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Original Article

Rapid Sequence Spinal Anesthesia for Category 1 Cesarean Section: Is it Fast, Effective, and Reliable?

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Keywords: APGAR score; category 1 cesarean section; general anesthesia; rapid sequence spinal anesthesia; spinal anesthesia.

ABSTRACT

Objective: Category 1 cesarean section (C1CS) is described as an emergency that threatens the life of the mother or fetus. Spinal anesthesia has become the standard technique in categories 2, 3, and 4 because it causes less maternal and neonatal morbidity than general anesthesia. However, due to hypoxia, the risk of aspiration, and discussions about drug doses, if spinal anesthesia can be performed more quickly, it will become a more acceptable option in a C1CS. Within the scope of this study,it was aimed to evaluate the applicability of rapid sequence spinal anesthesia (RSSA) in C1CS.

Methods: Retrospectively, 177 patients who underwent C1CS between September 2019 and September 2020 and were successfully administered spinal anesthesia by the same anesthesiologist were included in the study. In these cases, preparation time for spinal anesthesia, application time, time to start surgery, delivery time and the 1-minute (1-min) and 5-minute (5-min) Activity Pulse Grimace Appearance Respiration (APGAR) scores were recorded and statistically analyzed.

Results: The mean age of the patients was 31.1±0.3 years, mean height was 154.61±3.65 cm, and mean weight was 63.55±3.95kg. The preparation time was 52.1±0.4 s, the application time was 47.3±1.6 s, the time to start surgery was 193.6±2.1 s, and the duration of delivery was 215.0±3.1 s. the mean 1-min APGAR score was 7.7±0.0, while the mean 5-min APGAR score was 8.9±0.0. A very weak but negative statistically significant correlation was found between the 1-min APGAR score and the time to start surgery. A very weak but statistically significant negative correlation was found with the 5-min APGAR score and time to start surgery, while a weak but statistically significant negative correlation was found with the duration of delivery.

Conclusion: In conclusion, considering the benefits of this method for both mother and baby, RSSA in C1CS if performed as described to achieve rapid and safe block, can be a fast, effective, and reliable option in such surgeries.

INTRODUCTION

The classification for the urgency of cesarean section (CS) was first introduced by Lucas et al. in 2000.[1] Category-1 CS (C1CS) is described as an emergency that threatens the life of the mother or fetus. Anesthesia for emergency CS can be achieved using both regional and general anesthesia (GA) techniques, but most obstetric anesthesia guidelines recommend spinal or epidural anesthesia over GA for CS.[2] There are several different reasons for recommending neuraxial blocks. The first of these is to prevent the risk of failed endotracheal intubation and gastric contents aspiration, which is more common in the obstetric population. Other reasons can be listed as follows; avoidance of medications that depress the central nervous system and respiratory system, maternal alertness, less blood loss, early mobilization and reduced risk of deep vein thrombosis, early return of gastrointestinal function, and short hospital stay. The reasons why spinal anesthesia (SA) method is preferred more frequently among neuraxial techniques are its ease of application, being a more effective method and faster onset. This method is also the preferred method as it provides intense motor block with minimal drug toxicity both for mother and fetus.[3] SA is actually the standard technique recommended in all categories.[4] On the other hand, rapid sequence GA (RSGA) is

widely used in C1CS because this technique is performed more quickly than SA in some cases.[5] However, the RSGA technique has been questioned because of hypoxia, aspiration risk, and discussions about drug doses.[6] Kinsella et al. described a specific SA approach for C1CS in 2010, called rapid sequence SA (RSSA).[7] The advantages of RSSA are the same as the benefits of SA for non-emergency CS. The steps of the RSSA include using a no-touch technique for spinal needle insertion, simplifying drug combination, no adjuvant, limiting the time allowed for interventions, a maximum of 2 attempts, initiating surgery if necessary before the block is fully established, and being ready to administer GA.[8]

Moreover, during the Covid-19 pandemic, pregnant women who are infected with the virus and decided to have an emergency CS have a limited time to evaluate their respiratory tract and there is a risk of transmission during this evaluation. Coronavirus is associated with a wide variety of respiratory failure problems that can affect or aggravate the patient during or after GA. To avoid these problems and to prevent aerosol contamination, treatment with RSSA is recommended.[9] In addition, RSSA is becoming a new approach for C1CS and is considered safer both for healthcare professionals and mothers during the pandemic.[10] However, the possible risks related to the technique in RSSA should be compared with the risks of GA and should be carefully evaluated. Since there is a race against time in C1CS, it is not recommended this method to be used by those with less SA experience.

Within the scope of this study, we aimed to evaluate the applicability of RSSA in C1CS by evaluating only the RSSA applications and the correlation between SA times and Activity Pulse Grimace Appearance Respiration (APGAR) scores in C1CS.

MATERIALS AND METHODS

After the ethics committee approval, the data of the patients who underwent C1CS between September 2019 and September 2020, had a successful SA by the same anesthesiologist, were analyzed retrospectively, cross-sectionally. 177 patients with physical status of the American Society of Anesthesiologists (ASAPS) 2 were included in this study. Patients with ASAPS ≥3, under 18 years of age, morbidly obese, maternal coagulopathy, hemodynamic instability and operated under GA were excluded from the study.

In addition to demographic data and cesarean indications of all patients, perioperative hypotension (more than 20% decrease from baseline), headache and infection status in the postoperative period were recorded. In these cases, preparation time for SA (wearing sterile gloves, ensuring asepsis conditions and drawing medicine into the injector), application time (time to reach the intrathecal space and administration of the drug), time to start surgery (time to create sufficient block for surgery, ≤T10 level), delivery time (time from incision to delivery) and the 1-min (1-min) and 5-min (5-min) APGAR scores were recorded and statistically analyzed. Block was established with 2–2.5 mL hyperbaric bupivacaine (0.5%) and 25G spinal needle without adjuvant from the L3-L4 space in the sitting position, and surgery was initiated when ≤T10 level was reached.

The primary study outcome was to evaluate the applicability of RSSA in C1CS, including preparation and administration times. The secondary outcomes included: relationship between APGAR scores and preparation and administration times.

All procedures followed were in accordance with the ethical standards of the committee responsible for human experiments (both institutional and national) and the 1975 Declaration of Helsinki as revised in 2008.

Statistical Analysis

Data were entered into the Statistical Package for the Social Sciences (IBM® SPSS Statistics for Windows, Version 23.0, Armonk, NY, USA) software package. Descriptive statistics were used and quantitative variables were characterized using mean, maximum (max) and minimum (min) values. Inter-Quartile-Range result was also given for the values recorded as median. The correlation between the variables was examined by Spearman correlation analysis and the correlation coefficient (rho) was calculated. Correlation levels were divided into various classes according to the Rho value. If this value is <0.2, the correlation is very weak, between 0.2 and 0.4, weak, between 0.4 and 0.6, moderate, and >0.6, high. It was accepted that if the coefficient was negative, the relationship was inverse (one increasing and the other decreasing, or vice versa), and if it was positive, the relationship was straight (increasing when one increases or the other decreases while one decreases). In addition, $p<0.05$ was considered statistically significant.

RESULTS

The mean age of the patients was 31.1±0.3 years, mean height was 154.61±3.65 cm, and mean weight was 63.55±3.95 kg. The most common cause of C1CS was fetal distress (n=45, 24.4%), followed by dystocia (n=36, 20.3%) and malpresentation (n=27, 15.3%).

In the perioperative period, hypotension was observed in 23 patients (12.9%) and was intervened with ephedrine. Headache was observed in 7 patients (3.9%) in the postoperative period, and no complications related to infection were observed after the procedure.

The results for preparation time, application time, time to start surgery, and duration of delivery for all patients are shown in Table 1.

Additionally, the mean 1-min APGAR score was 7.7±0.0, while the mean 5-min APGAR score was 8.9±0.0 (Table 1).

The relationship between the 1-min APGAR score and the 5-min APGAR score and preparation time, application

Table 1. Minimum-maximum and mean values of the processing times

	Min.-Max.	Mean (SD)
Preparation time (sec)	39–76	52.1±0.4
Application time (sec)	24–120	47.3±1.6
Time to start surgery (sec)	120–241	193.6±2.1
Duration of delivery (sec)	121–302	215.0±3.1
1-min APGAR score	6–8	7.7±0.0
5-min APGAR score	7–9	8.9±0.0

Sec: Second; SD: Standard deviation; APGAR: Activity pulse grimace appearance respiration; Rho: Spearman correlation coefficient. Bold p values are those that are statistically significant. The p value in italics indicates closeness to statistical significance. If the Rho coefficient is negative, the relationship is considered to be in the opposite direction, and if it is positive, it is considered to be in the same direction.

time, time to start surgery and duration of delivery are shown in Table 2.

A very weak but negative statistically significant correlation was found between the 1-min APGAR score and the time to start surgery (rho=−0.174, p=0.02). A very weak but close to statistically significant negative correlation was found between the 5-min APGAR score and the application time (rho=−0.132, p=0.08). A very weak but statistically significant negative correlation was found with the 5-min APGAR score and time to start surgery (rho=−0.178, p=0.01), while a weak but statistically significant negative correlation was found with the duration of delivery (rho=−0.275, p<0.001) (Table 2).

DISCUSSION

Regional anesthesia has an important role in obstetric anesthesia. In this study, it was aimed to evaluate the applicability of RSSA in C1CS. RSSA has been shown to be associated with both short preparation and application times and positive neonatal outcomes, and according to the results obtained, it is considered that this technique is applicable in C1CS and is a fast, effective, and reliable option considering the benefits both for mother and baby.

Regional anesthesia is preferred in obstetric cases due to both safety and the patient's desire to be awake.[11] However, SA has been associated with adverse neonatal outcomes due to prolongation of the application period, unsuccessful attempts and long decision-making interval. The primary aim in CS anesthesia applications is to provide adequate and safe anesthesia both for mother and baby. SA is considered as safe for CS, but previous studies have shown that SA requires more time than GA and is not preferred method in C1CS. However, although delivery is performed faster with GA, the incidence of neonatal morbidity was also found to be higher.[12]

The standard recommendation for C1CS is to keep the delivery decision time within 30 min.[13] The RSSA method, introduced by Kinsella et al. for C1CS in 2010, has been developed as an alternative to both emergency GA, which carries the risk of many fatal complications, and time-consuming traditional SA.[7] In fact, this method is based on the principles of shortening the time and limiting block application attempts by performing only the absolute necessary steps as quickly as possible.[14]

From the literature, it is difficult to determine the time required precisely and clearly to initiate the case with regional or GA in an emergency (category 1–3) CS. In the case series of Kinsella et al., the median duration of spinal preparation was 2 min.[7] Another observational study of emergency CS showed that the average time from wearing gloves to positioning the patient after spinal injection was 5 min.[15] In their study, Gunka and Douglas found a minimal difference between GA induction and spinal injection in anesthesia administration for simulated CS, with an median of 2 min 6 s for the first one and 1 min 58 s for the second.[16] Within the study conducted by Bhattacharya et al., RSGA and RSSA were compared, and 144.80±3.42 s with RSGA versus 131.20±3.40 s with RSSA; the shorter duration of SA with p<0.001 supports this study.[14] In this study, the application time was shorter than both the original time of Kinsella et al. and the other studies mentioned (preparation time 52.1±0.4 s, administration time 47.3±1.6 s). The reason for this is considered to be the changes made in the RSSA technique. Since the procedure is easier to perform in the sitting position, the spinal injection was performed in this position in this study, and this step was skipped since the patients already had intravenous access. For asepsis, a one-time wiping was applied with 0.5% chlorhexidine solution, which was proven to be adequate according to previous studies.[8,16]

Table 2. The relationship between the 1-min APGAR score and the 5-min APGAR score and preparation time, application time, time to start surgery, and duration of delivery

	Preparation time		Application time		Time to start surgery		Duration of delivery	
	rho	p-value	rho	p-value	rho	p-value	rho	p-value
1-min APGAR score	0.011	0.887	−0.079	0.297	−0.174	0.021	0.004	0.963
5-min APGAR score	0.094	0.215	−0.132	0.080	−0.178	0.018	−0.275	<0.001

APGAR: Activity pulse grimace appearance respiration. Rho: spearman correlation coefficient. Bold p values are those that are statistically significant. The p value in italics indicates closeness to statistical significance. If the Rho coefficient is negative, the relationship is considered to be in the opposite direction, and if it is positive, it is considered to be in the same direction.

The time from incision to delivery was (215.0±3.1 sec), which is similar to the study of Gurvani and Chandrakar (181.90±8.49 s) and other previous studies.[17,18] In the studies previously performed, anesthesia time, preparation for surgery and time of delivery were found to be significantly shorter in RSSA than in RSGA, but APGAR score did not differ significantly between the groups. However, low APGAR score and other poor perinatal outcomes were more associated with GA.[14,18,19] A retrospective analysis concluded that the 5-min APGAR score is a valid predictor of neonatal mortality, and low 5-min APGAR scores are associated with death or cerebral palsy. This association is enhanced if both 1-min and 5-min APGAR scores are low.[20] In this study, the 1-min APGAR score of the infants was (7.7±0.0), while the 5-min APGAR score was found to be (8.9±0.0), and these values are within the normal range.

In addition, in our study, a negative significant correlation was found between 1-min APGAR scores and 5-min APGAR scores and time to start surgery, while a negative significant correlation was found between 5-min APGAR scores and duration of delivery. Moreover, a statistically significant correlation was found between the application time and APGAR scores, and it was observed that the APGAR scores increased with the shortening of the times. This strengthens the opinion that SA should be preferred in fetal distress in C1CS.

There are some limitations in this study. The fact that all RSSA procedures are performed by the same anesthesiologist may be a limitation as other anesthesiologist cannot perform within the same time interval. In addition, a comparison with GA could not be made in this study because the frequency of application in obstetric cases was low in the hospital where the study was carried out.

Conclusion

Neuraxial anesthesia techniques have many advantages in pregnant women. RSSA, which is defined as minimizing anesthesia time, is also a new method for safe and timely administration. RSSA is a multidisciplinary process, from the birth decision to the end of the operation, everyone from the operating room staff to the midwife in the delivery room should be involved in the process.

In conclusion, considering the benefits of this method for both mother and baby, RSSA in C1CS if performed as described to achieve rapid and safe block, can be a fast, effective, and reliable option in such surgeries.

Ethics Committee Approval

This study approved by the Zeynep Kamil Women and Children Diseases Training and Research Hospital Clinical Research Ethics Committee (Date: 23.12.2020, Decision No: 211).

Informed Consent

Retrospective study.

Peer-review

Externally peer-reviewed.

Authorship Contributions

Concept: K.T.; Design: B.Ç.; Supervision: K.S.; Fundings: H.Y.A; Materials: .K.T.; Data: C.O.; Analysis: İ.D.; Literature search: M.B.Y.; Writing:. K.T.; Critical revision: B.Ç.

Conflict of Interest

None declared.

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Kategori 1 Sezaryende Hızlı Seri Spinal Anestezi Uygulaması: Hızlı, Etkin ve Güvenilir mi?

Amaç: Kategori 1 sezaryen, annenin veya fetüsün yaşamına yönelik ani bir tehdit olduğu anlamına gelmektedir. Spinal anestezi, genel anesteziye göre daha az maternal ve neonatal morbiditeye neden olduğu için kategori 2, 3 ve 4'te standart teknik haline gelmiştir. Fakat, hipoksi, aspirasyon riski ve ilaç dozlarıyla ilgili tartışmalar nedeniyle spinal anestezi daha hızlı gerçekleştirilebilirse, kategori 1 sezaryende daha kabul edilebilir bir seçenek haline gelecektir. Bu çalışmada, hızlı seri spinal anestezinin kategori-1 sezaryende uygulanabilirliğini değerlendirmeyi amaçladık.

Gereç ve Yöntem: Çalışmaya, retrospektif olarak 2019 Eylül - 2020 Eylül tarihleri arasında kategori 1 sezaryen operasyonuna alınan ve aynı anestezi uzmanı tarafından başarılı spinal anestezi uygulanan 177 hasta alındı. Bu olgularda spinal anestezinin hazırlanma süresi, intratekal aralığa girilme ve spinal anestezinin gerçekleştirilme süresi, cerrahi için yeterli bloğun oluşturulma süresi, bebeğin çıkış süresi ve bebeklerin 1. ve 5. dk APGAR skorları kaydedilip istatistiksel olarak incelendi.

Bulgular: Hastaların yaş ortalaması 31.1±0.3 yıl, boy ortalaması 154.61±3.65 cm, kilo ortalaması 63.55±3.95 kg idi. Hazırlık süresi 52.1±0.4 sn, uygulama süresi 47.3±1.6 sn, cerrahi başlangıç süresi 193.6±2.1 sn, doğum süresi 215.0±3.1 sn idi. Ortalama 1. dakika APGAR skoru 7.7±0.0 iken 5. dakika APGAR skoru ortalaması 8.9±0.0 olarak saptandı. Apgar-1'i ile cerrahi başlangıç süresi arasında negatif yönlü istatistiksel olarak anlamlı çok zayıf düzeyde ilişki saptandı. Apgar-5 ile cerrahi başlangıç süresi arasında negatif yönlü istatistiksel olarak anlamlı çok zayıf bir ilişki saptanırken doğum süresi ile de negatif yönlü istatistiksel olarak anlamlı zayıf bir ilişki saptandı.

Sonuç: Sonuç olarak, bu yöntemin hem anne hem fetüs için faydaları göz önünde bulundurulduğunda hem de hızlı ve güvenli blok elde etmek için tarif edildiği gibi uygulandığında hızlı seri spinal anestezinin kategori 1 sezaryende hızlı, etkin ve güvenilir bir seçenek olabileceğini düşünmekteyiz.

Anahtar Sözcükler: Apgar skoru; genel anestezi; hızlı seri spinal anestezi; kategori 1 sezaryen; spinal anestezi.