Original Article

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Comparison of Spinal Anaesthesia versus General Anaesthesia in Paediatric Patients Undergoing Lower Abdomen Surgeries

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Abstract

Background: Over the last three decades, spinal anaesthesia has been widely used for herniotomy and other lower abdominal surgeries in paediatric age group. However the children undergoing surgery under regional Anaesthesia require sedation and closed monitoring. General Anaesthesia in paediatric age-group has its own sets of complications like difficult airway and sometimes life threatening complications as bronchospasm, laryngospasm etc may also occur. *Methods*: In this prospective study, 50 patients of 2 to 7 years divided into two groups, group SA and GA. SA group received spinal anaesthesia, patient were sedated in preoperative room with Dexmedetomidine 1mcg/kg(over 20 minutes infusion) and throughout procedure sedation was maintained on Dexmedetomidine 0.5mcg/kg with infusion. For group GA standard protocol of General anaesthesia was followed. The results were analysed using the Chi- Square Test. *Results*: The haemodynamic pattern and respiratory function were stable and smooth recovery was seen in group SA. While in group GA, oxygen desaturation was observed in 16% patients in immediate postoperative period. Incidence of nausea vomiting and sore throat was seen in 8% patients of GA group. *Conclusion*: It can be concluded that spinal anaesthesia is a suitable & alternative anaesthetic technique for paediatric surgery to avoid the incidence of postoperative respiratory complications of general anaesthesia.

Keywords: Paediatric Spinal Anaesthesia; Dexmedetomidine Sedation; General Anaesthesia; Lowers Abdomen Surgeries in Children.

Introduction

The use of spinal anaesthesia in infant and children for lower abdomen surgeries is gaining considerable popularity worldwide. August Bier, in 1898, first reported the successful use of spinal anaesthesia (SA) in an 11-year-old child for surgery of thigh tumour. By the middle of century due to considerable improvement in techniques of general anesthesia (introduction of muscle relaxants and safe intravenous induction agents) along with lack of expertise for spinal anesthesia (fear of adverse effects, lack of patient co-operation) possibly prevented widespread use of spinal anesthesia in children [1,2].

Over the last three decades, spinal anaesthesia has been increasingly used for herniotomy and other lower abdominal surgery in new-borns and infants who are at high risk of postoperative apnoea [3] after general anesthesia. Paediatric spinal anesthesia has been extensively practiced by many centres due to increase in knowledge on pharmacology, safety information, availability of specialized equipment for regional anaesthesia and monitoring in children. Paediatric Spinal Anaesthesia is slowly regaining its importance and becoming preferred choice in most lower abdomen surgery [4]. Several small clinical

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trials have shown spinal anesthesia in infant being associated with decreased incidence of hypotension, hypoxemia, bradycardia or post-operative apnoea compared with general anesthesia [2]. However, most children under spinal anaesthesia need sedation, closed monitoring of respiratory function and airway reflexes is necessary [5,6,7,8].

Various pharmacological agents were used in past for procedural sedation during spinal anesthesia in children like midazolam, thiopentone sodium, propofol and ketamine. More recently, selective alpha 2 adrenoceptor agonist, dexmedetomidine has been used as a sedative and hypnotic for patients undergoing procedures without need for tracheal intubation. Many author suggested use of intravenous dexmedetomidine during spinal anaesthesia provides satisfactory arousable sedation without compromising respiratory function [9,10].

Spinal Anaesthesia in paediatric patients has a reliable, profound sensory block with rapid muscle relaxation and it results in more control of cardio-vascular and stress response. However, children with Spinal Anaesthesia may develop some adverse effect like high block leading to compromised respiratory function intra operatively and post dural puncture headache and Transient Neurological Syndrome were reported postoperatively. At the same time children undergoing surgery under general anaesthesia may encounter with respiratory complications [2].

Therefore, we design our study to compare two techniques of anaesthesia i.e. general anaesthesia and spinal anaesthesia with Dexmedetomidine as IV sedation in paediatric patients undergoing lower abdomen surgeries.

Material and Methods

After obtaining institutional ethical committee clearance and written informed consent from parents, fifty patients of ASA grade I and II posted for lower abdomen surgeries were included in this study and divided in two equal groups. Patients with contraindications for SA were excluded.

Group SA- received Spinal Anaesthesia with dexmedetomidine sedation.

Group GA - received general anaesthesia.

Pre-anesthetic checkup was done for each patient in the evening prior to surgery and written informed consent obtained from the parents. In both groups IV cannulation was done after applying EMLA (eutectic mixture of local anaesthesia) cream half an hour prior. Standard monitors were attached to the patient. Group SA Patients were sedated in preoperative room with IV Dexmedetomidine 1mcg/kg over 10 minutes infusion [11] (50mcg of dexmedetomidine diluted in 10 ml of normal saline i.e. each ml contain 5mcg) with continuous monitoring of heart rate and SPO_2. Then patients were shifted in Operation theatre after confirmation of Ramsay sedation score (RSS) III/IV. After taking all aseptic precaution lumbar puncture was done in left lateral position with 25G quincke spinal needle at L3-L4 or L4-L5 intervertebral space. After confirmation of free and clear flow of CSF, injection Bupivacaine (0.3-0.5 mg/kg) was injected slowly in sub-arachnoid space. Monitoring was done with multipara monitor i.e. HR SPO_2 BP and Temperature. The level of motor block could not be assessed as throughout the procedure sedation was maintained with Dexmedetomidine at 0.5mcg/kg infusion. Care was taken not to raise lower limb or trendelenberg position before fixation of spinal drugs to prevent undue accent of spinal block.

For Group GA

Standard general anesthesia technique was followed in all patients. Premedication was done Injection glycopyrrolate (0.04mg/kg) IV and Inj. midazolam 0.05mg/kg IV in preoperative room. Patient was taken in Operation theatre after confirmation of Ramsay sedation score II/III. Injection fentanyl 2mcg/kg IV was used for analgesia and induction was done with injection thiopentone sodium 5-7mg/kg IV. All patients were intubated under the effect of vecuronium 0.08mg/kg and intermittent positive pressure ventilation done using Jackson and Rees circuit. Maintanence of anesthesia was done with oxygen, nitrous oxide, sevoflurane, intermittent vecuronium and IPPV. At the end of surgery, reversal was done using neostigmine 0.04mg/kg and glycopyrrolate 0.01mg/kg.

Results

The study was undertaken in order to evaluate perioperative morbidity, its efficacy and safety in two different techniques of anaesthesia i.e. spinal and general anesthesia in paediatric patients undergoing lower abdomen surgeries. Observation and results were obtained from two study groups by statistical analysis applying Chi-Square test and calculating the P values. Patient in both the groups were comparable with regard to age, weight, duration of surgery and type of surgery.

The change in mean heart rate in GA group was observed at baseline 108.6 ± 4.24 per minute to 115.68 ± 6.26 per minute at the end of 60 minutes. This increase in HR was highly significant (p value <0.001). While in SA group the change in heart rate was from baseline 108.32 ± 4.81 per minute to 98.68 ± 8.12 per minute at 60 minute. This decrease in mean heart rate was statistically significant (P value <0.001). This may be due to the effect of dexmedetomidine which was used for sedation in 0SA group. (As shown in Table 2). Mean blood pressure at baseline in Group GA and SA were 87.44 ± 9.28 and 88.21 ± 8.04. Intraoper-atively as well as postoperatively, mean blood pressure remained stable and was statistically insignificant.

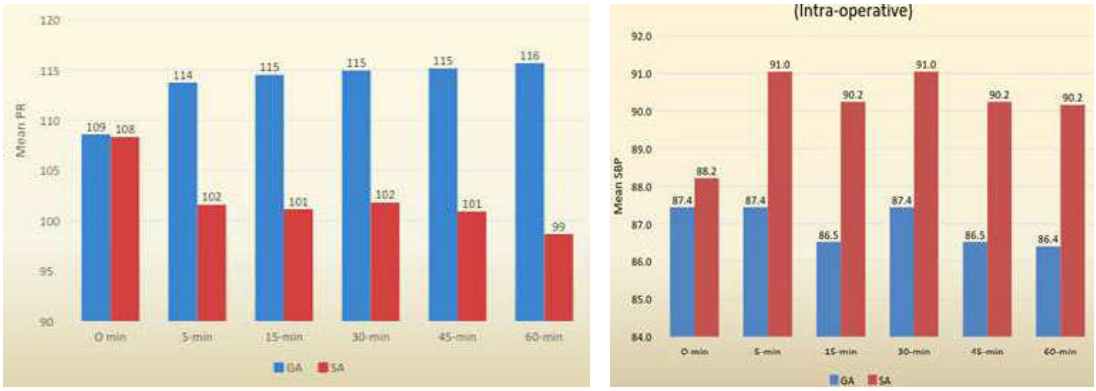
Oxygen saturation was stable in both the groups intra-operatively. Intra-operative assessment of sedation in Group SA after infusion of dexmedetomidine was assessed by Ramsay sedation score (RS Score). At 20 minutes after infusion of dexmedetomidine, RS score was 4 in 84% and score 3 in 16% patients. At the end of surgery, RS score was 3 in 60% and 2 in 40% patients. This sedation score was sufficient enough to keep the patients sedated and calm during surgical procedure.

Post-operatively, mean blood pressure were stable in both groups. However, Mean heart rate was significantly raised in GA group even after 60 minute of surgery. Postoperative assessment for oxygen saturation, visual analogue score (VAS Score) for pain, post-operative nausea and vomiting (PONV) and RSS were done. Decrease in SPO2 (96%) was observed in initial period i.e. up to 10 minutes in GA group which was statistically significant while no such change was observed in SA group. At 15 minutes post-operatively, VAS score in GA group was (3.20±1.35) as compared to (2.4±0.81) in SA group which was statistically significant (P <0.05). After 30 minutes it was nearly same as action of regional anesthesia weaned off. PONV in GA group was found in 16% of patients and no such events were noted in SA group postoperatively.

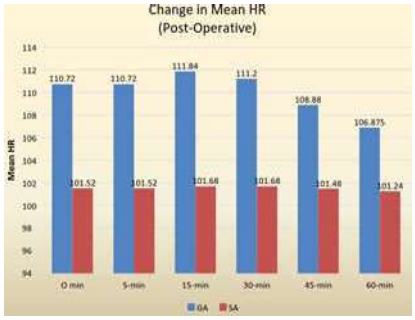
Ramsay sedation score in post-operative period were noted at regular intervals. In GA group 52% patients had RSS 3 and 48% patients had RSS 2 in group GA. 68% patients had RSS 2 and 32% had RSS 1 in SA group in immediate postoperative period which shows that inspite of using dexmedetomidine in SA group, children in GA were sedated for longer period (30-45 minutes) than SA group. We observed the incidence of sore throat being 8% in GA group. Incidence of PONV was 16% and oxygen desaturation was there in 8% patients in Group GA. However, delayed motor recovery was observed in 1 patient in Group SA.

Table 1: Showing demographic profile

	Group GA	Group SA
Age (years)		
2 – 4	13 (52%)	7 (28%)
4 – 6	7 (28%)	9 (36%)
6 - 8	5 (20%)	9 (36%)
Sex Distribution		
Male	24 (96%)	21(84%)
female	1 (4%)	4 (16%)
Weight (Kgs)		
Less than 15kgs	10 (40%)	8 (32%)
15 – 20 kgs	10 (40%)	5 (20%)
More than 20kgs	5 (20%)	12 (48%)



Graph 1: Showing mean pulse rate and mean blood pressure variation intra-operatively



Graph 2: Showing postoperative mean heart rate variation

Discussion

In this study we compared haemodynamic and respiratory changes in two different anaesthetic techniques i.e. General Versus Spinal anesthesia. This study included children's between the age group 2-7 years. In our study we found that that hemodynamic parameter and respiratory function were unaffected during intraoperative period under general anaesthesia and even in spinal anesthesia though we used dexmedetomidine for sedation.

The results from our study shows that intraoperative increase in HR from baseline was highly significant in GA group whereas there was decrease in HR from baseline in SA group. This decrease in mean HR may be due to effect of dexmedetomidine which was used for preoperative sedation and maintenance in SA group. Harsoor et.al (2013) [9] also found that there was clinically and statistically significant decrease in heart rate in group where dexmedetomidine was used for sedation and maintenance during spinal anesthesia and it persisted to be lower for 90 mins.

There was no change in oxygen saturation (SPO_2) intraoperative in both the groups. This shows that dexmedetomidine as a sedative can be used safely in patients undergoing invasive procedures like lumbar puncture during spinal anaesthesia and it can be continued throughout the surgical procedure without need of endotracheal intubation. Mohanad shukry and Jefferey A Miller, (2010) [11] used dexmedetomidine as a sedative in different procedures like fibreoptic bronchoscopy, cardiac catheterization, dental and ophthalmic procedures. They found that Dexmedetomidine causes minimal undesirable hemodynamic and respiratory effects with adequate sedation.

However we observed that there was decrease in SPO_2 in immediate postoperative period that is up to 10 minutes in GA group, these children were supplemented with oxygen via simple oxygen mask while no change was observed in SA group. Assessment of sedation in SA group was done with RSS during intra and postoperative period and shows that most of the patients were arousable at the end of surgery and can be quickly transferred to recovery room.

We compared RSS in postoperative period up to 60 minutes in both SA and GA group and observed that children in GA group were more sedated than SA group in spite of use of dexmedetomidine for sedation throughout the procedure. Dexmedetomidine produces sedation by its central effect and seems to be dose dependent manner as most of our patients were sedated but easily arousable with 1mcg/kg loading dose and then in infusion (0.5mcg/kg). These findings were similar with the study done by SS Harsoor et al (2013) [9].

Postoperatively we also compared VAS SCORE up to 60 minutes in both the groups VAS SCORE was statistically highly significant in initial period i.e. more in GA group and these patient were supplemented with rescue analgesia in the form of paracetamol suppository. This shows that the dexmedetomidine effects are not limited to sedation but also include analgesia. Therefore in spite of regression of action of spinal anaesthesia the patients from SA group did not required rescue analgesia in immediate postoperative period.

The incidence of PDPH as seen in spinal anesthesia in adults was not noted in our study. Although one child had complained of mild headache in post-operative period but it subsided by its own and did not required any treatment. However, recognition of mild symptoms of PDPH in the postoperative period in young children may be difficult and because analgesic were commonly used after surgery we may have failed to notice some milder case of PDPH in our study. Recovery in patients with SA was smooth while children under GA had complications such as oxygen desaturation, PONV and sore throat.

Conclusion

From our study we can conclude that spinal anesthesia is safe, reliable and simple technique and very good alternative to general anesthesia in avoiding respiratory complications. Intravenous Dexmedetomidine infusion can be safely used for sedation and maintenance during surgery without compromising hemodynamic and respiratory functions. Our study however had limitations in terms

of low sample size and that level of motor block couldn't be assessed because of dexmedetomidine which was used for sedation. Overall patient safety with this technique will only become better with greater use, experience and research.

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