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Outcome of Spinal Anesthesia in Children

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Abstract **Original Research Article**

***Background*:** Despite a long history of safety, spinal anesthesia (SA) is still seldom used outside of specialist pediatric institutions and is sometimes debated as a primary anesthetic approach for children. To lessen the risk of postoperative apnea, it is often used on previously preterm newborns who have not yet reached viability (60 weeks post- conception) (GA). There is, however, a wealth of evidence indicating its safety and effectiveness for appropriate operations in adolescents. ***Objective*:** The primary purpose of this investigation is to assess the efficacy of spinal anesthesia in pediatric patients. ***Method*:** Tertiary care hospital was the setting for this prospective investigation. Fifty children, ages 4 to 10, were included in the research because they were all given spinal anesthesia for infraumbilical or lower extremities surgery during the study's 1-year time frame. ***Results*:** Seventy percent of the participants in the research were preschoolers. Eighty percent of patients were seated throughout surgery, fifty percent required just one puncture, and seven percent demonstrated CSF reflux after the second puncture. The average time spent fasting was 5.82 0.1 hours. Premedication with an injection of atropine 0.01 mg/kg was administered. Ketamine was administered to the majority of patients, either alone (60%) or in combination with midazolam (40%). Diazepam was utilized by 3% of patients, and fentanyl by 2%. After subarachnoid block, there was no statistically significant change in any of the measured parameters throughout the course of any of the time periods. Ninety percent of patients reached the target peak sensory level T10 and Bromage score 3 after 10 minutes of SAB. ***Conclusion*:** Based on our findings, we believe that spinal anesthetic is the most convenient, secure, and economical option for outpatient surgical procedures that do not need overnight hospitalization. These advantages make spinal anesthesia a viable option for children having lower-body surgeries.

Keywords: Spinal anesthesia (SA), subarachnoid block, general anesthesia (GA).

INTRODUCTION

Subarachnoid and lower limb surgeries often make use of spinal anesthesia (SA). Spinal anesthesia was initially used on children by Bier (1898), then by Bainbridge (1901), and finally by Gray (1903). (1909) [1-3].

Improvements in general anesthesia (GA) in the middle of the twentieth century led to the gradual elimination of the need for this kind of local anesthetic. As caudal anesthetics were used less often, spinal anesthesia for premature or newborn babies rose by 2.1–3.6% between 1990 and 2000 [3, 4]. Up to 95.4% of newborns and premature babies now get SA as their primary form of pediatric anesthesia [4, 5]. In 1898, August Bier was the first to describe using SA successfully during surgery on a thigh tumor in a kid of 11 years old [1].

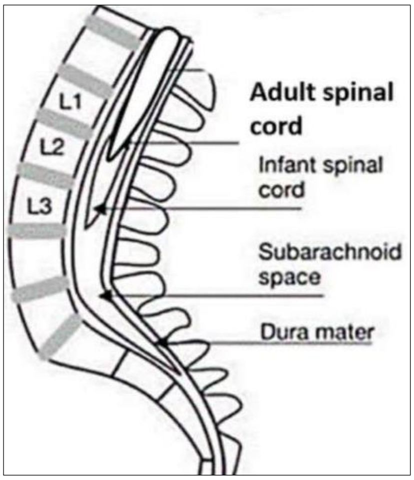

Figure 1: Spinal cord anatomy

Then, in the following years, authors like Bainbridge [2] (1901), Tyrell Gray [3] (1909), and Berkowitz and Greene [4] (1950) praised SA as a superior replacement for GA during thoracic procedures on children (lobectomy, pneumonectomy) [5]. The lack of skill for SA (fear of harmful effects, lack of patient co-operation) and the significant progress in procedures of GA (introduction of muscle relaxants and safe intravenous induction drugs) by the middle of the century may have precluded widespread use of SA in children.

Figure 2: Doctor was preparing children for spinal anesthesia

The understanding that regional anesthesia (RA) may be a useful adjunct to general anesthesia (GA) in children sparked a renaissance of interest in this field in the 1970s. SA was reintroduced in 1984 by Vermont University's Chris Abajian as an alternative to GA in high-risk former preterm newborns to reduce the occurrence of post-operative apnea and bradycardia [6]. Since then, SA has been established as the gold standard for treating newborns who are clinically dead [7-10]. The safety of this procedure has been established in 1554 babies, including ex-premature newborns, according to the Vermont Spinal Registry, which advocates for its usage in all infants having lower abdomen or limb surgery [10]. It has been shown to be an effective and safe alternative to GA in older children [11-13].

Though it gaining popularity in infants and children, the misconceptions regarding its overall safety, feasibility, and reliability can only be better known with greater use and research.

OBJECTIVE

- To asses the efficiency of spinal anesthesia in children.

METHODOLOGY

Tertiary care hospital was the setting for this prospective investigation. Fifty children, ages 4 to 10, were included in the research because they were all given spinal anesthesia for infraumbilical or lower extremities surgery during the study's 1-year time frame. The research participants had a thorough preoperative assessment. Lumbar puncture was not performed on patients who had contraindications.

The information was coded and entered into SPSS-25 for analysis. Inferential and descriptive statistics were calculated. Frequency count, percentage, bar chart, tabular data, and pie charts were all examples of descriptive statistics.

RESULTS

In table-1 shows age distribution of the patients where majority were belong to 4-6 years age group, 70%. The following table is given below in detail:

Table 1: Age distribution of the patients

Age group	Percentage (%)
4-6 years	70%
7-10 years	30%

In figure-3 shows gender distribution of the patients where 60% were male. The following figure is given below in detail:

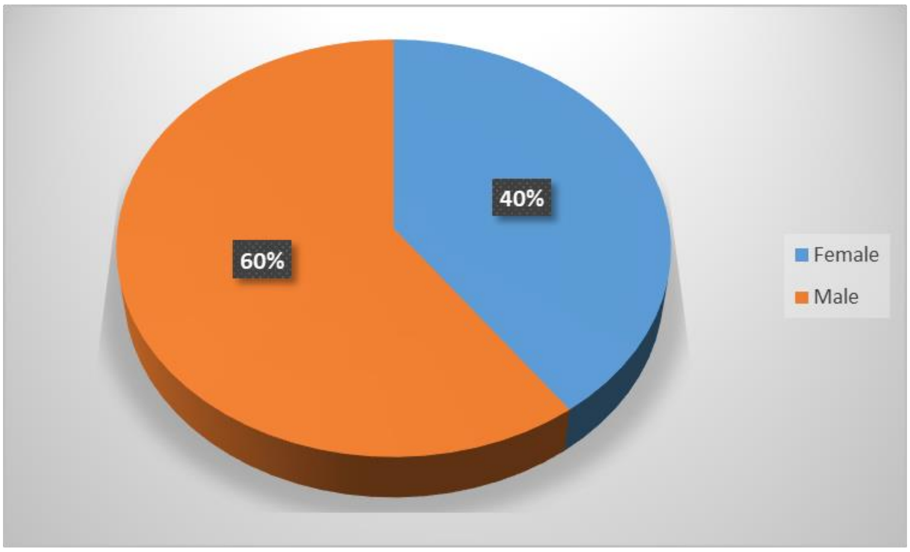

Figure 3: Gender distribution of the patients

In table-3 shows types of surgery where Circumcision cases seen in 50%, followed by Appendectomy seen in 19% cases, Herniotomy seen in 18% and 13% cases undergone in Lower limb orthopedic surgery. The following table is given below in detail:

Table 3: Types of surgery

Types of surgery	Percentage (%)
Circumcision	50%
Appendectomy	19%
Herniotomy	18%
Lower limb orthopedic surgery	13%

In table-4 shows operative status of study group where during surgery 80% patients' position was sitting, followed by 50% cases number of punctures was 1, where as 7% cases CSF reflux showed after 2nd puncture. Mean fasting hours were 5.82 ± 0.1 h. Injection atropine 0.01 mg/kg was given as premedication. Most of the patients were given ketamine either alone (60%) or with midazolam (40%). Other drugs used were diazepam (3%) and fentanyl (2%).

The following table is given below in detail:

Table 4: Operative status of study group

Position of the patient	**Percentage (%)**
Lateral decubitus	20%
Sitting position	80%
Number of punctures	**%**
1	50%
2	35%
≥ 3	15%
CSF reflux after a first blood reflux	2%
CSF reflux after a 2nd puncture	7%
Mean fasting hours	5.82 ± 0.91 h
Sedative Medication	**Percentage (%)**
Ketamine Alone	60%
Ketamine with midazolam	40%
Other medication	**Percentage (%)**
diazepam	3%
fentanyl	2%

In table-5 shows blood pressure and pulse rate status of study group where there was no significant change in the mean value of systolic blood pressure, diastolic blood pressure, respiratory rate, and oxygen saturation after subarachnoid block at all time periods. The following table is given below in detail:

Table 5: Blood pressure and pulse rate status of study group

Before SAB	SBP	DBP	PR
	87±0.21	**65±0.11**	**22–34**
15 mins after SAB	86±0.23	64±0.10	23–37
60 mins after SAB	89±0.24	66±0.13	22–35

In figure-3 shows outcome of surgery where After 10 min of SAB 95% patients achieved desired peak sensory level of T10 and Bromage score of 3. Surgery was completed in all these cases without anesthetic supplementation. The success rate of the study was 90%. Remaining 10% cases were classified as a failure and were given GA.

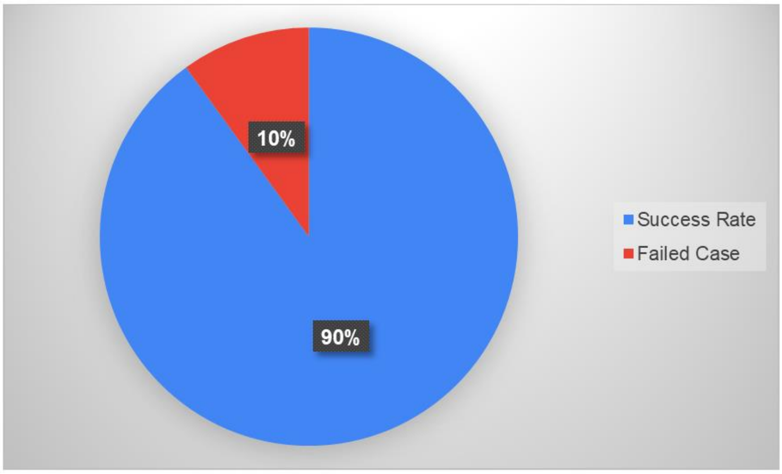

Figure 3: Outcome of surgery

DISCUSSION

Most patients (n = 56; 54.9%) receiving sedation in a single trial were given ketamine. Midazolam (n = 3), diazepam (n = 1), fentanyl (n = 7), and/or a combination of these were the other medicines utilized. In our research, four patients (3.9% of total) were not sedated before to SAB since they were elderly (>10 years) and cooperative [6].

This was borne up by our research, in which ketamine was administered to the vast majority of patients (59%), either alone or in combination with midazolam (41%). Diazepam (3%), fentanyl (2%), and other medications were also utilized.

All patients were sedated during the surgical phase with a propofol infusion (50-75 mcg/kg/min). The inability to block may be detected even with little sedation. During sedation, it is preferable to provide supplementary oxygen.

After two tries, lumbar puncture was unsuccessful in 4 of 34 pediatric patients (aged 7 weeks to 13 years) in a research that needed general anesthesia. We suspect that the fact that the children in our research were sedated before undergoing lumbar puncture increased the quality of the data we were able to collect [7].

Ketamine produces a dissociative anesthetic state in which the cortex and the limbic system become functionally disconnected from one another. Sedation does not impair the body's natural ability to protect the airway. Because of its high therapeutic index, ketamine may be safely used to sedate children [8].

Ninety percent of patients in our trial were determined to have an effective spinal block after 10 minutes of SAB, at which point they had reached the required sensory level of T10. In contrast, 10% of patients had a failed spinal block because they did not reach T10 level and required GA. The median sensory threshold was set at T6, whereas the mean was T6.35 1.20. In order to regress two segments, the average time required was 43.97 10.72 (30-70) minutes. All patients had sufficient dermatomal level till the completion of surgery since the level of operation was below T10. This means that, consistent with the results of other research, no patients in our study needed any additional anesthetic during surgery [9-11].

Sensory block revealed broad variation in height from T1 to T7, with the median being T4 in a study of 78 children aged 2 to 6 years receiving various types of surgery in the lower body [12].

Although we encountered no complications throughout our research, a study evaluating spinal anesthesia in children aged 2 to 6 years old revealed that five kids had shaking and one experienced vomiting. Two individuals had hypotension; ephedrine was administered; one patient exhibited bradycardia; atropine was administered [13].

CONCLUSION

We conclude that spinal anesthesia is the best choice for outpatient surgical operations that do not need overnight hospitalization since it is the most convenient, secure, and cost-effective. Because of these benefits, spinal anaesthetic is a real option for children undergoing procedures involving the lower extremities.

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