Neonatal short term outcome: Spinal versus General anesthesia for elective cesarean delivery

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Abstract:
Objective: To compare the effects of spinal and general anesthesia over Apgar score of newborns delivered by elective cesarean sections. Materials and Methods: This prospective randomized study conducted on 60 pregnant women belonging to American society of Anesthesiologists (ASA) Grade I criteria admitted at Government Medical College, Anantapuramu between June 2014 to December 2014, for whom elective cesareans were planned after 37 weeks gestation, were allocated randomly, after their informed consent, to spinal or general anesthesia groups. Thirty patients given spinal anesthesia and other thirty patients received general anesthesia. The Apgar score was recorded at 1 minute and 5 minute interval after each delivery. Results: An Apgar score ≥ 7 was observed at 1 and 5 minutes in 22 neonates (73.33%) and 30 neonates (100%) respectively in spinal group while it was 10 neonates (33.33%) and 28 neonates (93.24 %) in general group. An APGAR ≥7 was observed in significantly more neonates in spinal group at 1 minute (p=0.00095)and statistically less significant at 5 minutes(p=0.2360) interval. Apgar score at 1 minute were found to be lower for the general group than spinal group and need for respiratory assistance was greater for the general group. However at 5 minutes, no statistically significant difference was noted between the two groups with respect to Apgar score or outcome of neonates. Conclusion: There is a significant difference between the spinal and general group on Apgar score of neonates at one min interval after birth, but there is no significant difference at 5 min APGAR between the two groups. Neonates with low APGAR at one min improved with free flow of oxygen and bag and mask ventilation. Anesthesia type does not seem to influence the short term outcome of the newborn infants for elective cesarean deliveries. We believe that both spinal anesthesia and general anesthesia could be performed in elective term cesarean deliveries without any risk to the newborn infants.

Key words: Apgar score, cesarean section, general anesthesia, Neonatal shot term outcome, spinal anesthesia.
Introduction:

Deaths during immediate extra uterine life are a leading cause of child mortality which accounts for 6.5 million child deaths worldwide. Babies born under cesarean delivery are more liable to birth asphyxia due to factors associated with indication of cesarean section and added stress of anesthesia. Birth asphyxia as evidenced by low Apgar score is common among babies born by cesarean section under general anesthesia as compared with spinal anesthesia [1].

Various factors have been identified to affect neonatal and maternal outcomes during cesarean section. Types of anesthesia, maternal co-morbid condition, decision to delivery interval, uterine incision to delivery time are some of these factors [2]. Thus, this study is aimed to assess neonatal outcomes as evidenced by Apgar score among mothers delivered by cesarean section under spinal anesthesia as compared with general anesthesia.

Obstetric anesthesia is a demanding and challenging branch that requires special skills because two lives are involved. Although most patients undergoing caesarean section are young and healthy, they represent a high risk group of patients.

The choice of anesthesia for caesarean section depends upon indication for operation, its urgency, patient and obstetricians preferences and skill of anesthetist. Either of general anesthesia and spinal anesthesia is not ideal for caesarean section because each has advantage and risk to both mother and fetus [3, 4] However the aim of anesthetist is to choose the method which is safest and most comfortable for the mother, least depressant to the newborn and which provides optimal working conditions for obstetrician [5]. The outcome of anesthesia either spinal or general depends upon the condition of the mother and more importantly effects on newborn. Apgar score is best parameter to assess the immediate condition of the baby [2, 6]. It is performed one and five minutes after delivery.

The question posed regarding the effect of regional versus general anesthesia on neonatal Apgar scores is an interesting one. This subject has been studied by many investigators over the years, most commonly retrospectively and in the setting of elective cases. Some have shown no difference in Apgar scores between the groups. Some have reported lower Apgar scores and worse outcomes with the use of general anesthesia, suggesting that these differences are a result of transient sedation secondary to anesthetic agent [1]. Others have suggested an increased degree of acidosis in neonates delivered under regional anesthesia, possibly due to greater incidence of maternal hypotension and need for ephedrine to support maternal blood pressure [7].

The Apgar score (Figure-1) is a composite measure of clinical and cardio respiratory status of the baby at birth. It is measured usually at 1 minute (to determine the extent of resuscitation required) and at 5 minutes (to determine the response to resuscitation and to diagnose asphyxia).

![Apgar Scoring System](image)

The neonatal neurological adaptive score is an attempt to measure the neurological status of the babies on the assumption that the drugs used in inducing anesthesia may depress the central nervous system. It’s the first test done to the newborn in the delivery or birthing room. The test is simple and repeatable method to quickly and summarily assess the health of newborn physical condition immediately after delivery and to determine any immediate need for extra medical or emergency care.

The Apgar score was developed in 1952 by obstetric anesthesiologist named Virginia Apgar [8]. The Apgar score is usually done twice. Rarely, if there are concerns about the baby condition and the first two scores are low, less than 7, the scoring is also performed at 10, 15 and 20 minutes after delivery [9]. Five factors are used to evaluate the baby’s condition and each factor is scored on a scale of 0 to 2, as depicted with 2 being the best score for each.
Materials and Methods:
This prospective randomized study was carried out from July 2014 to December 2014 at Government Medical College and General Hospital, Anantapuramu, Andhra Pradesh and included sixty healthy full term mothers presenting in for elective lower segment caesarean section and who have consented voluntarily to take part in this study. Thirty subjects were given spinal anesthesia and other thirty mothers received general anesthesia, the Apgar scores of the neonates were recorded at 1 minute and 5 minute interval after each delivery.

Anesthesia management: Routine history and examination of all the patients done in the pre-anesthetic room. Patients are placed supine on the operating table with a wedge under the right hip. An 18 gauge intravenous peripheral vein cannulated and ringer’s lactate started. Patient connected to monitors for pulse, non-invasive blood pressure, and oxygen saturation. All patients were considered to have empty stomach and to be at risk of pulmonary aspiration; hence pre medicated with intravenous Ondansetron 4 mg and ranitidine 50 mg.

In the spinal group, after preloading the patients with 500-1000 ml of crystalloid solution, the patient was placed in sitting/left lateral position and space between 3rd and 4th lumbar spine was identified and marked. After taking all aseptic precautions, lumbar puncture was done with 23/25 gauge spinal needle and hyperbaric Bupivacaine 0.5%, 2.0ml (10mg) was administered. Immediately after injection of Bupivacaine, patient was placed in supine position with wedge under right hip or gravid uterus pushed to the left manually and oxygen at 4-6 liters with Hudson mask. After delivery, 15 units of oxytocin drip started and patient sedated with inj. midazolam 2mg.

In the General anesthesia group, patients were pre oxygenated with 100% oxygen and induced with propofol 2 mg/kg and inj. suxamethonium 1.5 mg/kg for rapid sequence intubation. After intubation 50% oxygen with nitrous oxide and 0.4 - 0.6% isoflurane are given. Anesthesia maintained with non-depolarizing muscle relaxants. After delivery, 15 units oxytocin drip started, volatile agent discontinued and inj. Butorphanol 1 mg given for analgesia.

Exclusion criteria: the patients with following criteria were excluded: Premature pregnancy <37 weeks of gestation, fetal distress, maternal co morbidity conditions like Liver, heart or kidney failure or metabolic disorders like diabetes mellitus, hypertension, thyrotoxicosis), and multiple pregnancy.

Time taken from induction of anesthesia to delivery of baby is noted. We consider that every fetus should deliver within 8-10 minutes after induction of anesthesia.

Recording of Apgar score: In this study, Apgar score of all 60 neonates was recorded at 1 minute and 5 minutes after delivery. Birth weight of each baby was recorded; Apgar score of each baby was compared with standard Apgar score chart. Apgar score (table 2) of the two groups was compared by using appropriate statistical methods.

Results

Table 1: Apgar score and Anesthesia technique

<table>
<thead>
<tr>
<th>Apgar score</th>
<th>At one minute</th>
<th>At five minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SA* Group (n=30)</td>
<td>GA# Group (n=30)</td>
</tr>
<tr>
<td>≥7</td>
<td>22(73.33 %)</td>
<td>10(33.33 %)</td>
</tr>
<tr>
<td>&lt;7</td>
<td>8(26.66 %)</td>
<td>20(66.66 %)</td>
</tr>
<tr>
<td>p-value</td>
<td>0.00095(Highly significant)</td>
<td>0.2360(not significant)</td>
</tr>
</tbody>
</table>

SA*: Spinal anesthesia; GA#: General Anesthesia

Out of 30 patients who received spinal anesthesia, only 8 patients give birth to neonate having Apgar score <7 at one minute after birth, who improved at 5 minute interval, and their Apgar score were ≥7. The Apgar score at 5 minutes of all 30 neonates, in spinal anesthesia group, was ≥7. On the other hand, out of 30 patients who received general anesthesia, 20 patients give birth to neonate having Apgar score <7 at one minute after birth and the remaining 10 neonates had Apgar score of ≥7. At 5 minutes, eighteen neonates with low Apgar score at one minute were improved after resuscitation and showed Apgar score of ≥7. On the whole 28 neonates bearing good Apgar score ≥7 at 5 minutes and two babies did not show improvement even at 5 minutes with Apgar score of 6. Statistically the p-value is highly significant at one minute apgar scores of the babies delivered by LSCS by inducing spinal anesthesia when compared to apgar scores of babies delivered by inducing general anesthesia. No such
statistical difference is observed in the two groups at five minutes.

Discussion:

Apgar score is a practical method of systemically assessing newborn infants immediately after birth to help identify those requiring resuscitation and to predict survival in neonatal period. The 1 min. Apgar score may signal the need for immediate resuscitation, and the 5, 10, 15 and 20 minutes score may indicate the probability of successfully resuscitating an infant. A low score may be due to a number of factors, including drugs given to the mother during labor, caesarean section under general anesthesia and immaturity [10].

Delivery of baby by caesarean section has become increasingly common, and both general and spinal anesthesia have certain advantages and disadvantages, but regional anesthesia has become the preferred technique because general anesthesia associated with higher maternal mortality and fetal depression [11] Death associated with general anesthesia are generally related to airway problem, such as inability to intubate , inability to ventilate or aspiration pneumonitis , large population studies in Great Britain and in the United States have shown that regional anesthesia for caesarean section is associated with less maternal morbidity and mortality than general anesthesia, whereas death associated with regional anesthesia are generally related to excessively high neural blockade or local anesthetic toxicity [11] however no technique is ideal for caesarean sections and both general and spinal anesthesia have certain advantages and disadvantages, therefore opinion remain divided whether regional block offers any real advantage over general anesthesia to both mother and baby during elective section delivery.

Apgars [12] was amongst the first to report that babies delivered by Caesarean section under spinal block were, in general, more vigorous at birth than those whose mothers had cyclopropane.

A Study done by Aftab Imtiaz and others at Abbasi Shaheed Hospital from March 2009 to July 2009, conclude that there is no significant difference between the affects of general anesthesia and spinal anesthesia on Apgar score of neonates at 5 minutes interval, born after full term elective caesarean section of healthy patients. Present anesthetic techniques, however limit the dose of intravenous agents such that fetal depression is usually not clinically significant with general anesthesia and recommended that spinal anesthesia is safe for caesarean section of healthy patients [13]. The result of this study was corresponding to our result i.e. there is significant difference only at one minute after delivery. Other study was done by Therese K. Abboud, MD et al, 2005; Los Angeles, California indicated that the Neonates delivered with general anesthesia had scored significantly lower on some of the test items than neonates delivered by spinal anesthesia at one minute after delivery [14]

Lalitha Krishnan et al as quoted by Aftab Imtiaz et al [13] studied two groups of patients; one received general anesthesia and other spinal anesthesia and found that no significant difference was seen in the mean 1minute Apgar scores in the two groups; however more neonates of the general anesthesia group appeared depressed soon after birth, needing free flow of oxygen and bag and mask ventilation.

There are different opinions about the ideal time at which the fetus should be delivered after induction of anesthesia. Barter was the first to emphasize that parturient woman should be prepped and draped before induction of general anesthesia [16]. Many workers have recommended that delivery is best completed 6-8minutes after induction of general anesthesia as nitrous oxide could cause neonatal depression by diffusion through the placenta [17, 18].

Datta et al observed that in absence of hypotension there is no change in Apgar scores or acid base status with prolonged induction to delivery interval in spinal anesthesia. Morgan describe long skin incision to delivery time more than 8 minutes and uterine-incision-to delivery time more than 180 seconds have been associated with fetal hypoxia and acidosis regardless of the type of anesthesia. In another study observed that Apgar scores of neonates whose mothers received general anesthesia were lower than neonates whose mothers received spinal anesthesia [19]. So widely believed that spinal anesthesia is safest anesthesia for newborn and mother, the reasons behind this is less neonatal exposure to depressant drugs, a decrease risk of maternal pulmonary aspiration, an awake mother at birth time, the option of using spinal opioid for postoperative pain relief and it is easy to perform, rapid with more intense block [20].
Conclusion:
There is not enough evidence from this review to show that either regional or general anesthesia is superior to the other in terms of major maternal or neonatal outcomes.

There is significant difference between the effects of general anesthesia and spinal anesthesia on Apgar score of neonates at one minute after delivery of full term neonate by elective caesarean section, but there is no significant difference between the effect of general and spinal anesthesia on Apgar score of neonates at 5 minute interval. The use of general anesthesia for cesarean section should be minimized and reserved only for those who are contraindicated to spinal anesthesia. Low birth weight, prolonged anesthesia to delivery of the baby, pre anesthetic fetal heart rate less than 120 and general anesthesia were found to be associated factors of low Apgar score.

Recommendations:
From our study we would like to recommend that spinal anesthesia is safe for caesarean section of healthy patient and much safer for newborn delivery than general anesthesia at one minute.

Implications for research:
Trials measuring outcomes such as maternal and neonatal morbidity, maternal satisfaction with techniques and adverse events are necessary, further research should be conducted using better indicators of neonatal asphyxia such as arterial gas analysis.

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