

Review Article

Maternal and Neonatal Outcomes Following General and Spinal Anesthesia Are Not the Same: A Systematic Review

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ABSTRACT

Introduction: Some other researchers also came to the conclusion during 2018 that in spinal anesthesia, the occurrence of sore throat, muscle pain, and rapid return of pain after surgery is less compared to general anesthesia. Considering the inconsistencies in the studies, we decided to systematically review maternal and neonatal outcomes following two methods of general anesthesia and spinal anesthesia.

Methodology: In this review article, all databases including Google Scholar, Scopus, Web of Science, PubMed, SID, MagIran, and the Cochrane Library were searched and reviewed by both authors of this article based on PRIZMA guidelines without time and language limitations. The keywords that were selected based on MeSh and based on which the search was conducted included general anesthesia, spinal anesthesia, neonatal, maternal, outcomes, cesarean, and delivery.

Results: Related to the examination of pain intensity after the operation in the two stages of recovery and before receiving painkillers, 44% of the participants had moderate pain and in the part after receiving painkillers, two percent of the participants had mild pain. Only three percent of the samples had a headache after spinal anesthesia, and in the general anesthesia group, all the samples had no headache.

Conclusion: According to the results of the present study, it seems that the use of spinal anesthesia for cesarean section compared to the general anesthesia with less pain, less painkiller consumption, higher Apgar score, higher average hematocrit and hemoglobin, no sore throat, and more satisfaction with, but the complications of nausea, vomiting, and headache after surgery are more common in the group with spinal anesthesia.

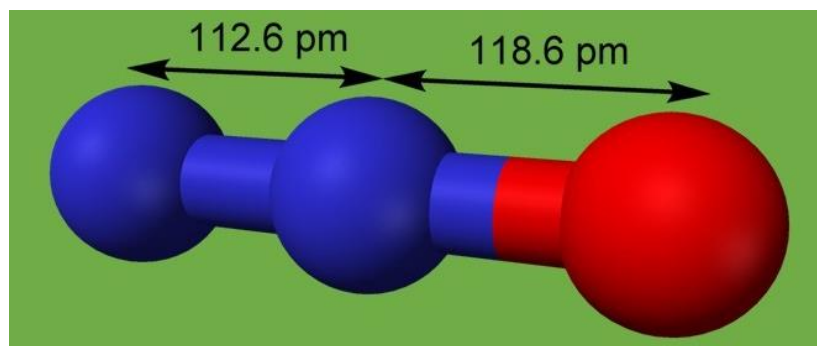
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GRAPHICAL ABSTRACT



Introduction

Childbirth is one of the divine gifts for the generation of human beings on earth, which has continued ever since the birth of Adam. The mechanism of giving birth is a spontaneous process without the need for intervention, which has been carried out for years with its natural course [1-3]. In the recent decades, with the advancement of science and technology, mankind has found ways to help them in cases where the life of mother or fetus is in danger with the help of surgery. The results of a study conducted in four Southeast Asian countries show that, in total, 27% of births were performed by cesarean section, and in this study, previous cesarean section was the most common cause [4-6]. This increasing trend can be further seen in Iran. According to the statistics published by the Ministry of Health, Treatment, and Medical Education, the prevalence of cesarean section in Iran is currently 40%, such that this statistic is 30-40% in university hospitals and 60% in private hospitals [7-9].

Caesarean section is a very dangerous operation for mother and fetus, which is much less safe than normal delivery, and this can be due to the complications such as bleeding twice as much as a normal delivery, increased likelihood of uterine infection after delivery, more pain after delivery, and consequences of anesthesia in mother and fetus [10-12]. In addition, pregnancy in a

pregnant mother whose previous delivery was performed by cesarean section is classified as a high-risk pregnancy (Figure 1). Because the risk of uterine rupture, damage to the mother and baby, prolongation of the operation due to intra-abdominal adhesions, bleeding during and after the operation, the possibility of infection and opening of the wound at the operation site, and the prolongation of the patient's stay in the hospital, are more likely [13]. It is relevant to a person who has not had surgery before [14-16].

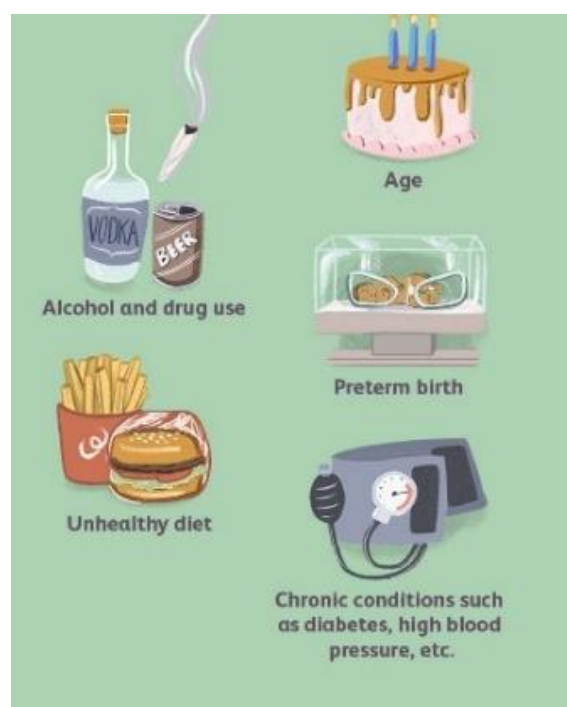


Fig.1. Risk factors of high-risk pregnancy.

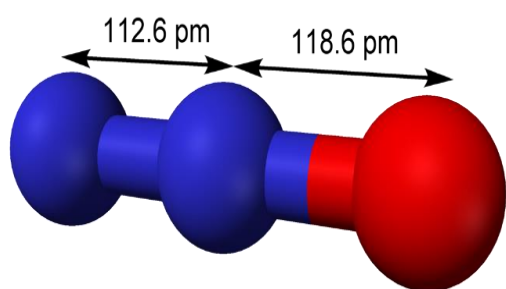


Fig. 2. Nitrous oxide molecule.

Choosing the type of anesthesia for caesarean section depends on factors such as the cause of the operation, the degree of operation urgency and the patient's own desire [17-19]. The anesthesiologist must choose the healthiest and most comfortable method for the mother and, at the same time, the method that has the least suppressive effects for the fetus in each patient [20-22]. General anesthesia is started by administering intravenous anesthetics or inhaled anesthetics with or without nitrous oxide (Figure 2), and spinal anesthesia is by injecting a local anesthetic solution into the cerebrospinal fluid in the subarachnoid space [23-25]. In a general estimation, the rate of complications of regional anesthesia is reported to be 23%. Among these side-effects are hypotension, complete spinal block (Figure 3), spinal headache, nausea and vomiting, back pain, and neurological side effects, and general anesthesia side-effects include gastric aspiration, aspiration pneumonitis, and failure of tracheal intubation [26]. The amount of hematocrit reduction after cesarean surgery in patients who are under general anesthesia is more than in patients who are under spinal anesthesia [27-29]. The effect of spinal anesthesia on the Apgar score of the first minute of newborns is less than that of general anesthesia. Therefore, it is recommended to use spinal anesthesia as much as possible for cesarean delivery [30-32].

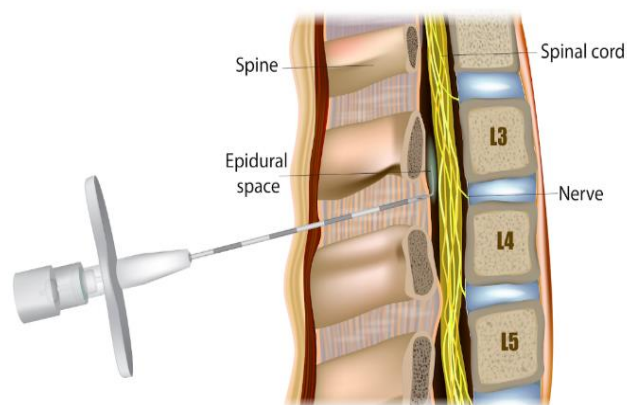


Fig. 3. Complete spinal block method.

Few studies have been done regarding the comparison of maternal and neonatal outcomes after cesarean surgery with two methods of general anesthesia and spinal anesthesia. For example, the researchers in 2020 concluded that general anesthesia controls headache, pain intensity, and nausea and vomiting better than spinal anesthesia [33-35]. However, some other researchers also came to the conclusion during 2018 that in spinal anesthesia, the occurrence of sore throat, muscle pain, and rapid return of pain after surgery is less compared to the general anesthesia [36]. Concerning the inconsistencies in the studies, we decided to systematically review maternal and neonatal outcomes following two methods of general anesthesia and spinal anesthesia [37].

Methodology

In this review article, all databases including Google Scholar, Scopus, Web of Science, PubMed, SID, MagIran, and the Cochrane Library were searched and reviewed by both authors of this article based on PRIZMA guidelines without time and language limitations. The keywords that were selected based on MeSh and based on which the search was conducted included general anesthesia, spinal anesthesia, neonatal, maternal, outcomes, cesarean, and delivery. These keywords were determined by both researchers

in one meeting, and then the search was performed in the mentioned databases by each

author separately. The search process is given in the following:

Table 1. Search strategy in PubMed database based on MeSh criteria

(Cesarean Section [mh] OR C/Section [tiab] OR Cesarean/S [tiab]) AND (C/S [mh] Neonatal [mh] OR Neonate [tiab] OR Maternal [tiab] OR General Anesthesia [tiab] OR G/Anesthesia [tiab] OR Spinal anesthesia [tiab] OR S/Anesthesia [tiab] OR Outcomes [tiab] OR outcome [tiab] OR Results [tiab] OR Result [tiab] OR Pain [tiab] OR Intensity [tiab] OR Heart Rate [tiab] OR Systolic Blood Pressure [tiab] OR Systolic BP [tiab] OR SBP [tiab] OR Diastolic Blood Pressure [tiab] OR Diastolic BP [tiab]).

The inclusion criteria of studies in this present study included the following:

1. The time limit was not applied.
2. Language restriction was not applied.
3. The studies had clear results.
4. The studies had a prospective approach.
5. The studies were in the form of clinical trials.
6. Randomization was done for all studies.
7. The study should be single-blind or double-blind.
8. The results of the study are expressed without bias.
9. Studies should be of good and high quality.

The criteria for excluding studies from the present study included the following:

1. Case studies, reviews, reports of rare cases, letters to the editor, and descriptive.
2. The age of the participants should be less than 18 years old.
3. The method of randomization is not clearly stated.
4. The dosage of the drugs used are not stated.
5. There is no control group in the study.
6. The expected results have not been achieved.
7. Exclusion criteria have not been stated.
8. The method of intervention is not clearly stated.
9. The conclusion is ambiguous.

It should be noted that the patients in the general anesthesia group were transferred to the ward after regaining full consciousness and the patients in the spinal anesthesia group after being able to bend the knee. The outcomes were

evaluated by a person who was not aware of the type of anesthesia. The pain intensity of the surgical site was recorded during three times, recovery (immediately after the operation), before receiving painkillers in the ward, and after receiving painkillers in the ward. The only pain reliever prescribed for the patients was diclofenac suppositories, and the prescription of any other painkillers or sedatives was avoided. Concerning the effect duration of diclofenac suppositories is 2 hours, in case of moderate and higher pain and the patient's willingness to receive painkillers, the next dose of suppositories was prescribed. Likewise, the frequency of nausea, vomiting immediately before the operation, the patient's blood pressure on 6 occasions including, before the operation, immediately after anesthesia, 15 minutes after the start of the operation, after the end of the operation, upon entering the recovery room, when leaving the recovery room and other variables were recorded in patients.

All the studies in the initial search were evaluated according to the inclusion and exclusion criteria, and if they met the necessary criteria, they were included in the evaluation. Then, the title and purpose of the study were reviewed and evaluated, and studies were included in the review that had a clear purpose in the title and were in line with our study. Finally, the full text of each article was reviewed by both authors, and the studies that had the appropriate and

desirable quality were included in this systematic review.

All the important information of each article was written and recorded separately by both authors in a paper sheet, and then in a face-to-face meeting, the important information was discussed and finally the important information of each article was included in this study.

Results

In relation to the examination of pain intensity after surgery, in the two stages of recovery and before receiving painkillers, 44% of the participants had moderate pain, and in the part after receiving painkillers, two percent of the participants had mild pain. Based on the obtained results, a significant relationship was observed between the type of anesthesia and postoperative nausea and vomiting. Only three percent of the samples had a headache after spinal anesthesia, and in the general anesthesia group, all the samples had no headache.

There is no statistically significant relationship between headache and type of anesthesia. 25% of the samples had a sore throat after general anesthesia, and in the spinal anesthesia group, all samples did not have a sore throat. There is a statistically significant relationship between sore throat and type of anesthesia. The type of anesthesia variable had an effect on the intensity of postoperative pain in recovery, and the variable of anesthesia type had an effect on the intensity of postoperative pain in the ward (after taking painkillers).

The data analysis of the present study using the paired t-test showed that the average hemoglobin and hematocrit after surgery in each of the treatment groups was statistically significantly different from the average before surgery and the amount of hemoglobin and hematocrit. There has been a significant decrease in each of both groups of general anesthesia and spinal anesthesia. The average standard deviation of Apgar score in the first minute was

7.49 ± 0.15 in women with general anesthesia and 8.88 ± 0.29 in women with spinal anesthesia, which was statistically significant. The mean standard deviation of fifth minute Apgar score in women with general anesthesia was 9.81 ± 0.85 and in women with spinal anesthesia was 10%, which difference was not statistically significant.

Discussion

Choosing natural delivery or caesarean section is always a challenge for pregnant women. Despite the adverse effects of cesarean section, if this method is chosen, regional anesthesia is recommended more than general anesthesia for cesarean section in the international anesthesia guidelines for obstetrics and gynecology [38-40]. From the operation, sore throat, headache, hematocrit and hemoglobin level, Apgar score, maternal blood pressure, and maternal satisfaction were evaluated in two groups of cesarean section with general anesthesia and cesarean section with spinal anesthesia [41-43]. Postoperative headache was observed in 2.7% of the samples, which was seen after spinal anesthesia. In the conducted studies, it was observed that headache was reported after spinal anesthesia, which is consistent with the clinical results of the present study, but the results were not statistically significant [44-46]. The data analysis of the present study using t-test and paired test showed that the amount of hemoglobin and hematocrit in each of the two groups of general anesthesia and spinal anesthesia decreased significantly compared to before surgery, and this means that in surgery, the resulting bleeding have caused a decrease in hemoglobin and hematocrit after the operation [47-49].

Apgar score is considered as a suitable and common method to measure the immediate well-being of newborns, and it was further evaluated in the present study. In a study that was conducted on the effect of general and spinal anesthesia in cesarean section on Apgar of

newborns, Apgar was the first minute in the group with general anesthesia and in the group of spinal anesthesia [50-52].

In a study that compared the effect of general anesthesia and spinal anesthesia on the Apgar scores of newborns during caesarean section on 168 full-term pregnant women, the average Apgar score was the first, fifth, and twentieth minutes, but no significant difference was observed in the other two times [53-55]. In this study, the first-minute Apgar score of babies whose mothers were under spinal anesthesia was higher than that of babies whose mothers received general anesthesia, but the Apgar score of the fifth and the 20th minutes was not. On the other hand, the results of another study showed that in babies born following the use of spinal anesthesia in the mother, the Apgar score of the first and fifth minutes is higher than that of general anesthesia. These results were consistent with the present study [56-58].

In a study, the results showed that the Apgar score of the first minute in babies born after using the combined epidural-spinal anesthesia method was higher than that of general anesthesia, and the results were consistent with the present study in terms of the effect of type of local anesthesia on the Apgar score of the first minute. Systolic pressure before spinal anesthesia is significantly lower than systolic pressure before general anesthesia. In addition, this situation applies to diastolic pressure before and after the operation as well as systolic pressure after the operation. 80% of all people undergoing spinal anesthesia in this study had excellent satisfaction and 20% had good satisfaction with the type of anesthesia. If only 5% of all people under general anesthesia in this study had excellent satisfaction with the type of anesthesia and 15% had good satisfaction.

Conclusion

It seems that the use of spinal anesthesia for cesarean section compared to general anesthesia

was associated with less pain, less analgesic consumption, higher Apgar score, higher average hematocrit and hemoglobin, no sore throat, and more satisfaction, but the complications of nausea, vomiting, and headache after surgery are more common in the group with spinal anesthesia. However, it should not be forgotten that the patient's choice regarding the anesthetic method should be respected and his/ or her role should not be ignored in choosing the anesthesia method. Therefore, according to the results of the study, it is recommended to use spinal anesthesia as much as possible in cesarean delivery.

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