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Original research article

COMBINATION OF 0.25% BUPIVACAINE WITH DEXMEDETOMIDINE AND 0.25% ROPIVACAINE WITH DEXMEDETOMIDINE FOR PAEDIATRIC CAUDAL BLOCK IN INFRAUMBILICAL SURGERIES: HAEMODYNAMIC CHANGES

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Abstract

A thorough neurological examination should be performed before planning for caudal epidural blocks. Raised ICP is an absolute contraindication. It can result in trans tentorial and foramen magnum herniation. Immediate loss of consciousness, permanent neurological sequelae or even death can occur. Major malformations are total contraindications for caudal epidural blocks as it results in impalpable anatomy. Universal sampling with randomization process. Patients were randomly assigned into two groups by computer generated table. Data was presented as mean, standard deviation or median and qualitative data as frequency and percentage. Data was compared by paired t test and Man- Whitney U test for independent continuous variables. The basal mean arterial pressure in group I was 62.6±3.52mmHg and in group II was 59.6±3.16mmHg. After 75mins it was 56.50±3.12mmHg and 57.0±3.54mmHg respectively.

Keywords: Paediatric caudal block, dexmedetomidine, haemodynamic changes

Introduction

Caudal epidural blocks are considered to be safe easy to perform by the French Paediatric Society of Anaesthesia (ADARPEF) which analyzed 84,412 anaesthetic procedures, they noted complications only in eight cases. It included accidental spinals, convulsions (due to inadvertent vascular injection) and rectal penetration. No neurological sequelae and no deaths were observed [1].

Gunter (1991), surveyed 1,58229 caudal epidural procedures. These procedure were done in 192 different hospitals in the USA. No deaths was related to the procedure.

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Complications were noted in 16 subjects. These included total spinals, syringe swaps, two rectal penetrations, dysrhythmias, hypotension, and one cardiac arrest. No infection or hematoma was noted.

Various needles, had been used for performing caudal epidural blocks. IV needle with a plastic cannula, needle with stylet and hypodermic needles used for the injection also have been used. For lower part of the abdomen, lower limbs, especially in neonates, infants, certain high-risk children caudal epidural block gives adequate intra- and postoperative analgesia [2].

In high-risk neonates, caudal epidural block reduces the need for general anaesthesia, endotracheal intubation and hence the risk of postoperative apnea. General anaesthesia can also be given with caudal epidural blocks for patients who do not tolerate surgery under regional anaesthesia alone. For urgent procedures such as reduction of incarcerated hernias, caudal epidural block is adequate and allows the return of normal bowel function before the surgical repair 23. Superficial operations of the lower limb such as; skin grafting and improving blood flow and reversing ischaemia in the lower limbs are other indications [3].

Emergency procedures for which Caudal epidural blocks are given include testicular torsion; repair of an omphalocele; strangulated hernia repair; and for the reduction of incarcerated hernias. Caudal epidural blocks are indicated for elective procedures that include: repair of inguinal or umbilical hernias, hydrocele, orchidopexy, and hypospadias; circumcision; anorectal and genitourinary surgery. surgery on the hip, the lower extremities, and the area of the coccyx; also used for taking muscle biopsy in undiagnosed neuromuscular disorders. Caudal epidural blocks are also performed upper abdominal surgery in children. But the risk of local anaesthetic toxicity, morbidity, and even mortality is more [4].

A thorough neurological examination should be performed before planning for caudal epidural blocks. Raised ICP is an absolute contraindication. It can result in trans tentorial and foramen magnum herniation. Immediate loss of consciousness, permanent neurological sequelae or even death can occur. Major malformations are total contraindications for caudal epidural blocks as it results in impalpable anatomy. Spina bifida occulta is a relative contraindication for caudal epidural blocks. Anatomical landmarks must be defined before the procedure commences.

The presence of a meningomyelocele or patients with sacral or lumbosacral agenesis are few other contradictions [5, 6].

Methodology

Study design: prospective double-blind randomized control study.

Study population: Children undergoing infraumbilical surgeries satisfying inclusion criteria.

Sample size: With 95% confidence interval, power of the study being 80% and allocation ratio being 1:1 expecting a odd ratio of 4 (according to present reference), sample size in each group was 30.

Sampling method: Universal sampling with randomization process. Patients were randomly assigned into two groups by computer generated table.

Data was presented as mean, standard deviation or median and qualitative data as

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frequency and percentage. Data was compared by paired t test and Man- Whitney U test for independent continuous variables.

Study groups

- 60 children were divided into two groups consisting of 30 children in each group.

Group 1: Received 0.25% bupivacaine 1ml/kg+ 1 µg/kg dexmedetomidine.
Group 2: Received 0.25% ropivacaine 1ml/kg+ 1 µg/kg. dexmedetomidine (0.5% ropivacaine will be diluted to 0.25%).

Inclusion criteria

a) ASA Physical status I and II patients.
b) Patients between 6 months to 6 years.
c) Patients coming for infraumbilical surgeries.

Exclusion criteria

a) Parental refusal.
b) Patients with known allergy to the study drugs.
c) Coagulopathies.
d) Infection at the site of injection.
e) History of developmental delay.
f) Neurological diseases.
g) Skeletal deformities.
h) Anticipated difficult airway.
i) Surgeries in prone position.

Study procedure

a) A detailed history, complete physical examination and routine investigations were done for all the patients.
b) Informed consent was taken.
c) The patient was premedicated with syrup Triclofos 30 mg/kg and oral atropine 0.3mg if wt is <10 kg and 0.6 mg if wt is >10 kg 45 minutes before the surgery.
d) Patient was shifted to OT and pre-induction monitors were connected (ECG, pulse oximeter, non-invasive blood pressure).
e) Patient was induced with oxygen and nitrous oxide at 1:1 ratio and sevoflurane 1-3%.
f) Intravenous (IV) access was secured with 22G IV cannula.
g) Appropriate size Proseal Laryngeal Mask Airway (PLMA) was inserted after deepening the plane of anaesthesia with Inj. Propofol 2mg/kg.
h) Anaesthesia was maintained with oxygen, nitrous oxide in 1:1 ratio with 0.6% sevoflurane with patient on spontaneous ventillation.

Results

The mean basal heart rate in group I was 137±7.16/min and in group II was 132.5±11.86/min. At the end of 75 mins the mean heart rate in group I was 116.65±6.22/min and in group II was 107±6.36/min.

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Table 1: Heart rate

HR (bpm)	Group1	Group 2	P value
0 min	137+_7.16	132.5+_11.86	0.456
5 min	133+_5.72	130.8+_7.57	0.789
10 min	130+_6.57	129.4+_6.59	0.567
15 min	127.5+_7.81	127.7+_9.25	0.234
20 min	126.3+_7.47	126.1+_8.45	0.432
25 min	125.8+_6.72	123.3+_6.34	0.321
30 min	120.7+_5.82	118+_5.57	0.678
45 min	119.6+_7.23	117.1+_8.56	0.487
60 min	116.75+_7.44	109+_7.34	0.456
75 min	116.65+_6.2	107+_6.36	0.345

The intraoperative systolic blood pressure in group I and group II. The basal mean systolic blood pressure in group I was 92.98±3.89 mmHg and in group II was 92.80±3.42mmHg. After 75 mins it was 88.75±4.31mmHg and 92.5±4.13mmHg respectively.

Table 2: Comparison of Systolic BP in two groups of patients

SBP (mm Hg)	Group1	Group 2	P value
0 min	92.98+_3.89	92.80+_3.42	0.654
5 min	87.27+_5.54	90.8+_5.56	0.453
10 min	89.36+_4.67	88.8+_6.75	0.675
15 min	88.12+_6.54	88.2+_5.34	0.567
20 min	88.56+_7.34	87.0+_7.45	0.234
25 min	88.26+_2.89	88.3+_2.90	0.567
30 min	89.2+_4.56	89.4+_4.56	0.456
45 min	89.0+_7.45	91.5+_6.45	0.238
60 min	88.45+_5.45	90.8+_3.65	0.567
75 min	88.75+_4.31	92.5+_4.13	0.234

The basal mean diastolic blood pressure in group I was 46.43±3.72mmHg and in group II was 47.60±3.78mmHg. After 75 mins it was 44.20±3.42mmHg and 44.2±3.17mmHg respectively.

Table 3: Comparison of Diastolic BP in two groups of patients

DBP (mm Hg)	Group1	Group 2	P value
0 min	46.43+_3.72	47.60+_3.78	0.567
5 min	44.70+_4.67	45.32+_5.01	0.236
10 min	44.60+_3.45	44.56+_2.43	0.432
15 min	45.50+_4.45	42.61+_3.78	0.675

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20 min	43.71+_5.67	42.50+_4.56	0.543
25 min	44.0+_4.34	44.31+_2.56	0.487
30 min	46.0+_6.34	44.38+_3.56	0.675
45 min	45.23+_2.31	44.81+_4.54	0.453
60 min	44.51+_2.56	44.71+_6.34	0.348
75 min	44.20+_3.42	44.20+_3.17	0.765

The basal mean arterial pressure in group I was 62.6±3.52mmHg and in group II was 59.6±3.16mmHg. After 75mins it was 56.50±3.12mmHg and 57.0±3.54mmHg respectively.

Table 4: Comparison of mean arterial pressure in two groups of patients

MAP (mm Hg)	Group1	Group 2	P value
0 min	62.6+_3.52	59.6+_3.16	0.453
5 min	58.3+_3.67	58.76+_4.23	0.675
10 min	57.93+_6.45	56.52+_3.20	0.432
15 min	58.2+_1.89	56.28+_1.87	0.567
20 min	58.1+_2.76	57.68+_2.67	0.659
25 min	57.3+_5.43	58.20+_3.32	0.348
30 min	58.12+_3.34	58.56+_2.67	0.564
45 min	57.62+_2.15	58.56+_3.34	0.697
60 min	57.56+_1.56	57.0+_4.34	0.348
75 min	56.51+_3.12	57.0+_3.54	0.564

The basal SPO2 in group I was 100±0 % and in group II was 99.96±0.18%. After 75 mins it was 99.9±0.18% and 100% respectively.

Table 5: Comparison of SPO_2 in two groups of patients

MAP (mm Hg)	Group1	Group 2	P value
0 min	100+_0	99.96+_0.18	0.123
5 min	99.56+_0.67	99.96+_0.45	0.243
10 min	99.76+_0.13	99.34+_1.45	0.321
15 min	99.87+_0.45	99.87+_0.67	0.432
20 min	99.45+_1.23	99.45+_0.89	0.163
25 min	99.87+_0.56	99.76+_0.42	0.234
30 min	99.32+_0.65	99.48+_0.59	0.154
45 min	99.56+_0.23	99.86+_0.64	0.196
60 min	99.96+_0.18	100+_0	0.325
75 min	99.9+_0.18	100+_0	0.143

Vital parameters were recorded postoperatively till the rescue dose of analgesic was given and then results were compared between both the groups.
There was not much variation in the hemodynamics postoperatively in both the.

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Discussion

Identification of the caudal epidural space is easy in children younger than 7 years, later it may be difficult because as the child grows there is a reduction in the size of the sacral hiatus and the sacral vertebrae fuse. In our study we included the children aged between 6months to 6years.

Bernard *et al*. in 1989 observed high failure rates in children above 7 years of age.

As the weight increases the volume of local anaesthetic required is higher.

This can increase the cephalad spread of the drug leading to a higher level of Blockade. The volume of the sacral canal averages 14.4 mL, but varies from 9.5 to 26.6 mL. Our study had children weighing less than 25 kgs.

In 1998 Constant *et al*. studied the efficacy of caudal blockade in children weighing less than 25kg.

As awake children do not cooperate while giving caudal block, they have to be sedated adequately. Various techniques of induction had been used. Some have induced the patients with Inhalational anaesthetics and some with intravenous anaesthetics and maintained either on spontaneous ventilation through a face mask/LMA or intubated the patients using Neuromuscular blockers.

Cook *et al*. in 1995 induced patients with Propofol 3-4mg/kg followed by placement of LMA and maintained with Halothane. In 2000 Ivani *et al*. premedicated the patients with oral Midazolam, induced and maintained with Sevoflurane through a regular face mask [7].

Manjushree *et al*. in the year 2003 gave oral Midazolam and iv Atropine as premedicants and induced with Halothane and intubated with Vecuronium and maintained with Halothane, Nitrous oxide and Oxygen [8].

In 2005 Locatelli *et al*. premedicated all the children with rectal Atropine and Midazolam, induced with Propofol and Fentanyl and maintained with Propofol infusion and the airway was controlled with a facemask or LMA [9].

“Delirium” during emergence from sevoflurane anesthesia has been well documented in children, hence we used Halothane as the inhalational agent. In our study we premedicated all patients with oral atropine 0.3 mg if wt was <10 kg and 0.6 mg if wt was >10 kgs, syrup triclofos 30 mg/kg, induced with sevoflurane and maintained on spontaneous ventilation with Halothane, Nitrous oxide and Oxygen.

Dexmedtomidine due to its action on the alpha 2 receptors causes a fall in the heart rate and blood pressure. Anand *et al*. compared ropivacaine plain (group R) and with dexmedetomidine (group R) in 60 children. They observed significant variation in hemodynamic parameters intraoperatively and post operatively in two groups [10].

Gupta *et al*. compared ropivacaine with saline (group A) and with dexmedetomidine (group B) in 60 pediatric patients. Hemodynamic parameters were more stable and on lower scale in dexmedetomidine group [11].

El-Hennawy *et al*. compared three groups. Group 1 was given bupivacaine with dexmedetomidine Group 2 was given bupivacaine with clonidine. Group 3 was given bupivacaine with normal saline. The intraoperative and post-operative hemodynamic parameters were significantly lower in first two groups as compared to the third group [12].

We did not observe any significant difference in SBP, DBP between the two groups,

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there was an increase in the haemodynamic parameters, when the child experienced pain.

Almost all the studies are associated with complications but most of them are within the acceptable range. The ultimate goal is to reduce the severity and number of complications as far as possible.

El hennaway in 2009 observed postoperative nausea and vomiting and urinary retention as side effects in those given caudal Dexmedetomidine as an adjuvant [12].

Conclusion

Intra-operatively there was a minimal fall in the heart rate and no significant variation in the mean arterial pressure in both the groups. Postoperatively there were no significant changes in the vital parameters until the child experienced pain when there was an increase in heart rate.

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