

## COMPARATIVE STUDY OF SPINAL ANESTHESIA AND GENERAL ANESTHESIA IN CHILDREN UNDERGOING SURGERIES BELOW UMBILICUS

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### HOW TO CITE THIS ARTICLE:

Ashish Mathur, Abhishek Singhal, Yashwant Dhawle. "Comparative Study of Spinal Anesthesia and General Anesthesia in Children Undergoing Surgeries below Umbilicus". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 47, September 25; Page: 11321-11326, DOI: 10.14260/jemds/2014/3480

**ABSTRACT: AIM:** Aim of our study to compare the spinal anaesthesia and general anaesthesia in children undergoing surgeries below umbilicus. **OBJECTIVE:** to assess the patient comfort in pt. with GA and pt. with spinal anaesthesia, the adequate surgical condition, assess the hemodynamic change, assess the post op analgesia and to assess the post op complication. **MATERIAL AND METHOD:** 60 ASA grade I & II children of either sex, aged 5-12 yrs undergoing elective surgeries for the lower abdominal, perineal and lower limb surgeries were taken. After taking a detailed history, thorough general physical examination, all pertinent investigation were carried out to exclude any systemic disease. Patients were classified randomly into 2 groups (30 patients in each group). Group A: General anesthesia was given. Group P: subarachnoid block was given. Intraoperative monitoring consisted of SPO<sub>2</sub>, PR, NIBP, RR and assessment of duration of post-operative analgesia. P-value <0.05 consider significant. **RESULT:** Analysis revealed that there were no significant differences between the patients with respect to age, sex, duration and type of surgery In SAB since less general anaesthetic drug including parental opioid are used the risk and postoperative respiratory depression is minimal. The stress response to surgery is also limited and recovery is fast. Postoperatively complications like sore throat, laryngeal irritation, cough etc. was also less associated with it. **CONCLUSION** pediatric spinal anesthesia is not only a safe alternative to general anesthesia but often the anesthesia technique of choice in many lower abdominal and lower limb surgeries in children. The misconception regarding its safety and flexibility is broken and is now found to be even more cost effective. It is much preferred technique special for common day case surgeries generally performed in the pediatric age group.

**KEYWORDS:** Pediatric anaesthesia, pediatric spinal anaesthesia, pediatric SAB vs GA.

**INTRODUCTION:** Being unpleasant, pain is a subjective sensation, which in children can only be experienced and not expressed, because they depend on their care-givers for their well-being.

August Bier, in 1898, first reported the successful use of SA in an 11-year-old child for surgery of thigh tumor.<sup>[1]</sup> Following this, Bainbridge<sup>[2]</sup> (1901), Tyrell Gray<sup>[3]</sup> (1909), Berkowitz and Greene<sup>[4]</sup> (1950) described SA as an excellent alternative to general anesthesia (GA) in children including thoracic surgeries (lobectomy, pneumonectomy).<sup>[5]</sup>

However, by middle of the century, considerable improvement in techniques of GA (introduction of muscle relaxants and safe intravenous induction agents) along with lack of expertise for SA (fear of adverse effects, lack of patient co-operation) possibly prevented widespread use of SA in children.

In 1970's, an awareness that children feel pain led to a renewed interest in pediatric regional anesthesia (RA) with the realization that RA can be complimentary to GA. But, SA did not gain popularity until 1984, when it was reintroduced as an alternative to GA in the high-risk former

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preterm neonates, as a means of limiting the incidence of post-operative apnea and bradycardia, by Chris Abajian of Vermont University.<sup>[6]</sup> Since then, SA has become a proven standard of care for moribund neonates.<sup>[7-10]</sup> The Vermont spinal registry proved its safety in 1554 infants including the ex-premature and advocated its use in all infants undergoing lower abdominal or extremity surgery.<sup>[10]</sup> Its efficacy and safety is also established in older children as an alternative to GA.<sup>[11-14]</sup>

The use of spinal anaesthesia in paediatric surgery particularly in the extremely premature infants requiring surgery has gained considerable popularity.<sup>[15]</sup>

It inspired me for the practice of spinal anaesthesia in infants and children and to accept the task of evaluation of its safety. It was in the beginning of 20th century that Lord H Tyrrell Gray supported the use of spinal anaesthesia for surgery in the infants and declared it to occupy an important place in the future for paediatric surgery.<sup>[16]</sup> In 1933 spinal anaesthesia was proposed for paediatric thoracic surgical procedures such as lobotomy and pneumectomy,<sup>[17]</sup> Later on due to development and safety of GA the use of spinal anaesthesia was abandoned.

After the study by Abajian et al in 1984, spinal anaesthesia in infants was successfully reintroduced into the modern anaesthesia practice.<sup>[18]</sup> Since then infant spinal anaesthesia has been used either alone or in combination with epidural anaesthesia for different types of surgical procedures of the lower parts of the body.<sup>[19]</sup> and even as an adjunct to general anaesthesia in infants undergoing repair of complex congenital heart diseases<sup>6</sup> with cardiopulmonary bypass.

**MATERIAL AND METHODS:** After taking informed and written parental consent this randomized study was conducted in Gandhi Medical College Bhopal, M.P.in which 60 ASA grade I & II children of either sex, aged 5-12 yrs undergoing elective surgeries for the lower abdominal, perineal and lower limb surgeries were taken. After taking a detailed history, thorough general physical examination, and all pertinent investigation were carried out to exclude any systemic disease.

Exclusion criteria for this study were patient refusal to participate in the study, had neurological diseases, spinal deformities, infection at local site, coagulopathy, increased intracranial pressure, failed spinal and drug allergy.

Patients were classified randomly into 2 groups (30 in each group)

### Group A:

- General anaesthesia was given, premedication with:
  - IV glycopyrolate – 0.005mg/Kg.
  - IV midazolam – 0.02mg/Kg.
  - IV fentanyl - 2µg/kg.
  - IV ondansetron—0.1mg/Kg.
- Induction with ketamine 2mg/Kg
- Relaxation with succinylcholine 1-1.5mg/Kg was given to facilitate tracheal intubation with appropriate size of endotracheal tube
- Anaesthesia was maintained with 50% N2O and 50% O2 and atracurium (0.5mg kg-1 loading and 0.1 mg/kg as maintenance dose) for further relaxation
- At the end of surgery muscle relaxation was reversed with standard dose of neostigmine and glycopyrrolate.

**Group B:**

- Subarachnoid block was given after  
IV glycolprrolate – 0.005mg/Kg  
IV Midazolam.-0.02mg/kg  
IV ondansetron—0.1mg/Kg  
IV ketamine -1mg/kg
- The lumbar puncture was done in lateral decubitus position using midline approach at L3-L4 interspace under full aseptic condition using 25 G. spinal needles, after verifying correct placement bupivacaine 0.3 mg/kg was injected in CSF.
- Intraoperative monitoring consisted of SPO<sub>2</sub>, PR, NIBP, RR and assessment of duration of post-operative analgesia

Statistical tests were performed using SPSS® version 11.05. Demographic data and operation characteristics were evaluated using descriptive statistics.

Further analysis was carried out for intervals during which differences from the baseline were statistically significant.

A value of p-value < 0.05 was considered to be statistically significant.

**RESULTS AND ANALYSIS:** In SAB since less general anaesthetic drug including parental opioid are used the risk and postoperative respiratory depression is minimal. The stress response to surgery is also limited and recovery is fast.

Postoperatively complications like sore throat, laryngeal irritation, cough etc. was also less associated with it. (Table-2)

Although pt. more comfortable under GA but the requirement of analgesia and inhalational agent not required when pt. operated in SAB surgeon also felt anesthesia to be incomplete due to unwanted upper limb movement in 40% of patient in group B (SAB), so need for supplement sedation, despite successful block.

Both groups were well matched in demographic profile and the mean duration of surgery. (P>0.05) (Table 1).

Duration of post-operative analgesia after spinal anesthesia was found to be significant more than group A (general anesthesia).

Mean heart rate values were higher in group A intra operatively and postoperatively (P<0.05). Intraoperative blood pressures values were comparable in the two groups but were higher in group A postoperatively. (Table-3)

In group A laryngoscopy and intubation was easy in all except 10% patients.

In group B dural puncture was successful in first attempt in 85% patients,

**DISCUSSION:** This study was designed to evaluate feasibility and safety of spinal anaesthesia in healthy children the patients remained stable hemodynamically during surgery and in the postoperative period. The heart rate increased in 24 (80%) patients which may be due to one effect of glycopyrolate and ketamine premedication. There was no episode of bradycardia.

The breathing was normal in all the patients as the pulse oximeter (spo<sub>2</sub>) remained normal (92%). Blaise and Roy (20) also noted no episode of hypotension/arrhythmia or vomiting intra

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operatively in their patients. Kachko et al (21) noted bradycardia (H.R. <100/min) without desaturating (spo2<90%) in 1.8% their patients as the main side effects. They have also noted no episode of hypoxia in their patients.

Regional anaesthesia may attenuated adverse physiological stress responses associated with circulatory (tachycardia, hypertension, vasoconstriction), metabolic (increased catabolism), immunological (impaired immune response) and hemolytic (platelet activation system)

Blaise and Roy<sup>(20)</sup> studied ASA-I paediatric patients aged from 7 weeks to 13 years, 4 of 34 patients required GA due to failure of lumbar puncture after two attempts. Better result of our performance of the technique may be due to the fact that we used Ketamine for sedation because slight movement of the children during lumbar puncture can cause difficulty and failure. Our patients were quite comfortable during the procedure of lumbar puncture after sedation with Ketamine.

Our results are also in accordance with Muhammad Jamil et al.<sup>(22)</sup>

Kachko et al<sup>(21)</sup> studied 505 new born and infants undergoing surgery under spinal anaesthesia. They achieved spinal anaesthesia at first attempt in 69.9% of their patients. Our results are comparable to their results in achieving spinal anaesthesia.

William et al<sup>(23)</sup> studied spinal anaesthesia in 1,554 infants and have successful spinal anaesthesia in 97.4% of their patients. We achieved spinal anaesthesia in first attempt in 85%, and in second attempt in 15% patients. This shows similar ease of performance of technique.

Despite these advantages, the shorter duration of sensory block in children may be major limiting factor in prolonged surgeries

**CONCLUSION:** Thus overall pediatric spinal anesthesia is not only a safe alternative to general anesthesia but often the anesthesia technique of choice in many lower abdominal and lower limb surgeries in children.

The misconception regarding its safety and flexibility is broken and is now found to be even more cost effective. It is much preferred technique special for common day case surgeries generally performed in the pediatric age group.

There is no requirement of any additional expensive equipment either this procedure can be easily performed peripheral center, however greater acceptance and experience is yet desired for this technique to become popular.

	Group -A	Group -B	P-value
Mean age (yrs)	6 2.3	6.55 1.8	>0.05
Duration of surgery (minutes)	45.05 5.83	48.04 8.05	>0.05
Duration of post op analgesia(minutes)	30.0510 .30	50.04 10.15	<0.05

Table1: Mean age, duration of surgery & time to first analgesic dose.

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Side effects	Group-A	Group-B
Hypotension	-	4
Nausea / vomiting	3	1
Shivering	-	3
Upper limb movement	-	8

TABLE 2: Side effects.

	Group-A	Group-B
Mean HR (intraoperative)	88±2.1/min	80±2.2/min
Mean HR (postoperative)	96±1.3/min	84±3/min
Mean BP (systolic) (intraoperative)	112±3.2mmhg	106±2.4mmhg
Mean BP (systolic) (post-operative)	124±4.2mmhg	118±2.6mmhg

TABLE 3: Hemodynamic changes

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Date of Submission: 09/09/2014.  
Date of Peer Review: 10/09/2014.  
Date of Acceptance: 18/09/2014.  
Date of Publishing: 23/09/2014.