

Effects of types of Anesthesia on Neurobehavioral Response and Apgar score in Neonates Delivered with Cesarean Section at CMCH Bhopal

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Abstract

Context: As the Frequency of cesarean section birth continuous to steadily rises worldwide the type of anaesthesia provided has gained importance. Though the anaesthesia has become very safe over the years some studies showed adverse Neonatal outcome in the babies delivered by cesarean section under general anaesthesia however this outlook needs to be further studied hence we aimed to compare the effect of general anaesthesia and spinal anaesthesia on foetal outcome delivered by cesarean section by monitoring APGAR & NACS scores. *Aims:* Settings and Design: Prospective Randomized Controlled clinical trail in tertiary level institute. *Methods and Material:* Our study was conducted in 100 patients with elective indications patients was randomly divided into general anaesthesia (in 50 patients) and spinal anaesthesia (50 patients). The APGAR score and neonatal neurological adaptive capacity score (NACS) were noted and the results were compared with the groups. The maternal age, height, weight, time taken for delivery of baby after induction & NICU admission were also noted and compared with groups. *Statistical Analysis Used:* Mean and standard deviation, unpaired t test. *Results:* There was no significant difference in spinal versus general anaesthesia group regarding age (26.34±3.61 vs 26.26±3.43), weight (75.36±6.33 vs 71.03±8.20) and height (5.21±0.16 vs 5.18±0.14) time taken for delivery of baby was statistically insignificant in both the groups percentage of NICU admission in the babies delivered under general anaesthesia group was high (28%) as compare to babies delivered under spinal anaesthesia group (10%) babies born to mothers underwent spinal anaesthesia had significantly better APGAR score after delivery (7.18±1.00 vs 6.1±0.70 P<0.001, 1 minute (8.30±1.00 vs 6.82±0.89 P<0.001) and 5 minute (8.56±1.07 vs 7.54±0.76 P<0.001) APGAR score. Neonate Neurological adaptive capacity score (NACS) at 15 minutes and 2 hours were better in spinal anaesthesia group compare to general anaesthesia group. *Conclusions:* NACS score and APGAR score were better preserved in neonates born to mother under spinal anaesthesia for elective cesarean section so this could be a base to recommend the spinal anaesthesia as a standard anaesthesia technique for cesarean section, though should be further evaluated.

Keywords: Neonatal Neurological Adaptive Capacity Score; APGAR Score; Caesarean Section; Spinal Anaesthesia; General Anaesthesia.

Introduction

The frequency of caesarean section births continuous to steadily rises worldwide [1], it is still

associated with high rates of perinatal mortality and morbidity [2]. The higher perinatal mortality and morbidity might be Attributable not only to surgical procedure but also to anaesthetic technique preferred.

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Caesarean anaesthesia has gained importance as the caesarean birth rates have increased for many years general anaesthesia was preferred type in this procedure [3]. Although it has many advantages, such as faster induction, Better Cardiovascular stability with lower incidence of hypotension, good control over ventilation.

Use of anaesthetic agents that cross the placental barrier can nevertheless produce neonatal depression. Thus, recently the rates of caesarean section using regional anaesthesia have been increasing and regional anaesthesia has now become the preferred anaesthetic technique for both maternal and foetal complication [4-5].

Although many reports have shown that regional anaesthesia and general anaesthesia have almost identical indexes of neonatal well being [6-9]. A growing number of anaesthesiologists prefers regional anaesthesia under elective conditions. Spinal anaesthesia among regional Anaesthesia is the better form of anaesthesia as it is associated with better neonatal outcome in terms of APGAR score and NACS scores [10-14].

Regional anaesthesia related hypotension due to sympathetic blockade may effect neonatal short-term outcome by impairing uteroplacental perfusion [15]. Additionally, cerebrospinal fluid leakage following lumbar puncture may induce Headache, nausea and vomiting [16-17]. On rare occasion, insufficiency of regional blockade and consequent conversion to general anaesthesia has been reported [1].

As a result no optimal caesarean technique and no ideal anaesthetic method for minimizing the mortality and morbidity among mother and neonate has yet been described in the literature, we found out many clinical trials and observational studies comparing neonatal outcomes delivered with caesarean section.

Whoever, still there are controversies on selection of types of anaesthesia and effects of each on neonatal outcomes. Besides, there are very few studies in india comparing neonatal outcomes delivered by caesarean section in clinical trial prospective observational study.

APGAR score is employed to confirm the need for resuscitation of the baby. However, APGAR score doesn't confirm effects of maternal pre-operative and intra-operative administered drugs on neonatal neurological effects. Anaesthesiologist and paediatrician used different techniques to assess neurobehavioral response of neonates delivered with caesarean section neonatal neurological adaptive capacity score is the recently new technique employed

by the anaesthesiologist. There were many clinical trials and observational studies conducted to assess the APGAR score delivered with caesarean section [18-32].

These studies showed that babies delivered under spinal anaesthesia had better outcomes as compared to general anaesthesia. Though studies conducted on effects of types of anaesthesia to neurobehavioral response of neonates were scarce worldwide, they showed that babies delivered under general anaesthesia had low neurobehavioral response than spinal anaesthesia group [33-35].

Materials and Methods

This study was conducted at Chirayu Medical College and Hospital, Bhopal with approval of Institutions Research Committee, during period of 01/09/2017 to 31/06/2017. Total 100 consecutive babies delivered by caesarean section under spinal and general anesthesia of ASA grade I and II parturients were studied in terms of APGAR score and Neonatal neurological and adaptive capacity score (NACS). Prospective effective study design was applied. The mothers were randomly divided equally into two groups of 50 each. Parturients in spinal anesthesia group were preloaded with 1 liter of ringers lactate before spinal block. Spinal anesthesia was given at L₃₋₄ with 25G Quincke needle with 2-2.2 ml of 0.5% hyperbaric bupivacaine in lateral position under full aseptic precautions. General anesthesia was introduced with I.V. propofol 2mg/kg and 2mg/kg Succinylcholine, rapid sequence induction, maintained with 1-1.5% of Isoflurane, I.V. Fentanyl 2mcg/kg plus 0.5 mg/kg of Atracurium I.V.

Data was collected by the consultant not involved in the anesthetic management of the patients. Socio-demographic characteristics, ASA status were noted in the preoperative assessment. Intraoperatively, maternal blood pressure, pulse rate, respiratory rate along with oxygen saturation at every 3 minutes until delivery of the baby and induction to delivery time were recorded. APGAR score was recorded at birth, 1 and 5 minutes according to the standard table format. Postoperatively the babies were sent to neonatal wards with their mothers and the neuro-behavioural response of the baby was assessed with Neonatal Neurologic and Adaptive Capacity Score (NACS) at 15 minutes, 2 hours. The NACS score contains five assessment areas as given in Table 1. Each criterion was given a score of 0 for absent, 1 for slightly abnormal and 2 for normal and the maximum score

was 40. The unpaired t test was used to analyse the collected data.

Results

A total of 100 patients were included in the study. The patient were divided into two groups of 50 each, named general anaesthesia and spinal anaesthesia groups. The maternal demographic characteristics are shown in Table1, age in spinal anaesthesia group was (26.34±3.61vs 26.26±3.43), weight was (75.36±6.36 vs 71.03±8.20) and height was (5.21±0.16 vs 5.18±0.14) were comparable to general anaesthesia groups. Time taken for delivery of baby in both groups is comparable (13.87±2.70 vs. 13.42±2.54). Result of

APGAR scores shown in Table 2 just after delivery APGAR was (7.18±1.00 vs 6.1±0.70), after 1minute was (8.30±1.00 vs 6.82±0.89) and after 5 minute score was (8.56±1.07 vs 7.54±0.76) difference was highly significant. To determine the effect of anaesthetic drugs on Neonatal outcome was Assessed by Neurological adaptive capacity Score in 15 minutes and 2 hrs is shown in Table 3. Neurological Adaptive capacity score components as adaptive capacity, passive tone, active tone, primary reflex, general assessment is higher in neonates delivered by spinal anaesthesia as compared to general anaesthesia. Percentage of NICU admission in spinal anaesthesia group was 10% and in general anaesthesia group NICU admission was higher 28%.

Table 1: Parturients Demographics

Components	Spinal Group (Mean ± SD)	GA group
Age(Years)	26.34±3.61	26.26±3.43
Weight(Kg)	75.36±6.33	71.03±8.20
Height(Feet)	5.21±0.16	5.18±0.14

Table 2: Apgar Score

Component	After Delivery Mean ± SD	@1min Mean ± SD	@5min Mean ± SD
Spinal	7.18±1.00	8.30±1.00	8.56±1.07
GA	6.1±0.70	6.82±0.89	7.54±0.76
p Value	<0.001	<0.001	<0.001

(P Value <0.001 Highly significant)

Table 3: NACS Score

Component	Time	Spinal Group (Mean ± SD)	GA Group (Mean ± SD)
Adaptive Capacity	15min	3.38±1.55	2.42±1.21
	2Hours	3.86±1.37	3.06±1.40
Passive Tone	15min	2.5±1.01	1.8±0.63
	2Hours	2.82±1	2.36±0.78
Active Tone	15min	2.8±1.22	1.9±1.09
	2Hours	3.34±1.18	2.56±1.19
Primary Reflex	15min	1.82±0.56	1.44±0.64
	2Hours	2.14±0.76	1.8±0.83
General Assesment	15min	2.8±0.57	2.3±0.67
	2Hours	2.9±0.3	2.8±0.49
P Value		<0.001	<0.001

(P Value <0.001 Highly significant)

Table 4: NICU Admission of Neonates in percentage

Spinal Group	GA Group
10%	28%

(P Value <0.001 Highly significant)

Discussion

Even today despite increasing knowledge and skills caesarean delivery carries higher maternal and perinatal mortality and morbidity risks than dose vaginal delivery [36]. A number of factors have played a role in the rise of regional anaesthesia rates, Such as the increasing experience of anaesthesiologist, the fact that newborn do not get exposed to the depressant effect relating to inhalation agents, the low rate of risk of lung aspiration increasing socio cultural level, the fact that the mother is awake after the caesarean delivery and early establishment of the bond between mother and newborn, given that the mother can see her baby shortly after birth [37-38].

Regional anaesthesia is divided into two subgroups: Epidural anaesthesia and spinal anaesthesia a careful examination of the relevant literature reveals that there is no difference between epidural anaesthesia and spinal anaesthesia in terms of maternal side effects [39].

Epidural anaesthesia is preferred because it has unlimited duration and post-operative pain management [40]. Spinal anaesthesia on the other hand is preferred because of its advantages of being implemented in a shorter span of time having faster onset of action and requiring less medication, and its capacity to provide a strong sensory and motor block [39].

Over recent years, our institution has also experienced an increase in the number of cases of regional anaesthesia in comparison with general anaesthesia in elective caesarean deliveries. One of the frequent maternal complications of spinal anaesthesia in intra-operative period is hypotensive episodes [39,41,42] and the potential risk factors for this are decreased sympathetic tone, advance age, obesity, high level block, insufficiency of the volume of fluid given before induction [44] fixed drug dose administration for induction instead of adjusting, it specifically to the person in question [45], and increased cerebrospinal fluid pressure [46].

In our routine clinical practice, we use crystalloid solution for prehydration and in cases of hypotension our first line intervention are to increase the crystalloid infusion rate and provide supplementation with colloid solutions if needed. Mephentermine is used if the hypotension is resistance to therapy. In recent literatures it is stressed that crystalloid is more effective than colloid in preloading for prevention of maternal hypotension after spinal anaesthesia [47].

The real question is whether maternal intra-operative hypotensive episodes increase neonatal mortality by impairing uteroplacental function [15, 42, 48]. A general examination of the current literature indicates that it is the duration and severity of hypotension that accounts for neonatal mortality [42,49,50]. Maaryan-Metzger et al [42], stated that despite very high prevalence of maternal hypotension during caesarean section, term infants tend to tolerate this placental blood perfusion challenge without major sequel. There is no difference between the general and spinal anaesthesia groups in terms of average first and fifth minute APGAR scores [6]. The Cochrane database analyses also confirm this finding pointing out that there is no significant difference between these two groups, not only in terms of the first & fifth minute average APGAR scores but also in terms of new borns oxygen requirement [51]. Nevertheless, the proportion of new borns with APGAR scores ≤ 6 has been found to be significantly low in the first minute in the spinal group but without any difference in core between the two groups with regard to the fifth minute [53].

Spinal anaesthesia is as effective as general anaesthesia. Maternal hypotension can be managed successfully with modest doses of mephentermine and IV fluid infusions. The factors that influence the selection of anaesthesia method in caesarean delivery are the following whether the operation is an emergency any systemic problems: the patient's choice: and the experience level of the anaesthesiologist.

Conclusion

Spinal anesthesia is a preferred anesthetic technique in caesarean delivery as compared with general anesthesia. Our study revealed that the mean first minute, fifth minute Apgar score and NACS score is preserved better than in general anesthesia group. Hence we conclude that the spinal anesthesia should be used as a routine anesthesia choice in all the parturient with no contraindications for it. Mothers early interaction with newborn, cost effectiveness and simplicity of the spinal anesthesia makes it a safe and smart choice.

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Conflict of Interest: None

Key Messages

Obstetric anaesthesiologist prefer regional anesthesia as the choice of technique for caesarean section deliveries. It is safe, of rapid onset with insignificant effects on both mother as well as neonates. This study was undertaken to establish the same facts and its outcome in our setting.

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