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Comparing Propofol with Sodium Thiopental on Neonatal Apgar Score after Elective Cesarean Section

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Abstract

***Background*:** The Apgar score (Appearance, Pulse, Grimace, Activity, and Respiration) of newborn babies immediately after birth is a determining factor involved with mortality of newborns after birth. Regarding the disagreement on advantages and possible disadvantages of propofol rather thiopental in the available references, the study was triggered with the aim of analyzing effects of two mentioned drugs on babies' apgar score, mothers' nausea, vomit and time necessary for mothers' recovery.

***Materials and Methods*:** In this double-blind clinical trial, a total of 230 healthy women who were volunteered to undertake cesarean operation were selected and then divided randomly into two equal groups using statistical blocking. One group was treated by propofol while other one was treated by thiopental. The prescribed drugs for both groups were identical except the anesthesia induction drug. Babies' Apgar score 1 and 5 minutes after birth and recovery period, mothers' nausea and vomiting after operation were recorded.

***Results*:** Apgar score I minute 1 (p=0.041) and apgar score in minute 5 (p=0.034) for propofol group were meaningfully higher than those for thiopental group. Recovery time from anesthesia was not different meaningfully in two groups (p=0.67). Statistical analysis of nausea and vomit in both groups showed that they are lower in propofol group rather thiopental group (p=0.028).

***Conclusion*:** It seems that in cesarean operations, after sufficient fluid therapy, propofol can be a proper drug to achieve anesthesia. Moreover it exerts less impact on cesarean babies' apgar and stimulates lower levels of nausea and vomiting in mothers.

Introduction

The Apgar score (Appearance, Pulse, Grimace, Activity, and Respiration) of newborn babies immediately after birth is a determining factor involved with mortality of newborns after birth. In the same direction, the drug used to achieve anesthesia in mothers is very effective to set apgar of cesarean babies [1]. Indications of cesarean including repeat cesarean delivery and cesarean delivery due to dystocia are main indication of cesarean in the United States and other developed countries. Although proposing a pervasive list of all cesarean indications is impossible, over 85% of cesarean operations are practiced because of former cesarean, dystocia, fetal distress or breech presentation. Hall and Bewley collected data of more than 2 millions deliveries in Britain from 1994 to end of 1996. They concluded that although emergency cesarean delivery in comparison to vaginal delivery increases death risk as large as 9 times, even elective cesarean delivery increases death risk as large as 3 times in mothers [1].

Increased numbers of newborn babies who come to the world through cesarean operation in recent years have attracted more attention to maternal and fetal complication of this method [2]. A number of studies, for instances, have shown that increased concentration of mother's respiratory oxygen during anesthesia is good for asphyxiated fetuses. Anesthetic drugs affect the uterine blood flow through changing perfusion pressure or through changing resistance of uterine arteries. After neuraxial techniques, sympathetic block may reduce maternal blood pressure hence affect the uterine blood pressure [2].

The response will be intensified in patients who have not been hydrated sufficiently. Sufficient hydration prior to neuraxial anesthesia will not completely prevent mothers' hypotension, but enhances mother's cardiac output, hence will retain uterine and placental blood flow. Recent studies have indicated that mother's cardiac output is in compliance with uterine artery pulsation and umbilical artery's pH. During general anesthesia, high concentration of inhalational anesthetics may cause systemic vasodilatation and bring about suppressive effects on myocardium.

Likewise, spinal anesthesia in contrast to general and epidural anesthesia enjoy lower pH in fetal cord which may be due to consuming higher doses of ephedrine in such patients. Most drugs prescribed for the pregnant

women pass through placenta, hence affect fetus. History of drug use may affect either directly or indirectly the uterine ambient. When a woman takes such drugs, a certain dose of the drug pass through the placenta and reaches the fetal blood circulation.

Drugs usually pass through placenta via three main methods: simple diffusion, active transport and pinocytosis. Rate of the transported dug depends on several factors including molecular weight, protein biding, degree of fat solubility, concentration of maternal drugs, fetal and maternal pH. Although general using anesthesia has decreased during the past decade, it is used for some certain situations including maternal bleeding, apparent coagulopathy, Threatened abortion or any other case in which patient rejects local anesthesia [3].

Prescribing propofol for inducing and maintaining anesthesia of mothers let patients to take advantage of 100% oxygen during operation while protect mother against any risk of recovery during surgery [4, 5]. Moreover, other studies have shown that propofol-induced recovery from anesthesia is short and it may be dangerous for those mothers who are at risk of aspiration of stomach contents (after cesarean) [4, 6]. On the other hand, placental transport of propoful is fast and enormous. Any contact between fetus and a certain dose of the drug may cause decrease nerve function after birth which affects the mother's blood pressure hence cause decrease fetal blood flow and the subsequent complications [7-13]. Thiopental is another drug used to induce anesthesia which have known and controllable effects and side effects [7-9]. Regarding better results gained from prescribing propofol rather thiopental for creating necessary condition for cesarean operation and disagreements on its possible disadvantages in various references, this study was conducted with the aim of analyzing effects of thiopental and propofol on newborn babies' apgar, which is a good index of their condition, as well on mother's nausea and vomiting, time necessary for recovery from anesthesia.

Materials and Methods

A double-blind clinical trial was exerted for this study. After being approved by Research Ethics Committee of Zahden University of Medical Sciences and proposing a full explanation about study and taking wisely consent from pregnant women who have referred to the hospital to undertake elective cesarean operation, the individuals enrolled in the study. A total of 230 pregnant women were divided into two groups, each 115 women. Our sample has been constituted of 230 Iranian women with class ASA1 or 2 whose age and weight range were 20-40 years old and 40-100 kg, respectively. Any suffering from heart diseases, high blood pressure, diabetes, allergy to certain drugs of the study, eclampsia and preeclampsia diseases, gestational diabetes mellitus (GDM), placental abruption, oligohydramnios, placental disorders, coagulopathy, fetal disorders, addiction to drugs and cold made volunteers unqualified for this study. Limiting and matching techniques were used to control confounding variables, and demographic profiles of both groups were identical. All women experienced standard monitoring (NIBP, SPO_2, ECG) since entering the operation room and they were injected with 500 ml Ringer's injection. Relying on thiopental and propofol groupings gained from statistical blocking, they received the related drug in order to carry out induction. Propofol group was inducted with 2mg/kg propofol and 1.5 mg/kg Esculin, then they were intubated and after that they received 0.5 mg/kg atracurium. In order to keep effective anesthesia condition, 0.5 MAC isoflurane and 3 L/min nitrooxy and 3 l/Min oxygen were used. For inducting thiopental group, 5 mg/kg sodium thiopental, 1.5 mg/kg exculin were used initially and then intubation was practiced an then 0.5mg/kg atracurium was injected. In order to keep effective anesthesia condition, 0.5 MAC isoflurane and 3 L/min nitrooxy and 3 L/Min oxygen were used. Both groups were treated with 1-2 mg midazolam, 2 µg/kg fentanyl and 4 mg morphine after removing fetus and clamping of the umbilical cord.

Likewise, depending on demand and request of the gynecologist and patient's blood pressure, oxytocin or methylarginine were described for both groups. In this study only one gynecologist, for conducting cesarean operation, a midwife of the operating room, who measured newborn babies' apgar, an anesthesiology resident, a nurse who followed recovery instructions for patients were employed for all patients? Patients, the midwife and the nurse were not informed on the anesthetic. Newborn babies' apgars were estimated and recorded 1 and 5 minutes after birth. Recovery period, any case of nausea and vomit during recovery period were estimated and recorded by the recovery nurse.

Amniotic fluid polluted with meconium, postmature babies, premature babies, if the interval between uterine incision and removing fetus is more than 180 seconds, if the intubation times is longer than 60 seconds or induction-extraction period is longer than 15 minutes, hemodynamic changes, need to pharmacologic intervention, need to blood injection during operation all made the case unqualified for the study.

Data were entered into computer using SPSS-18 and the results of recovery period, as mean value and standard deviation, were analyzed using Analysis of Variance test (ANOVA). The results about nausea and vomiting were analyzed through ANOVA and results of ratio of apgar score 10 to other scores were analyzed using χ^2 statistical test.

Results

In this study, for group propofol, the apgar score at 1 minute was recorded 10 for 113 newborns and 9 for 2 newborns. The apgar score at 5 minute was recorded 10 for 114 newborns and 9 for only 1 newborn. While, for thiopental group, the apgar score at 1 minute was recorded 10 for 108 newborns, 9 for 3 newborns and 8 for 4 newborns. The apgar score at 5 minute was recorded 10 for 109 newborns, 9 for 3 newborns and 8 for 3 newborns. Thus, the ratios of apgar score 10 to other scores at 1

minute were 56.51 and 15.42 for propofol and thiopental groups respectively; while the ratios at 5 minute were 114 and 18.6 for propofol and thiopental respectively (Table 1).

The set recovery time was recorded as 37±7 minutes and 45±8 minutes for propofol and thiopental groups, respectively. The incidence rate for nausea and vomiting after operation in propofol group was 8 cases and 107 cases had not such disorders while it was 34 to 81 cases in thiopental group. Therefore, the ratios of occurring nausea and vomiting to lack of such disorders were 0.075 and 0.419 for propofol and thiopental groups, respectively. As a result, it can be said that in propofol group apgar score at 1 minute (p=0.041) and at 5 minute (p=0.034) were meaningfully more than those for thiopental group. Recovery time from anesthesia was identical for both groups and no meaningful difference was found between these two groups (p=0.67). The statistical analysis of nausea and vomiting in both groups made it clear that either nausea or vomiting in propofol group was meaningfully less than that in thiopental group.

Table 1 . The ratio of apgar score 10 to other scores at 1 and 5 minutes in terms of anesthesia induction drug

Anesthesia drug / Apgar score	Propofol	Thiopental	p-Value
Apgar score of 10 to less than 10 in 1 minute	56.51	15.42	0.041
Apgar score of 10 to less than 10 in 5 minute	114	18.16	0.034

Discussion

In this study, the apgar score of cesarean newborn babies at 1 and 5 minutes who have been inducted with propofol was better than those who have been treated with thiopental; likewise, the recovery time from anesthesia was reported as without any meaningful difference; incidence rate of nausea and vomiting in propofol treated group was less than those in thiopental treated group. It must be reminded that the study was done only among the Iranian race; hence race would be effective in apgar score in this case. On the other hand, in this study, the participants were matched and randomized regardless of whether they were primiparous or multiparous.

Ghodrati et al. reported in Ardabil's Alavi Hospital no meaningful difference was found among apgar scores (at 1, 5, 10 and 15 minutes) of the cesarean newborn babies, who have been inducted with propofol and thiopental. Similarly, in this study, mothers' hemodynamic changes were found without meaningful difference for the two groups. In order to maintain the anesthesia condition, halothane had been used; however, regarding its effects on liver, recently it has been used very rarely. Using this anesthetic to maintain anesthesia condition for both groups, can justifies similar results in both groups [14].

Djordoevi et al. studied 40 Serbian pregnant women who were inclined to give birth to their children through cesarean operation.

They found that the apgar score at 1 minute of the cesarean newborn baby who has been treated with thiopental, as the anesthesia induction, was higher. In this study, both elective cesarean and emergency cesarean were included and groups' matching has not been explained. Propofol was used to maintain anesthesia [15].

Valtonen et al. examined 32 Finnish women who have registered in hospital for cesarean operation. The women were divided into two groups, each 16 women. The apgar scores of the cesarean newborn babies who had been inducted with thiopental and propofol did not differ meaningfully; it is interesting to note that both groups were treated with propofol for maintaining anesthesia condition. Likewise, the person who estimated apgar scores of babies was informed about the used drug for induction, but the results were in contradiction to our results [10].

Celleno et al. studied 90 Italian women who have referred to the Rome University of Medical Sciences. The apgar scores of cesarean babies who had been inducted with propofol were less than babies inducted with thiopental. Both elective and emergency cesarean cases were included in this study. Halothane was used to maintain anesthesia in this study which has lost its popularity today; thus their results were in contradiction to ours [16].

Gin et al. studied 40 Hong Kong women who had registered for the cesarean operation. The results showed that apgar scores of newborn babies, in both thiopental and propofol groups, who had born through elective cesarean, were similar. The study was enjoying a proper matching process and a sufficient fluid therapy has been practiced prior to inducing anesthesia, however, their results were in contradiction to ours [17].

With regard to these studies, their strength and weak points, advantages and disadvantages of thiopental and propofol, it seems that propofol can be a better option to induce anesthesia after sufficient fluid therapy for an elective cesarean operation when no certain risk threatens mother and fetus and there is not any contraindication. In contrast to thiopental, propofol not only exerts less effect on apgar score of cesarean newborn babies, but is followed by less nausea and vomiting in mothers.

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Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

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