of midazolam for post-operative pain relief when administered epidurally, in patients undergoing unilateral inguinal herniotomy. Study included 60 children, from age 1-10 years. The patients were divided randomly into group B and group M of 30 each. Group B received caudal bupivaccine 0.25%, 1 ml/kg and Group M received caudal midazolam 50 mg/kg, diluted as 1 ml/kg with normal saline. Mean duration of post-operative analgesia was longer in Group B 491.660 ± 64.572 minutes than that in Group M 456.833 ± 59.29 minutes and is statistically significant. We conclude, caudal midazolam 50mg/kg provides equivalent analgesia to bupivacaine 0.25%, when administered preoperatively in a volume of 1ml/kg to children undergoing unilateral inguinal herniotomy, without any significant adverse effects.

KEYWORDS : Midazolam, Bupivacaine, caudal analgesia

INTRODUCTION

Pain is by far one of the most common and distressing effects of disease and all medical persons regard its relief as one of their main duties. Whether it be by drugs, nerve injections, surgery or any other means, every patient wants desperately to be relieved of pain (1). In last 15 years, there were fewer studies conducted for pain management in children (2).

Children are special in this regard because the mystery is that they can feel different types of pains from same type of tissue damage. They can experience pain without injury or apparent injury and they can also sustain injury without experiencing pain (3). Relief of post-operative pain is a challenge for all anaesthetists (4). Congenital hernia is one of the common problems, in childhood and the reason for surgical encounter in the early childhood (5).

Herniotomy a procedure to correct it, is associated with considerable post-operative pain which may result in restlessness, agitation, bleeding and psychological stress in children (6). Insufficient pain relief in early post-operative period also leads to delay in full recovery, prolonged hospital stay, discouraged ambulation, behavioural and psychological problems and parental agony (7).

In order to maximize post-operative analgesia, a number of agents have been tried by epidural and spinal route. Epidural and spinal opioids have been used but the associated major side effects like sedation, itching, urinary retention, nausea, vomiting, respiratory depression and tolerance have limited their widespread use (8). Caudal epidural block is the most commonly used regional technique for post-operative analgesia in children. Because of the side effects of bupivacaine which include motor weakness, urinary retention and cardiovascular and central nervous system toxicity(9), this study was conducted to evaluate the use of epidural midazolam as an alternative analgesic to bupivacaine for children undergoing inguinal herniotomy and to evaluate the efficacy and side-effect of caudal midazolam and bupivacaine for post-operative pain relief when administered epidurally.

MATERIAL AND METHODS

A prospective study was conducted in male child aged between 1 year to 10 year undergoing unilateral inguinal herniotomy. The study was conducted in tertiary care centre located in central India. The study duration was from February 2017 to July 2018. The patients of ASA Grade I and II were included, whereas the patients with upper respiratory tract infections, cardio-respiratory diseases, systemic problems, coagulopathy, sepsis at the site of block, meningocele and myelocele and patients without consent (parental refusal) were excluded. Each patient was examined and interviewed (parents also) on the evening prior to operation. Detailed history about previous illness and treatment was elicited. Thorough physical examination was carried out. All patients underwent through complete blood and urine analysis. The children were kept nil by mouth for at least 4 hours before surgery and mothers were informed to give glucose water in the morning 4 hours before the scheduled time of surgery.

Patients were allotted to any of the two groups before premedication that was Groups B with Caudal epidural block with 0.25% Bupivacaine, 1ml/kg and Group M with Caudal epidural block with Midazolam 50mg/kg, with normal saline 1mg/kg.

Due to paucity of literature, the effective dose of epidural midazolam for post-operative analgesia is still not known so dose of 50mg/kg had been used for epidural administration based on some available literature (8,9). Similarly epidural dose of bupivacaine was decided to be 0.25% with volume of 1mg/Kgbased on various studies available (10-16).

The patients were premedicated with intramuscular ketamine, 5mg/kg along with atropine 0.02mg/kg and after adequate sedation they were brought inside the operation theatre from premedication room and intravenous line was secured. Vital parameters like pulse rate, blood pressure and respiratory rate were monitored. The patients were preoxygenated with 100% O2 on mask. Then the induction was done with intravenous ketamine, 1-2 mg/kg and IV succinylcholine 2 mg/kg, with 02 + N20 + Halothane if required. Then laryngoscopy was done and patient was intubated. Anaesthesia was maintained with 02 + N2O + Halothane through Ayre's T-piece with controlled ventilation. The muscle relaxant used was iv Pancuronium.

Child was placed in the lateral position with the hips and knees flexed and caudal block was performed. The sacral region was prepared with betadine and spirit solution, a 23G needle was inserted into the skin overlying the sacral hiatus. The needle was positioned at an angle of 65°-70°, in an upward direction with level towards the abdomen. The epidural space was identified by the loss of resistance when the needle pierced the sacrococcygeal ligament. The needle was made parallel to the back and inserted into the canal 2-3 mm more. After the negative aspiration for blood or CSF, the drug was injected.

In Group B, Bupivacaine 0.25% volume 1 ml/kg, was injected slowly in the epidural space and in Group M, Midazolam 50mg/kg, volume 1 mg/kg diluted with normal saline was injected slowly in the epidural space. The patient was turned to supine position and the surgery was carried out. Intraoperatively calculated iv fluid administration, continuous monitoring of blood pressure, heart rate and oxygen saturation was done.

At the end of surgery, the patient was reversed with IV neostigmine 0.05mg/kg and IV atropine 0.02 mg/kg. Thorough oropharyngeal and endotracheal suction was done and patient was extubated after return of reflexes.

Post-operatively, the following observations were made (1) The post-operative pain was assessed by using "Pain-discomfort scale" at ½ hour, 1 hour. 2 hours, 6 hours, 12 hours and 24 hours after the surgery, by personal visit to the recovery ward. The score zero is taken as no pain, the score 1-4 as mild or insignificant pain and score > 5 as significant pain. (2) The time for first analgesic i.e. Syp. Ibuprofen, 5mg/kg was noted when pain score > 5. (3) The total doses requirement in 24 hours was recorded. (4) The motor weakness in lower limb was assessed and time to unaided standing was noted. (5) The first micturition time was recorded. (6) The duration of pain relief was recorded as the time interval from the end of the surgery till the first analgesic dose was given. (7) The complications like nausea, vomiting, haematoma formation, infections, fever were looked for and were recorded. All the parents were informed regarding the procedures of anaesthesia and surgery and a written consent of the parents was obtained. The study was approved by Institutional ethical committee.

The data was entered in Microsoft office-excel and appropriate statistical analysis was done using SPSS version 16. All the qualitative data was expressed in frequency and percentage and all quantitative data was expressed in mean and standard deviation. Un-paired t test, chi square test and fisher's exact test was applied. P value less than 0.5 is considered to be statistically significant.

RESULTS

The mean age in Group B was 3.733 ± 1.7 years and that of Group M was 4.133 ± 2.161 years and the mean weight in Group B was 10.6 ± 3.165 kg (range 6-18 kg) and that of Group M was 12.366 ± 3.232 kg (range 6-20 kg).The mean duration of surgery was 54.833 ± 9.048 minutes and 58.5 ± 10.18 minutes in group B and group M respectively. The hemodynamic parameter were compared both pre and intra operatively.

Table 1: - Table showing different characteristics in both the group

Variable	Group B Mean ± SD	Group M Mean ± SD	P Value
Age	3.733 ± 1.7	4.133 ± 2.161	0.3916
Weight	10.6 ± 3.165	12.366 ± 3.232	0.0395
Duration of Surgery	54.833 ± 9.048	58.5 ± 10.18	0.1458
Pre-operative Pulse Rate	111.66 ± 8.155	111.8 ± 8.04	0.566
Pre-operative Blood Pressure	108.8 ± 4.715	110.6 ± 3.936	0.623
Intraoperative Pulse Rate	119.6 ± 8.492	121 ± 9.002	0.425
Intraoperative Blood Pressure	100.33 ± 4.003	100.6 ± 4.039	0.906
Duration of Analgesia	491.66 ± 64.572	456.83 ± 59.29	< 0.001
Time of First micturition	286.83 ± 58.47	276.16 ± 57.47	0.47

Post-operatively, the pain was assessed at the intervals of ½ hour, 1 hour, 2 hours, 6 hours, 12 hours and 24 hours, using modified pain discomfort score (17). In this score 0 is considered to be no pain, score 1 to 4 is mild or insignificant pain and more than 5 is significant pain.

25 (83.33%) patients in Group B and 26 (86.66%) patients in Group M had no pain till Vz hour and 5 (16.66%) patients in Group B and 4 (13.33%) patients in Group M had mild or insignificant pain. The mean pain score was 0.166 ± 0.379 in Group B and 0.16 ± 0.4611 in Group M at half an hour.

Table 2: Table showing post-operative pain discomfort score

Duration	Group B Mean ± SD	Group M Mean ± SD	P value
Half	0.166 ± 0.379	0.16 ± 0.4611	> 0.9999 (NS)
1 Hour	0.3 ± 0.5350	0.43 ± 0.5683	0.3533 (NS)
2 Hours	0.76 ± 0.77	1.2 ± 0.8867	0.048 (S)
6 Hours	2.83 ± 0.9129	3.86 ± 0.7303	0.0001 (S)
12 Hours	5.06 ± 0.6397	5.5 ± 0.5724	0.0076 (S)
24 Hours	5.93 ± 0.7397	5.9 ± 0.7120	0.8595 (NS)

22 (73.33%) patients in Group B and 18 (60%) patients in Group M had no pain and 8 (26.66%) patients in Group B and 12 (39.99%) patients in Group M had mild pain till 1 hour after surgery. The mean pain score was 0.3 ± 0.5350 in Group B and 0.43 ± 0.5683 in Group M at the end of one hour.

12 (40%) patients in Group B and 9 (30%) patients in Group M had no pain. And 18 (60%) patients in Group B and 21 (70%) patients in Group M had mild pain. The mean pain score was 0.76 ± 0.77 in Group B and 1.2 ± 0.8867 in Group M at the end of 2 hour.

29 (96.66%) patients in Group B and 25 (83.33%) patients in Group M had mild pain. And 1 (3.33%) patient in Group B and 5 (16.66%) patients in Group M had significant pain and discomfort by the end of 6 hours. The mean pain score at 6 hours was 2.83 ± 0.9129 in Group B and 3.86 ± 0.7303 in Group M at the end of 6 hour.

5(16.66%) patients in Group B and 1(3.33%) patient in Group M had mild pain. 25(83.33%) patients in Group B and 29(96.66%) patients in Group M had significant pain and discomfort at end of 12 hours. The mean pain score was 5.06 ± 0.6397 in Group B and 5.5 ± 0.5724 in Group M.

2 patients in Group B and no patient in Group M had mild pain and 28(93.33%) patients in Group B and all 30(100%) patients in Group M had significant pain. The mean pain score was 5.93 ± 0.7397 in Group B and 5.9 ± 0.7120 in Group M.

The duration of adequate post-operative analgesia or pain free period was taken as time from completion of surgery till the pain discomfort score > 5 was observed at which time rescue analgesic was given. This study showed that 29 (96.66%) patients in Group B and 25 (83.33%) patients in Group M had pain free period for 6 hours. 5 (16.66%) patients in Group B and 1 (3.33%) patient in Group M had post-operative analgesia for 12 hours. 2 (6.66%) patients in Group B and no patient in Group M had post-operative analgesia for 24 hours.

In this study, 11 (36.66%) patients in Group B and 18 (60%) patients in Group M received 2 doses in first 24 hours and 19 (63.33%) patients in Group B and 12 (40%) in Group M received 3 analgesic doses in first 24 hours. The mean total number of doses required in 24 hours was 2.633 ± 0.4901 in Group B against 2.4 ± 0.4983 in Group M. In Group B, patients had an average micturition time of 4 hours 7 minutes and 4 hours 6 minutes in Group M.

Table 3: Table showing adverse effect experience by patients

Variable	Group B N (%)	Group M N (%)	P value
Nausea& Vomiting	7 (23.33)	5 (16.66)	0.748
Delayed voiding	3 (10)	3 (10)	1.000

No evidence of post-operative infection or any other significant complications were seen in either group.

DISCUSSION

In the present study, children were pre-medicated using intramuscular ketamine 5 mg/kg mixed with 0.02 mg/kg of atropine to sedate the child. Various studied had similar and different kind of premedication (10,12,14,18-20).

In the present study, modified pain discomfort score(17) is used and the score of > 5 is taken as cut off point for termination of pain relief and indication of analgesic administration. The children were observed at the intervals of 1/2 hour, 1 hour, 2 hours, 6 hours, 12 hours and 24 hours.

This study found that mean duration of pain relief in Group B is 8 hours 19 minutes and in Group M is 7 hours 6 minutes. The mean duration of pain relief in group B was similar to various studies (10,12-16,18-21). Similar results i.e. longer time for first analgesic, was observed on study on caudal midazolam(8) and by epidural midazolam(22).

As this study includes the children from age 1-10 years, which consists of non-verbal (1-2 years), early verbal (3-5 years) and verbal (6-10 years) population (23).

In the present study, the average number of doses required were 2.63 in Group B and 2.4 in Group M. This was similar to some other studies done (8,9,24,25).

The mean micturition time in the present study is 4 hours 7 minutes in

Group B and 4 hours 6 minutes in Group M (p=0.47). 3 patients in Group B and 3 patients in Group M had micturition after 6 hours, but they required no active intervention for that. This finding is in concurrent with some other studies(13,20,23,26).

In this study, parents were asked to note the time for first unaided walking. The residual sedation of anaesthetics kept the subjects restricted to their beds or sleeping in immediate post-operative period. The mean duration of unaided walking was 3.933 ± 0.9072 hours in group B and 3.6 ± 1.003 hours in group M. This was statistically insignificant. Incidences of motor loss after caudal block is different in different studies (2,10,14,20,21,23,26). Incidence of post-operative nausea and vomiting in this study was 23.33% in Group B and 16.66% in Group M. This was found to be less than some other studies (11,12,15,18,19). There were no instances of hypotension, bradycardia, sedation, respiratory depression, residual paralysis or toxic reactions in any of the patients, observed for 24 hours.

This study stated that caudal epidural block with midazolam compared to caudal epidural block with bupivacine has shown similar degree of post-operative analgesia in children of unilateral inguinal herniotomy; with benefits of no post-operative motor weakness resulting in early ambulation, no urinary retention, less vomiting and less potential for serious complications.

CONCLUSION

We conclude that the caudal administration of midazolam in a dose of 50mg/kg provides equivalent analgesia to bupivacaine 0.25%, when administered pre-operatively in a volume of 1ml/kg to children undergoing unilateral inguinal herniotomy, without any significant adverse effects.

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