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A COMPARATIVE STUDY BETWEEN 0.25% LEVOBUPIVACAINE AND 0.25% ROPIVACAINE FOR CAUDAL ANALGESIA IN CHILDREN UNDERGOING INFRAUMBILICAL SURGERIES

Anaesthesiology

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ABSTRACT

Caudal block is one of the most popular and frequently practiced regional anaesthesia technique in paediatric population. We have studied comparative analysis of ropivacaine and levobupivacaine in caudal block in children undergoing infraumbilical surgery. We have observed in our study that both levobupivacaine (0.25%) and ropivacaine (0.25%) in caudal anaesthesia are effective agents for intraoperative and postoperative analgesia and both are comparable in terms of onset time, duration of sensory block and duration of motor block. Both causes significant residual motor blockade at wake up but has no residual motor blockade property at 180 minutes.

KEYWORDS

Background

Caudal block is one of the most popular and frequently practiced regional anaesthesia technique in paediatric population[1]. It is a safe and reliable technique that can be used with general anaesthesia for intraoperative and postoperative analgesia in patients undergoing short infraumbilical surgical procedures[2]. Sometimes residual motor block in post-operative period after caudal block causes distress to the patients. Among various long-acting local anaesthetics bupivacaine and ropivacaine in various concentrations are mostly used[3]. Compared to bupivacaine ropivacaine and levobupivacaine which has lower cardiotoxicity[4] cause less residual motor blockade. In this study we assessed the safety, efficacy and duration of analgesia for caudal block with levobupivacaine 0.25% and ropivacaine 0.25% at a volume of 0.5ml/kg in children undergoing infraumbilical surgeries.

Aims & Objectives

To compare two groups of patients (one with inj. levobupivacaine and another with inj. ropivacaine) regarding onset and duration of analgesia, efficacy of analgesia, time of first rescue analgesic, duration of motor block and adverse effect if at all occurring during the operative, postoperative period. Analyzing hemodynamic changes in them.

METHODOLOGY

The study was conducted after ethics approval in I.P.G.M.E.&R. /S.S.K.M. Hospital, Kolkata. Patients were aged between 6 months to 6 years, weight between 5 to 20 kg, ASA I ,II undergoing elective infraumbilical surgery within 90 minutes. Patients with local site infection, history of allergy to local anesthetics, seizure /neurological disorders, hemodynamically compromised, coagulation disorders were excluded from the study. It was estimated that 49(n=49) patients were required per group to detect the difference of 20% in this parameter between groups (assuming that successful caudal anesthesia occurring in 95% subjects in the better performing group). Calculation assumed 80% power and 5% probability of type I error-n.master-2.0(Department of Biostatistics, Christian Medical College, vellore; 2012) software was used to sample size calculation. This prospective, randomized clinical trial included 98 patients and randomly divided into two groups. All patients received caudal analgesia after general anesthesia; one group (Group L) received 0.25% inj. Levo-bupivacaine and another group (Group R) received 0.25% inj. Ropivacaine 0.5ml/kg in caudal analgesia.

Airway was secured with LMA after premedication with 0.01mg/kg iv atropine, sedation done with iv propofol 2mg/kg and iv fentanyl 0.002 mg/kg and maintained with iv propofol 0.125mg/kg/min. Thereafter with proper aseptic precaution caudal block was performed in the lateral position using an 22G needle. Surgery was not to be commenced until proper surgical anesthesia was achieved.

The primary outcome of the study was the clinical efficacy of the caudal block during operation which was defined as the absence of gross movements or significant (>20%) change in pulse rate and or respiratory rate on application of the forceps to the skin of the surgical field. In case of changes in two of these three parameters on mechanical stimulus even after 15 minutes the block was considered to be clinically ineffective. Post-operative pain was evaluated using CHIPPS score. When the CHIPPS score reached ≥ 4 points, suppository paracetamol 30 mg/kg was administered. Time to rescue analgesic was noted. Residual motor block was evaluated by using modified Bromage scale; defined as score of ≥1 points at wake up and 180 minutes after caudal block. Time of block, skin incision, surgery duration, wake up time after discontinuing propofol infusion noted.

Sensory block tested every 5 mins after block till onset then every 15 mins, motor blockade every 15 mins. Hemodynamics every 5 mins for first 30 mins then every 15 mins until first rescue analgesic drugs. Obvious side-effects like nausea-vomiting, hypotension, respiratory depression, pruritus, retention urine etc. noted.

RESULTS

There has been no demographic difference between the two groups. Both groups were comparable regarding type of surgery and duration of surgery and intraoperative hemodynamics. Onset of block was also comparable. The comparison between the children's pain intensity based on CHIPPS score vs time is shown in Table 1. Both the groups were comparable regarding wake-up time after surgery, time for requirement of first rescue analgesic drug. Time to first rescue analgesics were comparable. Average duration of sensory block (112 minutes in both groups) and motor block (group L= 143.87 min and in group R= 135.61 min) was also comparable thus recovery from motor block was also similar. Residual motor block assessed by modified Bromage Scale(MBS) at wake-up time and at 180 mins are also comparable (p=0.11 by Mann-Whitney U Test). When compared complete recovery time in patients found to be comparable in both the groups.

Among 98 patients 7 patients developed nausea/vomiting in Group L and 2 patients in Group R. 2 patients from Group L had urinary retention whereas in Group R 3 patients had retention. Neither patient had hypotension, pruritus or respiratory depression. Side effects after the caudal injection were also comparable between two groups.

Table 1

	Group L	Group R	P value
CHIPPS			
@0 mins	5	5	1
@3 mins	4.14	4.18	0.33
@6 mins	3.59	3.69	0.57
@9 mins	2.81	2.91	0.68
@12 mins	2.26	2.2	0.47
@15 mins	2.12	2.06	0.15
@30 mins	2.04	2.14	0.55

@45 mins	2.11	2.07	0.15
@60 mins	2.1	2.06	0.25
@75 mins	2.489	2.4	0.35
@90 mins	2.85	2.9	0.71
@105 mins	3.23	3.47	0.06
@120 mins	3.47	3.6	0.032
Duration of sensory block	112.65	112.34	0.9
MBS			
@0 mins	0	0	
@15mins	1.42	1.53	0.9
@30 mins	2.44	2.48	0.73
@45 mins	1.45	1.85	0.43
@60 mins	1.85	1.81	0.4
@75 mins	1.71	1.51	0.86
@90 mins	1.48	1.48	0.22
@105 mins	1.3	1.24	0.19
@120 mins	1.04	0.89	0.17
@135 mins	0.71	0.5	0.28
@150 mins	0.36	0.18	1.0
@165 mins	0.19	0.16	0.86
@180 mins	0.1	0.14	0.73
MBS @ wake up	1.67	1.63	0.73
Duration Of Motor block (mins)	143.87	135.61	0.083
Complication			
Nausea/vomiting	7	2	0.16
Urinary retention	2	3	0.98
Hypotension	0	0	
Pruritus	0	0	
Resp. depression	0	0	

Discussion

Pain control is a very important goal in pediatric surgery because insufficient treatment has been demonstrated to make the following procedures more distressing[5] that can lead to physiological and psychosocial repercussions[6,7]. Among various techniques of regional anaesthesia in paediatric population caudal epidural anaesthesia is one of the most common used technique. Dalens B (2003)[8] studied that neuraxial blocks are well tolerated by infants and children.

Bupivacaine, ropivacaine are long-acting local anaesthetics most commonly used for caudal anaesthesia in children[9].

Levobupivacaine is generally a well-tolerated anaesthestic and analgesic with a wide range of clinical effectiveness and can be used an alternative to bupivacaine[10.11.12].

In this parallel group, single blind, randomized controlled trial we studied 98 patients randomly either in Group L received 0.5 ml/kg 0.25 % levobupivacaine or in Group R patients received 0.5ml/kg 0.25% ropivacaine by caudal route.

There was not a single case who experienced intraoperative hypotension or bradycardia. Mean duration of motor block was 143.87 minutes for levobupivacaine and 135.63 minutes for ropivacaine and this difference has also no statistical significance (p 0.84). Average duration of sensory block was 112.65 minutes and 112.35 minutes in levobupivacaine and ropivacaine groups respectively (p 0.90). In case of asymmetrical block highest numerical value was recorded. In this study mean MBS at wake up was 1.67 and 1.63 in levobupivacaine group and ropivacaine group respectively. There was residual motor blockade at wake up in both the groups but there was no residual motor blockade at 180 minutes in either group of patients.

As for complications there were no cases of respiratory depression, pruritis and hypotension in patients of either group of this study. There were 7 cases of PONV reported in the group who received levobupivacaine and 3 cases in the group who received ropivacaine. 2 cases in each group complained of urinary retention. These were successfully managed.

CONCLUSION

Adding caudal block to GA is very much safe and effective method for intraoperative and perioperative pain control in pediatric patients undergoing infraumbilical surgery. Much faster onset of effective sensory and motor block with a longer duration of postoperative analgesia.

From the observation and analyses of present study, it can be concluded that both levobupivacaine (0.25%) and ropivacaine (0.25%) in caudal anaesthesia are effective agents for intraoperative and postoperative analgesia and both are comparable in terms of onset time, duration of sensory block and duration of motor block. Both causes significant residual motor blockade at wake up but has no residual motor blockade property at 180 minutes.

Some patients who received levobupivacaine and ropivacaine experienced postoperative nausea vomiting and urinary retention and they were successfully managed. Both levobupivacaine and ropivacaine do not cause any hemodynamic instability when administered caudally.

The limitation of our study was that we did not measure blood levels of the drug administrated; did not recorded CHIPPS score at wake up; the age distribution was not homogenous within groups.

Hence further studies are still requiring to define the optimal analgesic dosage and combination of drugs in patients undergoing infraumbilical surgeries. Studies over much longer duration are required to see the effects to document any undesired effects of drugs on the caudal space itself.

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