

Comparison of general anaesthesia v/s caudal epidural in paediatric infra umbilical surgeries

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Abstract

Background: Our aim was to compare caudal epidural versus general anaesthesia in paediatric patients for safety, efficacy, post-operative analgesia, cost effectiveness and surgeon's comfort.

Material and Methods: 60 paediatric patients 2 -6 years of ASA grade I and II posted for infra-umbilical surgery were randomly divided in to two groups. Group C (n=30) received caudal block anaesthesia using 0.25% Ropivacaine 1ml kg⁻¹. Group G (n=30) received general anaesthesia with Thiopentone sodium, Succinylscoline as induction agent and O₂, N₂O, Isoflurane and incremental doses of Atracurium as maintenance. They were extubated in a usual manner after surgery. In both groups pain was assessed by observer pain score.

Observation and Results: Cost was less in group C. There was no significant change in hemodynamics in both groups. Duration of rescue analgesia was significant less in group G. Rate of post-operative complication was higher in group G. caudal anaesthesia was much accepted by surgeon.

Conclusion: Caudal epidural is quite inexpensive with excellent anaesthesia and satisfactory post-operative analgesia with lesser complication rate.

Keywords: Caudal epidural, General anaesthesia, Thiopentone, Ropivacaine.

1.Introduction

Caudal epidural is one of the most common regional techniques used for post-operative pain management in paediatric patients[1]. It is commonly used for procedures like urogenital, rectal, inguinal and lower extremity surgeries[2].

There are advantages to use regional anaesthesia that are evident and continue to increase the popularity of its practice. The use of regional anaesthesia in combination general anaesthesia results in reduced concentration of potent inhaled agents and reduced or absent use of opioids resulting in quick recovery time and less nausea and vomiting.

In addition, regional anaesthesia suppresses the neuroendocrine responses to surgery compared with general anaesthesia alone. Regional anaesthesia has been a therapeutic tool in treatment of post-dural puncture.

In 1954, Rouston F G in Canada and Stringer R M first described in Anaesthesia and analgesia, lumbar epidural anaesthesia for inguinal hernia repair in infants and children.

The common advantages of caudal anaesthesia are adequate anaesthesia without polypharmacy, endotracheal intubation and respiratory support, minimal biochemical and physiological differences, absence of post operative nausea and vomiting, rapid return of feeding, minimal postoperative apnoeic spells, low cost, reduction in post operative hospital admissions in an outpatients population.

Drugs, which used commonly in caudal analgesia, are bupivacaine & lignocaine. Opioids may also be used as adjunct, although they are not recommended for day case surgery because of the risk of delayed respiratory depression[3].

Ropivacaine a new long acting amide local anesthetic agent, with fewer toxic cardiac and central nervous system effects provides greater separation of sensory and motor effects. The sensory block provided by ropivacaine is similar to that produced by an equivalent dose of bupivacaine in extradural and peripheral nerve block. The motor block produced by ropivacaine is slower in onset, less intense and shorter in duration than that after an equivalent dose of bupivacaine[4].

General anaesthesia in paediatric age group may be associated with difficulty in intubation due to anatomy of larynx, delayed recovery from muscle relaxant, more incidences of post-operative nausea and vomiting which may interfere with pain perception in paediatric patient due to excessive crying.

2. Materials and Methods

This study was conducted in Dhiraj hospital in Department of Anaesthesiology after clearance from the ethical committee. All the parents of patients' participating in the study were explained clearly about the purpose and nature of the study in the language they could understand. They were included in the study only after obtaining a written informed consent.

2.1 Inclusion Criteria

- ASA Grade I and II
- Age between 2-6 years
- Planned for elective infra-umbilical surgeries

2.2 Exclusion Criteria

- History of drug sensitivity
- Parental denial for consent
- Age <2yrs or >6yrs
- Skin infection at local site
- Congenital deformity
- Emergency surgery
- ASA grade III or IV
- Surgery >150 min
- History of convulsion
- Bleeding disorders

We studied 60 patients of American Society of Anesthesiologist (ASA) grade- I & grade- II, who were admitted for infra-umbilical surgery under caudal epidural anaesthesia and general anaesthesia. They were allocated randomly into two equal groups. Group C (n=30) (caudal group) received inj. Ropivacaine 0.25 % with inj. Ketamine 1-2 mg kg⁻¹ to perform the procedure, 1ml kg⁻¹ and group G (n=30) (general anaesthesia group) received general anaesthesia with inj. Thiopentone 5mg kg⁻¹ & Inj. Succinylcholine 1.5 mg kg⁻¹ as induction agent and O₂, N₂O, Isoflurane and incremental doses of inj. Atracurium as maintenance. They were extubated in

a usual manner after surgery. The study was prospective and interventional in nature.

All the patients were examined preoperatively for detailed clinical and physical examination, necessary laboratory investigation were carried out. All the patients were kept nil per orally, at least for 4-6 hours prior to surgery. In the operation room after taking i.v. line, i.v. infusion with Isolyte-P was started according to body weight. All patients received premedication in the form of inj. Glycopyrrolate 0.004 mg/kg i.v.; inj. Ondansetron 0.1 mg/kg i.v.; inj. Midazolam 0.03mg/kg and oxygenated with facemask.

a) Caudal anaesthesia technique

Group C (n=30) received Inj. Ketamine 1-1.5 mg/kg i.v. to make the patient immobile while performing caudal block with inj. Ropivacaine 0.25 % 1ml kg⁻¹. Patients were placed in left lateral decubitus position and the back was painted and draped. Confirmation of the bony landmarks was done. Sacral hiatus then was located. After identifying the midline, a finger was run down the tips of thoracic and lumbar spine towards the sacrum where the sacral hiatus was palpated as a depression between the two sacral cornua. Alternatively, a finger was run upwards towards the sacrum after identifying the tip of the coccyx, which then palpates the hiatus.

Once the sacral hiatus was identified, the hiatus was punctured with a short beveled 1.5 inch 23 gauge needle. The needle was inserted at an angle of 45° to the skin, until the characteristic "give" was felt, which was indicate that the sacro-coccygeal ligament was pierced. On entering the space, the needle was lowered to an angle of 20° and advanced 2-3 mm to make sure that the entire bevel was inside the space. Once the needle position was confirmed, inj. Ropivacaine 0.25% 1ml kg⁻¹ was injected and patients were kept in supine position for 10 minutes. After 10 minutes patients were handed over to the surgeon. Throughout the surgery patients were given O₂ through venturi mask.

b) General anaesthesia technique

Patients were pre-oxygenated with 100 % oxygen for 3 minutes. Group G (n=30) received general anaesthesia with inj. Thiopentone 5mg kg⁻¹, Inj. Succinylcholine 1.5 mg kg⁻¹ as induction, then were intubated with appropriate size of endotracheal tube. Patients were maintained on O₂, N₂O, Isoflurane, inj. Atracurium 0.5 mg kg⁻¹ as loading dose and incremental doses of 0.1 mg kg⁻¹. After completion of surgery & satisfactory respiratory efforts, patient were reversed from muscle relaxants by inj. Glycopyrrolate 0.008 mg kg⁻¹ and inj. Neostigmine 0.05 mg kg⁻¹ i.v. slowly.

Patients were monitored for SpO₂, pulse (H.R.), Non Invasive Blood Pressure (NIBP) was recorded at 5-minute intervals for 30 minutes then at every 10 min till the end of the surgery. Patients were assessed every 30 minutes after surgery for post-operative analgesia by Observer Pain Score (OPS)[16][17] till the rescue analgesia.

Rescue medication (rectal suppository of Diclofenac 1.5 mg kg⁻¹) was given when the OPS score ≥4.

2.3 Statistical analysis

Data analysis was performed using the Student’s t-test. Results are presented as means SDs, numbers or percentages, and p value of < 0.05 considered statistically significant.

3.Results

Total of 60 patients were recruited for the study. There were no significant differences between the two groups in demographic data and duration of surgery (Table 1).

Table 1: Demographic profile

Parameters	Group G (n=25)	Group C (n=25)	P Value	
Age (years) Mean±SD	4.2±0.15	4.4±0.16	p>0.59	NS
Sex (m/f)	21/9	29/1		
Duration of surgery (min) Mean±SD	85.33±1.67	83.33±1.49	p>0.15	NS

NS- not significant

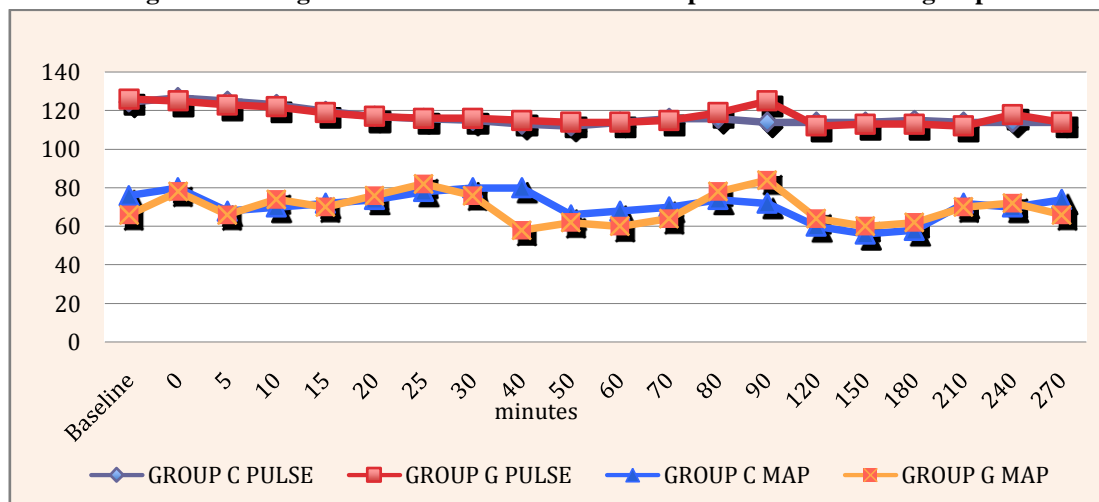
In Group C, one patient had delayed onset of action of the caudal block, which had to be supplemented by Inj. ketamine 2 mg /kg i.v. In Group G, three patients had delayed recovery with no other abnormal outcome.

Table 2: Comparison of mean time for pre-operative preparation in both the groups

Time for pre-operative preparation (min)	Group G	Group C	P Value
Mean±SD	7.3 ± 2.6	10	P<0.05

Time of pre-operative preparation is considered as the time since the start of premedication till the patient was handed over to surgeon. In group C, the patients were handed over to surgeon after 10 minutes.

Figure 1: Change in heart rate and mean arterial pressure in both the groups



There was no significant change in hemodynamics in both groups. SpO₂ remained stable throughout the surgery in both the groups.

Table 3: Mean duration of surgery

Duration of surgery (min)	Group G	Group C	P value	
Mean ± SD	85.33±1.67	83.33±1.49	0.15 NS	NS

NS – not significant

Mean duration of surgery was comparable in both groups.

Table 4: Mean duration of rescue analgesia

Rescue analgesia (min)	Group G	Group C	P value	
Mean± SD	88±4.68	266.0±1.89	< 0.0001	S

S – Significant

Rescue analgesia in group G was given soon after surgery which was much significant.

Table 5: Observer's pain score ≥ 4 at various time intervals[15]

Time (hours)	Group C n (%)	Group G n (%)	P value	Significance
1	0	0		NS
1.5	0	30 (100)	< 0.0001	S
2	0			
2.5	0			
3	0			
3.5	0			
4	19 (63.3)			
4.5	11 (36.6)			

Table 6: Complication related with caudal anaesthesia technique

Complications	Group C (n)
Dural puncture	0
Failed technique	0
Hypotension	0
Convulsion associated with Local Anaesthetic Agent	0
Urinary retention	0
Neurological complications	0

Table 7: Complication related with general anaesthesia technique

Complications	Group G n (%)
Gastric inflation	2 (6)
Laceration of oral cavity	2 (6)
Perioperative hypotension	1 (3.3)
Post-operative nausea and vomiting	3 (10)
Hoarseness of voice	1 (3.3)
Delayed recovery	3 (10)
Post-operative irritability	2 (6)
Urinary retention	2 (6)

There was no incidence of any complication in group C. in group G three patients had delayed recovery and three patients had nausea and vomiting, which was significant.

4. Discussion

Epidural analgesia is now firmly established in paediatric anaesthetic practice and its popularity continues to grow. Benefits of caudal epidural include, avoidance of per operative parenteral opioids so as to limit the incidences of respiratory depression and reduction of stress hormone responses. General anaesthesia has many adverse incidences of sore throat, oral trauma, respiratory depression, delayed recovery and needfulness of multiple top-up doses of analgesics[19]. Avoidance of complications associated with endotracheal intubation as for example oral and laryngeal injury, post-operative sore throat and complication of general anaesthesia like post operative nausea and vomiting (PONV), respiratory depression, aspiration pneumonitis and awareness during anaesthesia.

Ropivacaine is a newer amide with superior post-operative analgesia and motor block by caudal administration. Among different doses of

ropivacaine, 0.25% 1 ml kg⁻¹ showed superior post-operative analgesia[8] and significantly lower incidence of motor block[5].

In our study, Isoflurane was used as inhalation agent in Group G, Isoflurane decreases systemic vascular resistance and so reduces blood pressure and causes tachycardia. So there was a transient rise in heart rate (Miller's Anaesthesia). While the same was observed after giving inj. Ketamine before caudal block in group C.

In the present study, there was no significant difference in the two groups with regard to age and weight.

Surgeons' satisfaction was higher in group C which was comparable with the study of Himanshu *et al*[11]. As in group C there was better analgesia and no incidence of nausea or vomiting as compare to group G three patients had nausea and vomiting. Delayed recovery from neuromuscular blockade was sometimes considered as the prime issue especially in

paediatric age group where prolonged ventilation may lead to respiratory complications. In our study, group G had three patients with delayed recovery. Group C patients provided acceptable operating condition to the surgeon.

In group C we had given inj. Ketamine prior to caudal block to make the patient immobile to perform the block. We had asked the surgeon to start after 10 minutes. In one patient there was delayed onset of action so we had to repeat the dose of Ketamine before starting the surgery. Time taken for pre-operative preparation was less in group G than group C.

Patients in group G, were given rescue analgesia soon after extubation. While in group C rescue analgesia was given after 4 hours of caudal block, which was significant.

In our study, post-operatively out of 30 patients all (100%) patients reached pain score 4 in less than 15 minutes in group G. In group C out of 30 patients 19 (63.3%) patients reached pain score 4 in 4 hours while 11 (36.6%) patients reached in 4.5 hours which was comparable with the study of Shah *et al*[11].

In group G two patients had gastric inflation (6%), two patients had oral trauma (6%), three patients had PONV (10%), three patients had delayed recovery (10%), two patients had urinary retention (6%), two patients had post operative irritability (6%), one patient had perioperative hypotension (3.3%) and one patient had hoarseness of voice (3.3%).

Cost of anaesthesia was less in group C than in group G.

5. Conclusion

Caudal anaesthesia gives better intra-operative and post-operative analgesia with fewer complications. It is also cheap and devoid of polypharmacy.

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