REVIEW ARTICLE

General versus Spinal Anesthesia during Caesarean Section: A Narrative Review

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This research is a method review type, comparative study between the effects of General anesthesia versus those of spinal anesthesia during caesarean section on the newborns and the mother undergoing cesarean section. The variables considered in the study included patient family history, patient medical history, status of patient during pregnancy, age of patient, and emergency or planned cesarean. Both general and spinal methods of anesthesia had differing results in multiple aspects and effects both during and after the surgery. However, pros of spinal anesthesia topped those of general anesthesia and is therefore the more favorable method of anesthesia.

keywords: **General anesthesia; Spinal anesthesia; Cesarean section**

Caesarean section can be described as the procedure where a baby is delivered by an incision on the abdominal wall and uterus of the mother. In spite of the fact that operation has become very secure over the years, it is still connected with significant maternal mortality and morbidity [1-2]. The type of anesthesia utilized and the protection with which it is managed is a significant factor of the result of caesarean section [1-3]. The purpose of the anesthetic is to reduce the pain that appears in the caesarean section operation. This can be gained by a general anesthetic, a spinal anesthetic or an epidural anesthetic [4]. Regional and general anesthesia are two kind of anesthesia commonly used for caesarean section and both have their advantages and disadvantages [5]. General anesthesia is inability in feeling pain connected with loss of consciousness created by intravenous or inhalation anesthetic agents [6]. The dangers include the aspiration of stomach contents, awareness during the surgical process (because of insufficient anesthesia), unsuccessful intubations, and respiratory obstacles for both the mother and baby [5]. When completed with halogenated volatile agents, general anesthesia has also been connected to a major danger of maternal blood loss compared with regional anesthesia [7]. However, it is a more rapid operating process and is often chosen in cases where speed is matter [5]. Regional anesthesia is the utilization of local anesthetic solutions to induce a loss of sensation to restricted areas. The kinds of regional anesthesia utilized for caesarean section are spinal (subarachnoid) and epidural (extradural) anesthesia which are done by the infiltration of a local anesthetic agent, mainly bupivacaine, into the environment of the spinal cord at the lower back region of the woman.

Spinal and epidural anesthesia cause a significant fall in maternal blood pressure, which can impact both mother and fetus [8-9], and can be dreadful when the woman has a bleeding problem [1]. They are also contraindicated in women with coagulation (clotting) disorders because the insertion of the block may accelerate a bleed. They can cause a serious postural puncture headache although the incidence of this is now decreased with the utilization of special needles [10].

The benefits of regional anesthesia are a decrease of the occurrence of general anesthetic problems and that of early bonding between the mother and the newborn, since the mother is awake during the procedure [1]. Particularly, spinal and epidural anesthesia are alike in their safety profiles with a few differences. Spinal anesthesia has a rapid start of action and needs less of the drug, but makes more hypotensive episodes than epidural anesthesia [11].

Anesthesia-related maternal mortality is reduced when general anesthesia is prevented [12-13]. The maternal mortality rate associated with anesthesia had a drastic fall in the UK and the US between the late 1970s and the late 1980s. This is assumed to be somehow because of the growing utilization of regional anesthesia for caesarean delivery [14].

In the recent years, there has been a great deal of growth in the number of cesarean deliveries carried out by section in lots of countries. Extensive differences happen between countries, regions or even hospitals within the same region with the same socioeconomic profiles and patient features [15]. This reflects that cesarean section (CS) is possibly often carried out for nonmedical reasons resulting in a totally overuse of this surgical obstetric intervention. As a matter of fact, it has been confirmed that elective primary and repeat CS have attributed heavily to the rise in CS [16]. Because of this global increase in CS rates, more attention is being paid to their outcomes. Spinal, epidural or general anesthesia's (GA) are the methods of selection for CS delivery. Considering that both methods have advantages

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and disadvantages, the choice of which anesthetic to be used is a challenging subject [17-18].

Mother and fetus well-being must be considered in the process of planning for anesthetic for cesarean delivery. Regional anesthesia is more secure for the mother than general anesthesia and the most frequent method of anesthesia for delivery [19]. Spinal and combined spinal epidural anesthesia are more frequently utilized than epidural anesthesia since it has a quicker start and lower occurrence of unsuccessful block than pure epidural techniques [20].

One of its complications is the occurrence of postural puncture headache (PDPH), particularly in parturient who are more vulnerable for their age and gender [21-23]. The utilization of fine, pencil-point needles can decrease such impacts [10, 21, 23-24]. Yet, the finer the needle, the greater the risk of puncture failure. The possible mechanism is a raise in needle flexibility inversely proportional to size [25-27]. Thus, the more a needle is flexible, the less its path is rectilinear when it passes through tissues [26,28].

In contrast to regional anesthesia, general anesthesia provides a very quick and reliable start, control over the airway and ventilation and probably less hypotension. The significant adverse fetal impact of regional anesthesia and its sympathetic blockade is utero-placental hypo-perfusion which results in a severe drop in intervillous blood flow with the possibility of fetal academia [19].

The question created in respect to the impact of general versus regional anesthesia on neonatal Apgar scores is an interesting one. This subject has been researched by lots of scholars over the years. Some have proved no difference in Apgar scores between the groups. Some have offered lower Apgar scores and worse results with the use of general anesthesia, proposing that these differences are an outcome of transient sedation secondary to anesthetic agents [26]. Others have proposed a developed degree of acidosis in neonates delivered under regional anesthesia, probably because of greater occurrence of maternal hypotension and requirement for ephedrine to support maternal blood pressure [29]. As continuous epidural techniques enhanced, spinal anesthesia for Caesarean section was employed less commonly. Several elements connected to this. Spinal anesthesia was related with a high occurrence of postural puncture headache, and its quick start made greater hypotension, which often lead to lower Apgar scores in the neonate. In the United Kingdom in the early 1950s, the famous Woolley and Roe cases virtually ended the utilization of spinal anesthesia in that country until recent years [30].

In those cases, permanent paralysis happened after spinal anesthesia in two male patients. The cause is mainly connected with contamination of the local anesthetic by phenol, the substance employed to sterilize glass ampoules including the local anesthetic. The popularity of epidural anesthesia was improved by reports in the early 1980s of the utilization of epidural morphine for post-Caesarean section analgesia [31]. This trend away from spinal anesthesia for Caesarean section was moved back in the late 1980s when the first report emerged of an extremely low incidence of headache with the utilization of pencil-point spinal needles [32].

Based on the national reports into maternal mortality associated straightly to complications during general anesthesia (GA), regional anesthesia (RA) is the most frequent utilized technique for caesarean section (CS), because of the better secure profile this technique provided. The advantages of this include, avoiding intubation which reduces the risk of aspiration, failed/oesophageal intubation and avoids the pressor effect, reduced blood loss [33], reduced risk of venous thromboembolism, better pain relief postoperatively, reduced potential for transfer of drugs to the baby the woman is awake during birth of her baby.

Spinal anesthesia is the most frequent utilized form of RA, but epidural (either de novo or conversion of a labour epidural) or a combined spinal-epidural (CSE) techniques are also used. The selection of which technique to utilize will be related to patient and surgical elements and the urgency of the surgery.

Hypotension after regional anesthesia is typical, most frequently with spinal than epidural techniques and it might deal placental blood flow. Symptoms (nausea, vomiting and/or light headedness) can come before decreased BP readings. The goal is to keep systolic blood pressure at pre-spinal levels [33]. Prohibit hypotension by preventing aortocaval compression either with left lateral tilt of the operating table or with uterine displacement, providing intravenous fluids Performing intravenous phenylephrine or ephedrine infusions and/or boluses.

There are some studies which were conducted in the field of general anesthesia and spinal anesthesia such as, Afolabi, Lesi and Merah (2006) aimed to compare the impacts of regional anesthesia with those of general anesthesia on the results of cesarean section. The design of the study was randomized and quasi-randomized controlled trials assessing the use of RA and GA in women who had CS for any indication. The authors concluded that there is no evidence from this review to show that RA is superior to GA in terms of major maternal or neonatal outcomes. Further research to evaluate neonatal morbidity and maternal outcomes, such as satisfaction with technique is required [29].

Abdallah, et all. (2014) tried to specify the impacts of combined spinal epidural anesthesia and general anesthesia on the newborns and the mother undergoing elective cesarean section. The researcher concluded that combined spinal–epidural anesthesia is more secure on the newborn than general anesthesia in respect to the APGAR scores and acid–base balance [34]. Elgebaly and Elhawary, (2013) assessed the hemodynamic impacts of general anesthesia versus combined spinal epidural anesthesia in patients experiencing caesarean section in the presence of mild to moderate pericardial effusion. As measurements, Heart rate, central venous pressure, mean arterial blood pressure, and pulmonary capillary wedge pressure were measured 10 min before anesthesia, after 20 and 30 min of anesthesia and 30 min after recovery.

This study concluded that CSE anesthesia emerged to be more beneficial, in patients experiencing caesarean section with mild to moderate pericardial effusion, with less hemodynamic changes, reduced blood loss, and better postoperative analgesia than general anesthesia patients [35].

Ismail and Huda (2009) compared time to surgical readiness and total operating room time with spinal with general anesthesia for elective caesarean section at a Pakistani university hospital for a period of six months. It was concluded that the utilization of spinal anesthesia was not connected to reduce intra-operative time usefulness compared to general anesthesia for elective caesarean section [36]. McDonnell and his colleagues designated a

prospective observational study during 2005-2006 in 13 maternity hospitals. They concluded that General anesthesia is most commonly used in emergency situations [37].

Zirak N showed that the incidence of shoulder tip pain (STP) is 39.45% in the parturient undergoing cesarean section while the prevalence of STP is higher in general anesthesia than spinal [38].

In a randomized controlled trial evaluating the use of RA (Regional Anesthesia) and GA (General Anesthesia) in women who had CS for any indication showed that there is no evidence from this review to show that RA is superior to GA in terms of major maternal or neonatal outcomes [29].

In a study comparing the complications between general and regional anesthesia, a total of 3389 caesarean sections were evaluated. The observed data revealed a predominant use of regional anesthesia for normal caesarean section, generally (86.2%) and 83.8% for emergency caesarean.

Many studies reveal several danger outcomes related to spinal anesthesia. The main danger is hypotension of the mother leading to reduced utero-placental blood flow due to sympathetic block. Other complications are post-spinal anesthetic headache and vomiting [39].

In a randomized study by Visaliyaputra et al, the hemodynamic effects of spinal versus epidural anesthesia at cesarean delivery, were monitored in 100 severe preeclamptic patients. They concluded that the results of this large prospective study support the use of spinal anesthesia for cesarean delivery in patients with severe preeclampsia [8].

The objectives shown were that the spinal analgesia had better results than general analgesia on mother and newborns. The results of this study showed that newborns in the first minute Apgar in general anesthesia had scored less than newborns in the first minute in general anesthesia in. Furthermore, mothers had better situation in spinal anesthesia during caesarean section.

There have been a number of developments in anesthesia recently, particularly in anesthetic pharmacology and technology, which have potentially changed obstetric anesthesia practice.

Conclusion

In conclusion, we found that both general and spinal anesthesia are reliable and well tolerated anesthesia techniques for elective caesarean section and awareness with recall of intraoperative events remains a significant complication of obstetric general anesthesia. However, spinal anesthesia is better than general anesthesia. This study demonstrates that emergency situations remains the most common indication for general anesthesia for caesarean section.

References

1. Murray E, Mark J. A Guide to effective care in pregnancy and childbirth. Oxford: Universiry Press; 2000.
2. Liu S, Liston RM, Joseph K, Heaman M, Sauve R, Kramer MS. Maternal mortality and severe morbidity associated with low-risk planned cesarean delivery versus planned vaginal delivery at term. CMAJ. 2007; 176(4):455-60.
3. Andersen HF, Auster GH, Marx GF, Merkatz IR. Neonatal status in relation to incision intervals, obstetric factors, and anesthesia at cesarean delivery. Am J Perinatol. 1987; 4(04):279-83.
4. Graham D, Russell I. A double-blind assessment of the analgesic sparing effect of intrathecal diamorphine (0.3 mg) with spinal anaesthesia for elective caesarean section. Int J Obstet Anesth. 1997; 6(4):224-30.
5. Thorp J, Laughon S. Clinical aspects of normal and abnormal labor. Maternal-Fetal Medicine: Principles and Practice 6th ed Philadelphia, Pa: Saunders Elsevier. 2009:453-76.
6. Rosen M. Obstetric anaesthesia and analgesia. Current Opinion in Anesthesiology. 1994;7(3):219-20.
7. Andrews WW, Ramin SM, Maberry MC, Shearer V, Black S, Wallace DH. Effect of type of anesthesia on blood loss at elective repeat cesarean section. Am J Perinatol. 1992; 9(03):197-200.
8. Visalyaputra S, Rodanant O, Somboonviboon W, Tantivitayatan K, Thienthong S, Saengchote W. Spinal versus epidural anesthesia for cesarean delivery in severe preeclampsia: a prospective randomized, multicenter study. Anesth Analg. 2005;101(3):862-8.
9. Macarthur A, Riley ET. Obstetric anesthesia controversies: vasopressor choice for postspinal hypotension during cesarean delivery. International anesthesiology clinics. 2007;45(1):115-32.
10. Brownridge P. Spinal anaesthesia in obstetrics. British journal of anaesthesia. 1991;67(5):663.
11. Ng KW, Parsons J, Cyna AM, Middleton P. Spinal versus epidural anaesthesia for caesarean section. The Cochrane Library. 2004(2).
12. Hawkins JL, Koonin LM, Palmer SK, Gibbs CP. Anesthesia-related deaths during obstetric delivery in the United States, 1979–1990. Anesthesiology. 1997;86(2):277-84.
13. Hibbard B, Anderson M, Drife J, Tighe J, Gordon G, Willatts S. Deaths associated with anaesthesia. Report on confidential enquiries into maternal deaths in the United Kingdom. 1991;1993:87-102.
14. Ezri T, Szmuk P, Evron S, Geva D, Hagay Z, Katz J. Difficult airway in obstetric anesthesia: a review. Obstet Gynecol Surv. 2001; 56(10):631-41.
15. Loo C, Dahlgren G, Irestedt L. Neurological complications in obstetric regional anaesthesia. Int J Obstet Anesth. 2000; 9(2):99-124.
16. Kararmaz A, Kaya S, Turhanoglu S, Ozyilmaz M. Which administration route of fentanyl better enhances the spread of spinal anaesthesia: intravenous, intrathecal or both? Acta Anaesthesiol Scand. 2003; 47(9):1096-100.
17. Gadsden J, Hart S, Santos AC. Post-cesarean delivery analgesia. Anesth Analg. 2005;101(5S):S62-S9.
18. Cardoso MM, Carvalho JC, Amaro AR, Prado AA, Cappelli EL. Small doses of intrathecal morphine combined with systemic diclofenac for postoperative pain control after cesarean delivery. Anesth Analg. 1998;86(3):538-41.
19. Bloom SL, Spong CY, Weiner SJ, Landon MB, Rouse DJ, Varner MW, et al. Complications of anesthesia for cesarean delivery. Obstet Gynecol. 2005;106(2):281-7.
20. Ranasinghe J, Steadman J, Toyama T, Lai M. Combined spinal epidural anaesthesia is better than spinal or epidural alone for Caesarean delivery. Br J Anaesth. 2003;91(2):299-300.
21. Choi PT, Galinski SE, Takeuchi L, Lucas S, Tamayo C, Jadad AR. PDPH is a common complication of neuraxial blockade in parturients: a meta-analysis of obstetrical studies. Can J Anaesth. 2003;50(5):460-9.
22. Douglas M, Ward M, Campbell D, Bright S, Merrick P. Factors involved in the incidence of post-dural puncture headache with the 25 gauge Whitacre needle for obstetric anesthesia. Int J Obstet Anesth. 1997;6(4):220-3.
23. Morewood GH. A rational approach to the cause, prevention and treatment of postdural puncture headache. CMAJ. 1993;149(8):1087.
24. Smith E, Thorburn J, Duckworth R, Reid J. A comparison of 25 G and 27 G Whitacre needles for caesarean section. Anaesthesia. 1994;49(10):859-62.
25. Hatfalvi BI. Postulated Mechanisms for Postdural Puncture Headache and Review of Laboratory Models. Clinical Experience. Reg Anesth. 1995;20(4):329-36.
26. Sitzman BT, Uncles DR. The effects of needle type, gauge, and tip bend on spinal needle deflection. Anesth Analg. 1996;82(2):297-301.
27. Ahn WS, Bahk JH, Lim YJ, Kim YC. The effect of introducer gauge, design and bevel direction on the deflection of spinal needles. Anaesthesia. 2002;57(10):1007-11.
28. Kopacz DJ, Allen HW. Comparison of needle deviation during regional anesthetic techniques in a laboratory model. Anesthesia & Analgesia. 1995;81(3):630-3.
29. Afolabi BB, Lesi F, Merah NA. Regional versus general

anaesthesia for caesarean section. Cochrane Database Syst Rev. 2006;4.
30. Cope RW. The Woolley and Roe case; Woolley and Roe versus Ministry of Health and others. Anaesthesia. 1954; 9(4):249-70.
31. Kotelko DM, Dailey PA, Shnider SM, Rosen MA, Hughes SC, Brizgys RV. Epidural morphine analgesia after cesarean delivery. Obstet Gynecol. 1984;63(3):409-13.
32. Sprotte G, Schedel R, Pajunk H, Pajunk H. Eine atraumatische Universalkanüle für einzeitige Regionalanaesthesien Klinische Ergebnisse nach sechsjähriger Erprobung bei über 30000 Regionalanaesthesien. Der Anaesthesist. 1987;36(7):104-8.
33. Afolabi BB, Lesi FE. Regional versus general anaesthesia for caesarean section. The Cochrane Library. 2012; 10:CD004350.
34. Abdallah MW, Elzayyat NS, Abdelhaq MM, Gado AAM. A comparative study of general anesthesia versus combined spinal–epidural anesthesia on the fetus in Cesarean section. Egyptian Journal of Anaesthesia. 2014;30(2):155-60.
35. Elgebaly AS, Elhawary T. General anaesthesia versus combined spinal epidural anaesthesia in the presence of mild to moderate pericardial effusion: A study of volunteers undergoing caesarean section. Egyptian Journal of Anaesthesia. 2013; 29(1):19-24.
36. Ismail S, Huda A. An observational study of anaesthesia and surgical time in elective caesarean section: spinal compared with general anaesthesia. Int J Obstet Anesth. 2009;18(4):352-5.
37. Devroe S, Van de Velde M, Rex S. General anesthesia for caesarean section. Curr Opin Anaesthesiol. 2015;28(3):240-6.
38. Martin T, Bell P, Ogunbiyi O. Comparison of general anaesthesia and spinal anaesthesia for Caesarean section in Antigua and Barbuda. West Indian Med J. 2007;56(4):330-3.
39. Arndt M, Benad G. The risks of anesthesia in obstetric interventions. Anaesthesiol Reanim. 1994;19(4):88-94.