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ORIGINAL ARTICLE
ORİJİNAL ARAŞTIRMA

Comparison of the Maternal and Neonatal Outcomes for the Cesarean Section Performed During 1st and 2nd Stage of Labor

Aktif Doğum Eyleminin 1. ve 2. Evresinde Yapılan Sezaryenlerde Maternal ve Neonatal Sonuçların Karşılaştırılması

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ABSTRACT

Aim: Comparison of maternal and newborn outcomes and complications in pregnant women who have a cesarean delivery in the 2nd stage of active labor with the 1st stage cesarean deliveries.

Material and Method: In this retrospective study, 50 cases who had term, singleton, uncomplicated pregnancy and gave birth by emergency cesarean section in the second stage of labor were compared cases (n=50) who gave birth in the first stage. Demographic characteristics of the cases, indications for cesarean section, intraoperative and postoperative surgical characteristics and complications (uterine incision lengthening, arterial and/or organ injuries, hemoglobin levels, bleeding, need for blood product transfusion, relaparotomy, operation times, postoperative hospital stay) and newborn outcomes were analyzed. A p value of <0.05 was considered statistically significant.

Results: The demographic characteristics of the groups (age, number of pregnancies, body mass index, educational status) were similar (p>0.05). The rates of lengthening of the uterine incision, need for lengthening of the uterine incision, uterine artery and bladder injuries, and uterine atony were significantly higher in cesarean sections performed in the second stage (42% vs. 8%, p<0.001). Postoperative hospital stay was similar (p>0.05). Apgar scores, observation and intensive care unit needs were similar in both groups (p>0.05). No trauma or fracture occurred in newborns in either group.

Conclusion: Cesarean deliveries in the second stage of active labor cause a significant increase maternal complication, although not in newborns. Performing cesarean deliveries in the second stage by experienced obstetricians is important for the prevention and management of complications.

Keywords: Second stage cesarean, maternal, neonatal, morbidity

ÖZ

Amaç: Aktif doğum eyleminin 2. evresinde sezaryen ile doğum gerçekleştirilen gebelerde maternal, yenidoğan sonuç ve komplikasyonların 1. evrede yapılan sezaryen doğumlarla karşılaştırılmasıdır.

Gereç ve Yöntem: Retrospektif çalışmamızda gebelik komplikasyonu gelişmemiş, term, tekil gebeliği olan ve doğum eyleminin 2. evresinde acil sezaryen ile doğumu gerçekleştirilen 50 olgu çalışma grubu, 1. evrede sezaryen ile doğumu gerçekleştirilen aynı sayıda olgu (n=50) ise kontrol grubu olarak çalışmaya alındı. Olguların demografik özellikleri, sezaryen endikasyonları, intraoperatif ve postoperatif cerrahi özellikleri ve komplikasyonları (uterin insizyon uzaması, arter ve organ yaralanmaları, hemoglobin düzeyleri, kan ürünleri transfüzyonu ihtiyacı, relaparatomi, ameliyat süreleri, postoperatif hastanede kalış süresi) ile yenidoğan sonuçları incelendi. p<0.05 istatistiksel anlamlı kabul edildi.

Bulgular: Grupların yaş, gebelik sayıları, vücut kütle indeksi, eğitim durumu benzerdi (p>0.05). Uterin insizyonun uzaması, uterin insizyonun uzatılmasının gerekmesi, uterin arter ve mesane yaralanmaları ile atoni gelişimi oranları 2. evrede yapılan sezaryenlerde belirgin daha yüksekti (%42'ye karşı %8, p<0.001). Postoperatif hastanede kalış süreleri her iki grupta benzerdi (p>0.05). Apgar skorları, gözlem ve yoğun bakım ihtiyaçları her iki grupta benzerdi (p>0.05) ve hiçbir yenidoğanda travma ya da kırık meydana gelmedi.

Sonuç: Aktif doğum eyleminin 2. evresinde yapılan sezaryen doğumlar yenidoğanda olmasa da maternal komplikasyonlarda anlamlı artışa neden olur. 2. evrede sezaryen doğumların tecrübeli obstetrisyenler tarafından yapılması komplikasyonların önlenmesi ve yönetilebilmesi konusunda önemlidir.

Anahtar Kelimeler: İkinci evrede sezaryen, maternal, neonatal, morbidite

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INTRODUCTION

The period of active labor until the baby is born is divided into 2 stages. The first stage begins with the regular and effective contractions accompanied by cervical changes (dilatation/opening and effusion/erasure) and the second stage of the labor begins with the full cervical dilation. The second stage of active labor is defined as the time from complete cervical dilatation to the complete birth of baby. Cesarean section is a preferred surgical delivery method in life-threatening situations for both the mother and the fetus. Cesarean sections performed during active labor are considered as emergency cesarean sections and found to be in relation with maternal and fetal complications (1,2). In cesarean sections performed in the 2nd stage of labor, if the head is engaged in the pelvis and is located in the deep pelvis, removal of the fetal vertex can often be compelling for the obstetrician, and this surgery is also associated with an increased risk of both maternal and fetal complications (3).

Maternal complications of emergency cesarean sections include extending of uterine incision, uterine artery injury, traumatic postpartum hemorrhage, intraoperative/postoperative increased transfusion rates, bladder injury, atony and need for hysterectomy. Neonatal complications include perinatal asphyxia, low APGAR score, admission to neonatal intensive care unit and increased neonatal mortality.

In this study, we aimed to compare maternal and newborn outcomes and complications in pregnant women who have a cesarean delivery in the 2nd stage of active labor (in the presence of full cervical dilatation) with the 1st stage cesarean deliveries. Thus, in the presence of complete cervical dilatation, a better understanding of possible maternal and fetal complications can be achieved in case of need to plan about the mode of delivery.

MATERIAL AND METHOD

The study was carried out with the permission of Ankara Etlik City Hospital No: 1 Clinical Researches Ethics Committee (Date: 14.06.2023, Decision No: AEŞH-EK1-2023-298). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

In this retrospective case-control study, 50 cases who had term, singleton, uncomplicated pregnancy and gave birth by emergency cesarean section in the second stage of labor were enrolled as study group, and the same number of cases (n=50) gave birth by cesarean section in the first stage were included as the control group.

Term and singleton pregnancy with no pregnancy complications were included in the study.

Indications for cesarean sections performed in the second stage were cephalopelvic disproportion (CPD) (n=26) and fetal distress (n= 24). Indications for cesarean sections performed in the first stage were fetal distress (n=23), CPD (n=14), non-progressive labor/ unsuccessful induction (n=7), fetal macrosomia (n=2), placental abruption (n=1), malpresentation (n=2) and cord prolapse (n=1). Since high-risk pregnancies were not followed up and delivered in the delivery unit of our hospital, pregnant women with antenatal risks were excluded from the study. However, cases with diet-regulated gestational diabetes, cases with drug-regulated thyroid dysfunction, and pregnancies thought to be SGA (small for gestational age) were included in the study.

In addition to the demographic characteristics of the cases, indications for cesarean section, intraoperative and postoperative surgical characteristics and complications (extanding of uterine incision, arterial and organ injuries, hemoglobin levels, bleeding, need for transfusion and relaparatomy, duration of surgery, postoperative hospital stay) and neonatal results were analyzed statistically

SPSS (Statistical Package for Social Sciences) for Windows version 22.0 software was used for the statistical analysis of the data obtained in our study. The conformity of the data to the normal distribution was made using the Shapiro Wilk and Kolmogorov-Smirnov test. Comparisons between groups of demographic and laboratory data of all participants in those with normal distribution were made with Student's t test. Non-normally distributed data were compared between groups using the Mann-Whitney U test. Categorical data were presented as numbers and percentages and compared with the Chi-square test. Data are presented as mean±standard deviation, median (minimum-maximum) or number (percentage). The statistical significance level was accepted as $p<0.05$.

RESULTS

Demographic data of the groups (age, number of pregnancies, body mass index, education level, smoking) were found to be similar ($p>0.05$) (**Table 1**). General anesthesia was applied in 40% (n=20) of the cases who underwent cesarean section in the second stage, while general anesthesia was applied in 18% (n=9) of those who underwent cesarean section in the first stage ($p=0.015$).

In cases where cesarean section was performed in the second stage of active labor, the mean time until cesarean section was recorded as 79±70 minutes. Total operative times were similar in both groups ($p>0.05$). Active labor and cesarean section characteristics are shown in **Table 2**. Fetal head had to be pushed from the vagina in 17 of 50 cases delivered by cesarean section in the 2nd stage, and fetal foot had to be pulled in 2 cases. 21 of the emergency

cesarean sections performed in the second stage showed that at least one complication. (p<0.001) (**Table 2**, **3**) In order to remove the fetus, the uterine incision had to be extended at least 5 cm upwards (toward the uterine corpus) in an inverted T-shape in 3 cases (6%). Inverted T incision was required in only 1 case in cases where cesarean section was performed in the first stage.

Table 1. Comparison of demographic characteristics

	Cesarean section in stage 2 (n=50)	Cesarean section in stage 1 (n=50)	p
Age	27.0±6.2 (15-41)	26.6±4.3 (17-38)	0.667
BMI * (kg/m2)	29.3±5.2 (16.3-40.7)	29.9±4.5 (22.30-41.0)	0.547
Gravida (n)	1(1) (1- 5)	1(1) (1- 7)	0.981
Parity (n)	0 (1) (0-4)	0 (0) (0-5)	0.723
Abortus (n)	0 (0) (0-3)	0 (0) (0-3)	0.900
Education status			0.294
≤4 years	12 (24%)	6 (12%)	
5-12 year	22 (44%)	26 (52%)	
>12 year	16 (32%)	18 (36%)	
Smoking			0.498
None	47 (94%)	45 (90%)	
≤5	2 (4%)	one (2%)	
6-10	1 (2%)	3 (6%)	
>10	-	1 (2%)	

*BMI, body mass index

Table 2: Features of active labor and surgery

		Cesarean section in stage 2 (n=50)	Cesarean section in stage 1 (n=50)	p
Duration of active labor (hour)		5.2±2.7 (1-13)	3.5±3.0 (1-12)	0.006
Duration of oxytocin stimulation (hour)		11.8±8.7 (1-34)	9.7±8.1 (1-38)	0.379
Anesthesia	Spinal General	30 (60%) 20 (20%)	41 (82%) 9 (18%)	0.015
Interval from the start of the surgery (skin incision) to the birth of the baby (min)		5.3±4.0 (1-25)	5.4±3.9 (1-25)	0.920
Total operation time (min)		45.0±14.2 (25-80)	41.6±12.5 (20-80)	0.170
Complication * (n)		21 (42%)	4 (8%)	<0.001
Duration of hospital stay (day)		2 (0) (2-22)	2 (0) (2-21)	0.266
Duration of hospital stay (n)	>median ≤median	11 (22%) 39	6 (12%) 44	0.183

* uterine incision elongation, uterine artery injury, organ (bladder, intestine, ureter) injuries and atony

Table 3: Comparison of neonatal outcomes

	Cesarean section in stage 2 (n=50)	Cesarean section in stage 1 (n=50)	p
Birth weight (g)	3385±441 (2400- 4590)	3250±488 (2200- 4300)	0.148
Apgar score 1 min <7 (n)	6 (12%)	4 (8%)	0.505
Apgar score 5 min <7 (n)	3 (6%)	-	0.079
Observation in neonatal care service (n)	8 (16%)	4 (8%)	0.218
Follow- up in Neonatal Intensive Care Unit (n)	5 (10%)	5 (10%)	1,000

The lower segment uterine incision (Kerr incision) extended to the edges ≥2 cm from the unilateral or bilateral corners of the uterine incision in 11 (22%) cases in the 2nd stage cesarean section. In 7 cases (14%), the incision made in the lower segment was found to be torn up to the vagina. Uterine artery was injured unilaterally in 7 cases and bilaterally in 2 cases. Lateral extension of the uterine incision occurred in only 4 cases (8%) in cesarean sections performed in the first phase of active labor, and uterine artery was injured in 3 of them. There was no Kerr incision extending into the vagina.

No organ (bladder or bowel) injury occurred and no hysterectomy was required in any of the cases. While intraoperative and postpartum uterine atony developed in 3 of the deliveries by cesarean section in the 2nd stage, intraoperative atony developed in only 1 of the deliveries by cesarean section in the 1st stage. Although he need for blood product transfusion is higher in cases who underwent cesarean section in the second stage (14% vs. 4%), this difference does not show statistical significance (p=0.081) (**Table 2**).

In the first 24 hours postoperatively, erythrocyte suspension (ES) was transfused to 6 cases (12%) and fresh frozen plasma (FFP) was transfused to 3 cases (4.5%). Discrimination of intraoperative and postoperative blood product transfusions are shown in **Table 4**.

Preoperative hemoglobin levels were similar in both groups (p=0.901). In addition, postoperative 2nd hour and 6th hour values were similar between the groups (p>0.05) (**Table 5**).

While the skin incision was infected in 2 of the 2nd stage cesarean section cases, the skin incision was infected in 4 of the 1st stage cesarean section cases. Intra-abdominal abscess occurred in 1 of the patients who underwent cesarean section in the first stage. Intra-abdominal bleeding was observed in 1 of the patients who underwent cesarean section in the 2nd stage, and relaparotomy was performed in 1 of the patients who underwent cesarean section in the 1st stage due to intra-abdominal abscess.

Postoperative hospital stay was similar in both groups (p= 0.266). The need for antibiotic use in 4 cases, drain follow-up in 3 cases, relaparotomy in 2 cases, blood transfusion in 2 cases in study group. Additional interventions in those who underwent cesarean section in the 1st stage can be listed as: the need for antibiotic use in 2 cases, infected incision in 1 case and drain follow-up in 1 case. Pediatrics or neonatologists accompanied all deliveries in both groups. When newborn results were examined, Apgar scores, observation and intensive care needs were similar in both groups (p>0.05) (**Table 6**). No trauma or fracture occurred in newborns in either group.

Neonatal complications in study group (n=8, 16%) were suspicion of asphyxia (n=2), tachypnea/difficulty breathing (n=2), hypernatremia/dehydration (n=2), early-onset neonatal sepsis (n=2); asphyxia (n=2), tachypnea / respiratory distress (n=1), hypernatremia / dehydration (n=1) in the first stage cesarean section group (n=4, 8%).

Indications for the need for intensive care unit were asphyxia±intubation (n=4) (2 of these newborns died) and early-onset neonatal sepsis (n=1) in the group that underwent cesarean section in the second stage of active labor (n=5, 10%); asphyxia (n=3), early-onset neonatal sepsis (1), and bradycardia (n=1) in control goup (n=5, 10%).

DISCUSSION

Data on the incidence of cesarean section performed in the second stage of active labor, that is, when the cervix is fully dilated, is limited. While the rate of cesarean sections performed in the first stage of active labor revealed as 13-27% of all deliveries, the rate of cesarean sections performed in the second stage was noted as 1.7% of all deliveries. 2% of cesarean sections during active labor, and 2.5% of women who have reached complete dilatation (4).

When primary cesarean sections performed in active labor in low-risk nulliparous pregnancies at term were examined, it was observed that those performed in the second stage constituted 12.3% of all primary cesarean sections (5). When all pregnancies are considered, 1 out of every 4 primary cesarean sections is performed in the second stage of active labor (6).

Arrest of active labor is one of the most common indications of primary cesarean section with rates varying between 20-34% (7,8,9). World Health Organization recommended to allow up to 3 hours for nulliparous women and up to 2 hours for multiparous women (10). American Collage of Gynecologists and Obstetricians remind that the absolute maximum duration in the second stage of labor cannot be determined and allows up to 4 hours for the second stage of labor as long as the well-being of the mother and fetus allows before operative delivery is attempted (7,11). In our study, in cases where cesarean section was applied in the second stage of active labor, the average duration until cesarean section was recorded as 79±70 minutes, and there was no case in which operative delivery was attempted before cesarean section in the second stage.

There are studies showing that allowing the maximum waiting period in the second phase of labor is associated with reducing the cesarean section rate (12,13). It has also been shown that allowing the 2nd stage of labor to be prolonged to 4 hours with epidural anesthesia or to 3 hours in women without epidural anesthesia, if the mother and fetus can tolerate it, reduces the risk of cesarean section by more than 50% (14).

A relationship has been shown between the prolongation of the second stage and negative perioperative outcomes in those who delivered by cesarean section (12). However, contrary to this study, in a study (n=6273), no statistically difference was found in maternal and fetal outcomes with the increase in duration of the 2nd stage. Need for neonatal intensive care unit, low Apgar score (Apgar score <5), respiratory distress syndrome, seizure, sepsis and apnea did not increase over time. If only the second stage lasted longer than 3 hours, it was observed that the duration of hospital stay (for more than 5 days) increased approximately 2 times, regardless of the mode of delivery (15). Therefore, it would be appropriate to discuss the risks of cesarean section in the second stage with the mother before deciding on a cesarean section as the mode of delivery, since the duration of the second stage of labor exceeds the generally accepted limit of 2 hours (15).

Neonatal mortality and morbidity due to hypoxia and fetal trauma is also one of the major issues regarding cesarean sections performed in the second stage (16). It is seen that cesarean sections performed in the second stage of the labor have negative effects not only on the maternal but also on the newborn outcomes (5). Observational data suggest worse neonatal outcomes associated with prolongation of stage 2, but observational studies do not confirm absolute causality and this issue is still controversial (17). Negative neonatal outcomes may be the result of hypoxia or perinatal asphyxia in the fetus, especially if the second stage of labor is prolonged and the well-being of the fetus cannot be adequately controlled during this period (5).

While a statistically significant increase was found in neonatal morbidity (neonatal hospitalization, hypoxic-ischemic encephalopathy and subaponeurotic hemorrhage) in some studies examining neonatal morbidity in cesarean sections performed in the 2nd stage of labor (18), it was reported that there was no difference in neonatal morbidity in the 2nd stage cesarean section in larger and multicenter studies (19-21).

When the newborn results were examined, the 1st and 5th minute Apgar scores (16) and the rate of babies with a 5th minute Apgar score <4 were similar in both groups (0.6% vs. 1.1%) (5). The rate of baby followed in intensive care unit was found to be significantly higher in the group who underwent cesarean section at the 2nd stage (7.6% vs. 4.1%) (5). The median length of stay in the neonatal intensive care unit was 3-4 days (15).

In another study, neonatal intensive care unit admission rate and neonatal mortality rates were found to be

similar between the two groups (16), whereas neonatal intensive care admission rate was not different (OR: 1.63, 95% CI 0.91-2.91) in a meta-analysis, and neonatal mortality rates were similar. The rate of 5th minute Apgar score <7 was found to be significantly higher in cesarean sections performed in the second stage (OR: 5.20, OR: 2.77, respectively) (22).

Except for meconium aspiration, the need for intubation was 3 times higher in babies born by cesarean section in the second stage. It has been reported that neonatal seizures are significantly higher (OR: 2.04) in those born with stage 2 cesarean section (22).

In our study, Apgar scores and intensive care unit follow-up rates were not different between babies delivered by cesarean section at stage 2 and those delivered by cesarean section at stage 1. This can be explained by the fact that neonatologists actively accompany all deliveries in our clinic.

According to the results of our study, while organ injury was not observed in any case in emergency cesarean sections performed in the 2nd stage of the active phase of labor, the rates of other surgical complications (lengthening of the uterine incision, need for lengthening of the uterine incision, uterine artery injuries and atony development) were significantly higher than the emergency cesarean sections performed in the 1st stage. However, this increase did not have a negative effect on maternal blood transfusion need and hospital stay. In addition, newborn outcomes were similar in both groups.

As a limitation of our study, it would be appropriate to examine the maternal and neonatal morbidity and mortality results separately according to the length of the period in the second stage. Thus, predicting the risks of cesarean section according to the length of the second stage will be more valuable in patient information in cases where cesarean section is planned in the second stage. It is important to evaluate the options for cesarean section and operative vaginal delivery for the prolonged second stage of labor and to share this with the mother. Separation of groups by parity can also be recommended for future studies.

CONCLUSION

As a result, cesarean deliveries in the second stage of active labor cause a significant increase in maternal complications, although not in newborns, and require more closed care. Performing cesarean section in the 2nd stage by experienced obstetricians is important for the prevention and management of complications, similarly, it should be considered that the presence of a pediatrician or neonatologist in cases of cesarean section in the 2nd stage can improve the prognosis of the newborn.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Ankara Etlik City Hospital No: 1 Clinical Researches Ethics Committee (Date: 14.06.2023, Decision No: AEŞH-EK1-2023-298).

Informed Consent: All patients signed the free and informed consent form.

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