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*Original Article*

# Comperative Study between Caudal & Subarachnoid Block in Children for Sub-Umbilical Surgery

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## Abstract::

***Background:*** *Caudal block has slower onset and is frequently practiced as a supplemental but Sabarachnoid block has rapid onset and with good haemodynamic stabilityin children but there remains some hesitation in its use.affectivenes of subarachnoid block*

***Objectives:*** *To compare the time of onset of sensory block, its haemodynamic stability andaffectivenes of subarachnoid block in children for subumbilical surgery.*

***Methods:*** *In this study 60 patients who fulfilled the eligibility criteria were chosen and the procedure was explained to the patient's attendant. After obtaining written and informed consent, patients were randomized into two equal groups of 30 each. Group-S was given spinalanaesthesia with 0.5% hyperbaric bupivacaine in a dose of 0.4mg/kg over 10 secends. Group-C was given caudal block with 0.25%plain bupivacaine 2mg/kg in volume of 1ml/kg. Patients were observed for time and duration of onset&level of sensory block, need ofadjuvants, hemodynamics condition and per-operative complications if any.*

***Results:*** *The study showed rapid onset of sensory block in Group-S without any supliment and with a good haemodynamics stability. Sensory level block achieved in more than 90% cases of group-S wasT6 while in group-C it was T8 level in 64% cases. No major per-operative complications occurred in either group.*

***Conclusion:*** *The anaesthesiologists who care for infants and children during their practice should have option for spinal anaesthesia as an alternative to general anaesthesia forshort surgical procedures below umbilicus requiring immediate relaxation.*

***Keywords:*** *Caudal block, Subarachnoid block, Children, Sub-Umbilical surgery.*

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## Introduction:

Regional anaesthesia is commonly practiced in adult patients.But this valuable technique can be applicable to youngest patients[1]. The reseasons for these are several. Local anaesthetics available today are safer than those in the past and well evaluation of pharmacological effects of those drugs even in neonates and their safe approach have been

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extensively studied[2,3,4]. Caudal block is the most commonly practiced regional anaesthetic technique in children[5], may be a sole anaesthetic procedure or as an adjunct to general anaesthesia or to provide post-operative analgesia[6]. But the problem with caudal anaesthesia is it's slower onset, a supplemental general anaesthesia is often needed and a relatively higher doses of agent is required[7]. During performance of the procedure in children, inadvertent intrathecal, intraosseous or intravascular injection of local anaesthetic can be catastrophic, occurs in 0.4% of caudal block in padiatrics[8]. On the contrary, subarachnoid block produces a profound and uniformly distributed sensory block with rapid onset of a good muscle relaxation and results in more complete control of cardiovascular and tress responses[9].

SAB gained acceptance for children undergoing surgery in the lower part of the body[10]. In children cardiovascular stability during subarachnoid & caudal block is good[11,12]. The main problem,concerned with subarachnoid block is PDPH. Bolder, posted that post-spinal headache only occurs in children older than 13 years, being less frequent in younger ones(13). Comparing with agents and equipment used in for general anaethesia and a more rapid turnover in the operating room, subarachnoid block,is less expensive alternative option in country with limited resources[14,15]. SAB is applied in children with muscular dystrophy, inrisk of malignant hypothermia , in neonate and infant need herniotomy, to avoid post-operative apnoea[16-21]. Some studies confirmed on efficacy and safety of SAB as well as its applicability for all age groups during sub-umbilical surgery[22-27].

This study was done with intention to represent sub arachnoid block in children as a safe, feasible and more effective technique than caudal block for sub-umbilical surgery.

**Material and Methods:**

This study was conducted as a randomized prospective study in the dept. of anesthesiology, Sir Salimullah Medical College & Mitford Hospital Dhaka, between the period of September2013 to February2014. After obtaining the Ethical Committee approval and parental informed written consent, sixty American Society of Anaesthesiologist Physical Status I and II patients of either sex in the age range of 7–10 years posted for elective Sub-umbilical surgical procedures were selected for this study. Exclusion criteria included children with spinal deformities, any infection at the injection site and the presence of a blood-clotting disorder.

On the day of operation in the preoperative room patients were divided equally and randomly into either (Group C) received caudal block or(Group S) received subarachnoid block. After standard fasting times, patient was shifted to operation theater. Standard monitors were connected. After recording baseline parameters, intravenous access secured with the 22-gauge cannula, the children were given injection midazolam 0.4mg/kg intravenous and 100% $O_2$ was administered with mask.

Group-C: The patient was positioned in the left lateral and under full aseptic precautions: asterile 22-gauge needle was introduced in the caudal epidural space. After confirming the position of the needle with lose of resistance test and negative aspiration, 0.25% plan Bupivacaine at a dose of 2mg/kg & with a volumeof 1mg/kgwas given slowly over 60 s. Then, the patient was turned to supine position and awaited for 10 to 15 minutes. After level of sensory block testing surgery was started.

Group-S: The patient was positioned in the left lateral and under full aseptic precautions: lumber puncture is performed in space of L4-L5 or L5-S1, using a spinal needle ( Quincke) of 25g or 27g. After obtaining CSF, 0.5% hyperbaric bupivacaine at a dose of 0.4mg/kg was injected over 10 seconds,then put the pts in supine position. After waiting 1 minute,level of sensory block was tested and then surgery was proceeded.

If any movement on surgical incision was noted inj. Ketamine .5mg/kg was given in both groups.In both groups of pts heart rate, blood pressure & Spo2 were monitored in every 5 minutes for 30 minutes, then every 10 minutes. Adverse effects occurring was noted and immediate correction was done.

Data was collected in the data collection sheet and the pts were monitored in the recovery room for at least 1 hour and when vital signs were stable were transferred to surgical ward.

**Statistical Analysis**

Data were processed manually and analyzed with the help of SPSS(Statistical package for social science) version 19.0. Quantitative data were expressed as mean and standard deviation and comparison were done by student "t" test. Qualitative data were expressed as frequency and percentage and comparison, carried by chi-square(x2) test. Aprobability value less than 0.05 was considered to indicate statistical significance.

**Results:**

This study was performed on 60 patients divided into two groups (30 patients in each group). Group S(SAB) and group C (caudal block).

**Table-I**

*Demographic characteristics of the study population*

| Parameter | Study group | | P- value |
|---|---|---|---|
| | Group-C (Mean ± SD) | Group-S (Mean ± SD) | |
| Age in yrs Range (min-max) | 7.83(± 1.02) | 8.47(±1.13) | 0.20 |
| Weight in kg Range (min-max) | 18.83(±2.39) | 20.07(2.76) | 0.16 |

Table shows mean age and weight in Group-S and Group-C with p> 0.05 is not statistically significant.

**Table-II**

*Type of operations*

| Operations | Study Group | | Total |
|---|---|---|---|
| | Group-Cn (%) | Group-Sn (%) | |
| Circumcision | 12(40.0 ) | 13(43.3) | 25 |
| Herniotomy | 10(33.3) | 08(26.7) | 18 |
| Hypospedias | 04(13.3) | 05(16.7) | 09 |
| Hydrocele | 04(13.3) | 04(13.3) | 08 |
| Total | 30(100) | 30(100) | 60 |

**Table-III**

*Time of onset of sensory block in minute.*

| Time of onset of Sensory block | Study Group | | P-value |
|---|---|---|---|
| | Group-C (Mean ± SD) | Group-S (Mean ± SD) | |
| | 20.53(±1.71) | 2.40(±0.56) | <0.001 |

Values expressed between groups are analysed by student “t” test, which are regarded as highly significant (p<0.001).

**Table-IV**

*Level of sensory block.*

| Level of Sensory block | Study group | | P- value |
|---|---|---|---|
| | Group-C | Group-S | |
| T6 | 28(±1.05) | 0(±0) | <0.001 |
| T8 | 30(±0.05) | 14(±.06) | <0.001 |
| T10 | 30(±0.02) | 16(±.01) | <0.001 |

Values expressed between groups are analysed by student “t” test, which are regarded as highly significant (p<0.001).

**Table-V**

*Need of adjuvents*

| Need of adjuvents | Study Group | | P-value |
|---|---|---|---|
| | Group-Cn % | Group-Sn % | |
| Yes | 06(20) | 00 | <0.001 |
| No | 24(80) | 30(100) | |
| Total | 30(100) | 30(100) | |

Table shows Group-C need 20% adjuvant but Group-s need no adjuvant. It was statistically significant p<0.05.

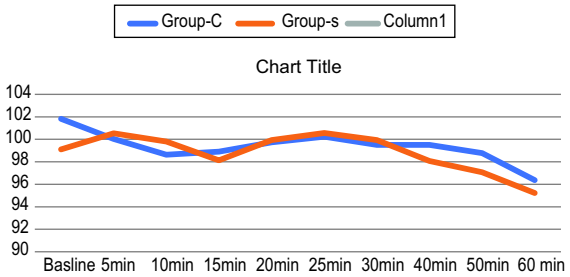


**Fig.-1:** *Changes of heart rate (HR) in different time periods*

Chart shows values are expressed in mean ± SD between groups analysis done by student “t” test. Here p> 0.05 which is statistically not significants

**Table-VI**

*Changes of mean arterial pressure in mmHg in at different time.*

| Mean arterial blood pressure | Study Group | | Pvalue |
|---|---|---|---|
| | Group-C mean±SD | Group-S mean±SD | |
| Baseline | 71.80±5.61 | 72.57±5.54 | 0.59 |
| 5min | 70.57±5.72 | 70.57±5.007 | 0.69 |
| 10min | 69.77±4.61 | 69.73±4.33 | 0.97 |
| 15min | 69.20±5.62 | 70.77±4.09 | 0.40 |
| 20min | 70.00±5.61 | 69.73±4.95 | 0.84 |
| 25min | 69.20±5.67 | 69.67±3.88 | 0.70 |
| 30min | 69.30±5.63 | 68.63±3.57 | 0.17 |
| 40min | 70.07±5.74 | 71.87±5.07 | 0.20 |
| 50min | 71.03±5.58 | 72.47±5.37 | 0.83 |
| 60min | 72.53±5.72 | 73.27±5.41 | 0.06 |

Table shows values are expressed in mean ± SD between groups analysis done by student “t” test. Here p> 0.05 which is statistically not significants.

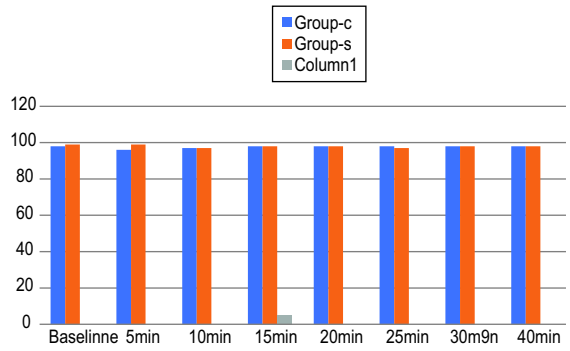


**Fig.-2:** *Changes in the Spo2 at different time.*

values are expressed in mean ± SD between groups analysis done by student "t" test. Here p> 0.05 which is statistically not significants.

**Table-VII**

*Per-operative complications*

| Variables | Group-C | Group-S |
|---|---|---|
| Hypotension | 0 | 01 |
| Bradycardia | 0 | 02 |
| Desaturation | 0 | 0 |
| Convulsion | 0 | 0 |
| Sshivering | 0 | 07 |
| Vomitting | 0 | 01 |

**Discussion:**

The regional anaesthesia in pediatric patients become popular in current anaestheticpractice.The objective of subarachnoid and caudal block in infantsand children are analgesia and muscle relaxation with minimal physiological disturbances, rapid recovery and less side effects like general anaesthesia.

Caudal block is one of the most common procedure,while there remain some hesitation in applying subarachnoid block in children for sub-umbilical surgey.Sub-arachnoid block produces a reliable, profound and uniformly distributed sensory block and it results in more complete control of cardiovascular and stress responses than epidural and opioid analgesia[35]. It is ideal for day case surgeries and is safe&cost-effective. Spinal anaesthesia has gained acceotance for children undergoing surgery in sub-umbilical region[36].

General anaesthesia may be associated several life threatening complications specially in preterm and children with co-morbities who are at higher risk of apnoea, bradycardia and desaturation after general anaesthesia[37].

Kokki et al also studied 100 children for paediatric day -case surgery and found the technique safe and effective[38].

Bang-Vojdanovaski B studied over 10 in paediatricorthopaedic surgery and concluded that spinal anaesthesia is a suitable technique for paediatric surgery[39].

Kokki et al also conducted study on 40 children , age 2-5 yrsunder goingpaediatric surgery and comparing with general anaesthesia, they found more haemodynamic and respiratory stability and less complications in subarachnoid block than general anaesthesia[40].

In this study we compared effectiveness of caudal anaesthesia with plan bupivacaine at 2mg/kg dose and spinal anaesthesia with hyperbaric Bupivacaine at 0.4mg/kg for producing adequate sun umbilical anaesthesia. This dose and volume were enough to keep an ideal anaesthetic plan allowing the surgeon to perform surgeries without complications and toxicity[43,44].

The level of sensory block in 90% of Group-S reached T6, whereas level of sensory block in 46%Group-Creached T8. Onset of sensory block in Group-C was delayed then Group-S,that was 20.53 (±1.71) minutes and 2.40 (± 0.56) minutes respectively but duration of analgesia was longer with caudal block 120 (± 15) than subarachnoid block 90 (± 10).

The changes in mean blood pressure, heart rate were minimal($P<0.05$). This is because sympathetic vascular tone at rest in children is less than in adult. Some adverse effects were noted in Group-S which were not statistically significant. PDPH is not occurred as small gauge needle was used.

Bolder et al posted that PDPH only occurs in children older than 13yrs, less in younger ones[45].

Group-S patients have their oral intake and were discharged from recovery earlier as there was less advesrse effects and rechieved oral or parenteral analgesic.

Limitations: The limitations of this study were as follows

1. This study was conducted in only one centre.
2. The sample size was small and study was short.

**Conclutions:**

Our experienceof this small study wasfaster onset of action of local anesthetic agents, rapid establishment of both sensory and motor block, stable hemodynamics and minimal adverse effects during surgery subarachnoid block very effective regional anaesthesia in children for subumbilical surgery. So that anaesthesiologist who care for safety infants and children during their pactice should have option of spinal anaesthesia as an alter native to general anaesthesia.

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