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Research Article

**EFFECTIVENESS OF SPINAL ANESTHESIA AMONG
CHILDREN SUFFERING FROM CEREBRAL PALSY WHO
UNDERWENT ORTHOPEDIC SURGERY**¹Javairia Saleem, ²Sayyeda Khadija Bukhari, ²Uzma Khalid¹Services Hospital Lahore²CMH, Lahore**Article Received:** December 2019 **Accepted:** January 2020 **Published:** February 2020**Abstract:**

Objective: One of the most common neuro-muscular complications in children is cerebral palsy. Spinal Anesthesia among children is a progressing method with many benefits in peri-surgical administration. The main purpose of this retrograde research work was to provide the examination of the children suffering from cerebral palsy and orthopedic surgical intervention under the impact of Spinal Anesthesia.

Methodology: Medical records of children suffering from Cerebral Palsy who underwent orthopedic surgical intervention under Spinal Anesthesia from June 2018 to September 2019 were reviewed in this research work. In all these patients, the performance of lumbar puncture carried out in the lateral decubitus position by mask sevoflurane nitrous-oxide anesthesia. In the calm patients before spinal block, we terminated inhalation anesthesia. Among restless patient's prior spinal block, we combined the anesthesia with the light sevoflurane anesthesia and laryngeal mask. We noted the amounts of efforts needed for the completion of lumbar puncture, success rates of Spinal Anesthesia and peri-surgical complications from the records of anesthesia. We expressed the data in percentages and numbers.

Results: There were 36 patients in this research work in which 20 were girls and 16 were boys. The average age of the patients was 71 months. 86% was the rate of obtaining subarachnoid space on very 1st attempt. We considered the Spinal Anesthesia successful in all the patients. In 26 patients, there was requirement of laryngeal mask and light sevoflurane anesthesia to regulate the ideal condition of surgery. We observed no major peri-surgical complication in this research work.

Conclusion: Spinal Anesthesia alone or in combination with the light sevoflurane anesthesia is very reliable method with very high rates of success in the children suffering from Cerebral Palsy and underwent orthopedic surgical intervention.

KEY WORDS: Spinal Anesthesia, Cerebral Palsy, Anesthesia, Orthopedic, Laryngeal, Surgery, Intervention.

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INTRODUCTION:

Cerebral Palsy influences one out of five hundred children. This complication is also most common occurring neuromuscular disease in the world [1, 2]. Non-progressive neurological complication in development of motor are secondary to abrasions of abnormalities of brain [3]. In the children suffering from cerebral palsy, 61% children have to undergo surgery of bone of lower limb as well as soft tissues to increase the mobility [4]. The range of clinical presentation of these patients can be from mild monoplegia to spastic quadriplegia with serious retardation of mental activities [5]. So, there is a need of particular anesthetic considerations for the accommodation of the disabilities of patients.

According to available data, GA (General Anesthesia) is in use for the children with cerebral palsy, but in some chosen patients, there is application of regional anesthesia or the combination of both General Anesthesia and regional anesthesia [6-9]. There is wide approval of regional anesthesia in children from last few years. Now a day, it is much effective and valid method being used in normal routine practices of various pediatric units [10]. There are many advantages of Spinal Anesthesia in children as very high success rate and fast onset. This method also leads to better control of the stress responses in comparison with the General Anesthesia [11, 12]. In last twenty years, the popularity of this procedure for pediatric patients has been enhanced and there are many research works available on this topic [13-16]. The case reports related with Spinal Anesthesia are in the pediatric patients present with different neuromuscular complications [14, 17].

MATERIAL AND METHODS:

In current research work we reviewed the anesthesia and special registry form of 36 patients suffering from cerebral palsy with the application of Spinal Anesthesia for the surgery of lower limbs from June 2018 to September 2019 in Services Hospital, Lahore. Anesthesiologist for very patient who was undergoing Spinal Anesthesia, filled a special registry form which contained perioperative information. We excluded the patients with incomplete forms. The pediatric Spinal Anesthesia method described in literature was in use [18]. After

a pre-anesthetic assessment and consent of parents, we transported the patients to Operation Theater. The monitors for electro-cardiographs, non-invasive BP, pulse oximetry and pediatric BIS (Bi-spectral Index Sensors) were in use. We recorded the measurements at intervals of five minutes. There was start of warming of upper body of patients with the utilization of the forced air-warming system. The sedation of every child carried out with 8% sevoflurane in 60% N₂O- 40% O₂ mixture during breathing with the use of face mask. After establishment of peripheral IV access, we placed the child in lateral decubitus and, if possible, knee chest position with table inclined to a 45-degree head-up tilt [18]. A skilled anesthesiologist accomplished lumbar puncture with midline approach utilizing a 27-gauge pencil point needle. We selected S1 to L3 vertebrae for lumbar puncture. We verified the right needle placement by a free-flow of obvious cerebrospinal fluid. We used the 0.5% hyperbaric bupivacaine for spinal anesthesia.

We maintained the heart rate and arterial BP of the patients within 20% of pre-surgical values. For the provision of this condition, there was decrease in the sevoflurane concentration to maintain level of 0.7% MAC (Minimum Alveolar Concentration). Hypotension is a decrease in the systolic BP greater than 20% from baseline. We shifted the children into ward after surgery. We discharge the patients when they were completely stable. We evaluated all the necessary parameters associated with the ideal procedure of Spinal Anesthesia. We presented the results on averages, standard deviations and numbers. We did not evaluate the complications after surgical intervention like headache because of the cognitive dysfunction of the patients.

RESULTS:

There were 36 children in this research work in which 20 were females and 16 were male patients. Spinal Anesthesia was performed on 21 patients among total 36 patients. The average age of the patients was 71 months with a range of age from 13 to 144 months. The traits of demography of patients and outcome of the study are present in Table-1 and Table-2 respectively.

Table-I: Patient Characteristics (n=36)

Characteristics		Value
Gender	Male	20
	Female	16
Age	Mean	71.17
	Range	13-144
Weight	Kg	17.75
	Range	8 - 39
ASA	I/II/III	0/30/6
Surgery Duration	Mean	55.9

range

30 - 125

At the very 1st attempt, rate of reaching to the subarachnoid space was 86%, and rate of reaching to particular site need a 3rd attempt was 5.6%. We considered the Spinal Anesthesia as successful in all the patients. In 26 patients, there were requirements of laryngeal mask and light sevoflurane anesthesia for calmness of the patients as well as to maintain the ideal condition for surgery. Pediatric BIS were present in 21 put of 26 patients who needed light sevoflurane anesthesia. The average data of BIS was 60.5 with a range of BIS data from 55 to 67 after spinal anesthesia in the duration of 0.7 MAC of sevoflurane. There was development of transient hypotension in 2 children but it was normal. All the children's discharge from hospital eventfully.

Table-II: Procedural Data of the Patients (n, %).

Procedural Data		No	Percentage
Needle type	27G Pencil point	15	41.7
	25G Cutting point	21	58.3
Number of attempts for successful LP	1	31	86.1
	2	3	8.3
	3	2	5.6
Success rates	Successful SA	36	100
	Unsuccessful SA	0	0
BIS		60.5	3.1

DISCUSSION:

This was the only research work presenting the knowledge about SA alone or in combination with the light sevoflurane anesthesia in our country. This is much reliable method with high rates of success in the patients suffering from Cerebral Palsy and underwent orthopedic surgery. The rate of success at very 1st attempt of lumbar puncture under General Anesthesia is more than 90% among children with no neurologic complication who are present with more than one year of age [18, 19]. In this current research work, the success rate in reaching the particular site on 1st attempt was 86%. One of the important issues for the children in the application of these procedure is anxiety because most of the patients of this age are not able to communicate appropriately. Many research works confirmed the notion that performing regional-anesthesia under General Anesthesia is much secure practice [20]. However, there are some children who are able to remain in ease and tolerate the application of procedures without any deep GA [21, 22].

In our hospital, majority of regional blocks activated on the children under anesthesia comprise nitrous oxide (N₂O) and sevoflurane. This particular method gives painless puncture of lumbar and intravenous access. The mediation of MAC is through spinal cord [23]. The concentration of the sevoflurane which has association with the clue of MAC is decreased in the children suffering from

cerebral palsy, use of analgesic and application of additional caudal block [7, 24]. There is a sedative impact of the spinal block [25, 26], although there is no determination of the sevoflurane concentration among children present with Cerebral Palsy under spinal anesthesia. Kim displayed in his research work that mixed caudal-general anesthesia is present with 36% reduction in the concentration of sevoflurane in comparison with the General Anesthesia [27]. Fast onset is the main benefit of Spinal Anesthesia on other methods of anesthesia.

CONCLUSION:

Spinal Anesthesia alone as well as in combination with the light sevoflurane anesthesia is very successful method in the children suffering from cerebral palsy and underwent orthopedic surgeries. This kind of anesthesia is very much successful for the patients who are present with high risk during GA (General Anesthesia). There is need of further research works to consolidate the findings of this research work.

REFERENCES:

1. Zhang, X., Dong, Q., & Fang, J. (2019). Impacts of General and Spinal Anaesthesia on Short-Term Cognitive Function and Mental Status in Elderly Patients Undergoing Orthopaedic Surgery. *Journal of the College of Physicians and Surgeons Pakistan*, 29(2), 101-104.

2. Cohen, J. L., Klyce, W., Kudchadkar, S. R., Kotian, R. N., & Sponseller, P. D. (2019). Respiratory Complications After Posterior Spinal Fusion for Neuromuscular Scoliosis: Children With Rett Syndrome at Greater Risk Than Those With Cerebral Palsy. *Spine*, 44(19), 1396-1402.
3. Ozkan, D., Gonen, E., Akkaya, T., & Bakir, M. (2017). Popliteal block for lower limb surgery in children with cerebral palsy: effect on sevoflurane consumption and postoperative pain (a randomized, double-blinded, controlled trial). *Journal of anesthesia*, 31(3), 358-364.
4. Lins, L. A., Nechyporenko, A. V., Halanski, M. A., Hetzel, S. J., & Noonan, K. J. (2019). Does an intrathecal baclofen pump impact scoliosis progression and complicate posterior spine fusion in patients with cerebral palsy? *Spine Deformity*, 1-7.
5. [No authors listed]. Correction of hemodynamic in children with CSIP, operated under general and combined epidural anesthesia. *Anesteziol Reanimatol*. 2012;1:10-13.
6. Wongprasartsuk P, Stevens J. Cerebral palsy and anaesthesia. *Paediatr Anaesth*. 2002;12:296-303. doi: 10.1046/j.1460-9592.2002.00635.x
7. Mossetti V, Ivani G. Controversial issues in pediatric regional anesthesia. *Paediatr Anaesth*. 2012;22:109-114. doi: 10.1111/j.1460-9592.2011.03655.x.
8. Wolf AR. Effects of regional analgesia on stress responses to pediatric surgery. *Paediatr Anaesth*. 2012;22:19-24. doi: 10.1111/j.1460-9592.2011.03714.x.
9. Wolf AR, Doyle E, Thomas E. Modifying infant stress responses to major surgery: spinal vs. extradural vs. opioid analgesia. *Paediatr Anaesth*. 1998;8:305-311. doi: 10.1046/j.1460-9592.1998.00239.x
10. Sahin M, Apiliogullari S. Spinal anesthesia is a blessing for children. *Paediatr Anaesth*. 2011;21:908. doi: 10.1111/j.1460-9592.2011.03545.x.
11. Kokki H. Spinal blocks. *Paediatr Anaesth*. 2012;22:56-64. doi: 10.1111/j.1460-9592.2011.03693.x.
12. López T, Sánchez FJ, Garzón JC, Muriel C. Spinal anesthesia in pediatric patients. *Minerva Anesthesiol*. 2012;78:78-87. doi: 10.1111/j.1460-9592.2011.03769.x.
13. Katznelson R, Mishaly D, Hegesh T, Perel A, Keidan I. Spinal anesthesia for diagnostic cardiac catheterization in high-risk infants. *Paediatr Anaesth*. 2005;15:50-53. doi: 10.1111/j.1460-9592.2004.01393.x
14. Sener M. Spinal anesthesia is a valid alternative to other anesthetic approaches for children with neuromuscular disease, and dexmedetomidine sedation is a safe method for pediatric regional anesthesia. *Paediatr Anaesth*. 2012;22:597-598. doi: 10.1111/j.1460-9592.2012.03869.x
15. Apiliogullari S, Duman A, Gok F, Ogun CO, Akillioglu I. The effects of 45 degree head up tilt on the lumbar puncture success rate in children undergoing spinal anesthesia. *Paediatr Anaesth*. 2008;18:1178-1182. doi: 10.1111/j.1460-9592.2008.02780.x.
16. Puncuh F, Lampugnani E, Kokki H. Use of spinal anaesthesia in paediatric patients: a single centre experience with 1132 cases. *Paediatr Anaesth*. 2004;14:564-567. doi: 10.1111/j.1460-9592.2004.01240.x
17. Shah RD, Suresh S. Applications of regional anaesthesia in paediatrics. *Br J Anaesth*. 2013;111:114-124. doi: 10.1093/bja/aet379.
18. Duman A, Apiliogullari S, Duman I. Effects of intrathecal fentanyl on quality of spinal anesthesia in children undergoing inguinal hernia repair. *Paediatr Anaesth*. 2010;20:530-536. doi: 10.1111/j.1460-9592.2010.03315.x.
19. Köroğlu A, Durmuş M, Toğal T, Ozpolat Z, Ersoy MO. Spinal anaesthesia in full-term infants of 0-6 months: are there any differences regarding age? *Eur J Anaesthesiol*. 2005; 22:111-116.
20. Fassoulaki A, Kaliontzi H, Petropoulos G, Tsaroucha A. The effect of desflurane and sevoflurane on cerebral oximetry under steady-state conditions. *Anesth Analg*. 2006; 102:1830-1835. doi: 10.1213/01.ane.0000205739.37190.14
21. Frei FJ, Haemmerle MH, Brunner R, Kern C. Minimum alveolar concentration for halothane in children with cerebral palsy and severe mental retardation. *Anaesthesia*. 1997; 52:1056-1060. doi: 10.1111/j.1365-2044.1997.257-az0376.x
22. Hermanns H, Stevens MF, Werdehausen R, Braun S, Lipfert P, Jetzek-Zader M. Sedation during spinal anaesthesia in infants. *Br J Anaesth*. 2006; 97:380-384. doi: 10.1093/bja/ael156.
23. Yagi, M., Ames, C. P., Keefe, M., Hosogane, N., Smith, J. S., Shaffrey, C. I., ... & Watanabe, K. (2018). A cost-effectiveness comparisons of adult spinal deformity surgery in the United States and Japan. *European Spine Journal*, 27(3), 678-684.
24. Theologis, A. A., Bellevue, K. D., Qamirani, E., Ames, C. P., & Deviren, V. (2017). Asymmetric C7 pedicle subtraction osteotomy for correction of rigid cervical coronal imbalance secondary to post-traumatic heterotopic ossification: a case report, description of a novel surgical technique, and literature review. *European Spine Journal*, 26(1), 141-145.
25. Fromer, I., & Belani, K. (2018). Anesthesia for children with cerebral palsy.

- In Anesthesiology (pp. 429-434). Springer, Cham.
26. Dursun, N., Akarsu, M., Gokbel, T., Akyuz, M., Karacan, C., & Dursun, E. (2019). Switching from Onabotulinumtoxin-a to Abobotulinumtoxin-a in Children with Cerebral Palsy Treated for Spasticity: a Retrospective Safety and Efficacy Evaluation. *Journal of rehabilitation medicine*, 51(5), 72-76.
27. Stein, A. L., Baumgard, D., Del Rio, I., & Tutiven, J. L. (2017). Updates in pediatric regional anesthesia and its role in the treatment of acute pain in the ambulatory setting. *Current pain and headache reports*, 21(2), 11.