

Repeat Cesarean Sections: Maternal and Neonatal Outcomes and Complications

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ABSTRACT

Background & Objective: Although the safety of cesarean sections has increased, there are still considerations, especially for women with a history of repeated cesarean sections. This study was conducted with the aim of investigating maternal and neonatal outcomes in candidates for cesarean sections due to repeat cesarean sections according to the number of previous cesarean sections.

Materials & Methods: This prospective descriptive study was conducted from April 2020 to June 2022 at Taleghani Hospital. All candidates for cesarean sections due to repeated cesarean sections were included in the study. According to the number of previous cesarean sections, they were divided into three groups. Statistical analysis was performed with Kruskal-Wallis, Chi-squared and Fisher's exact tests. A P value < 0.05 indicated statistical significance.

Results: A total of 345 women were included in the study. The results of this study showed that these three groups were significantly different in terms of duration of surgery (P<0.001), abnormal placental adhesion (0.012), and the presence of intraperitoneal adhesions (P<0.001), but there was not a significant difference in terms of other maternal and neonatal outcomes (P<0.05).

Conclusion: The results of this study showed that an increase in the number of previous cesarean sections does not increase most maternal and neonatal complications during a current cesarean section. Of course, it should be noted that the number of women with a history of three or more previous cesarean sections was small in this study, and for this reason, more studies are needed.

Keywords: Repeat Cesarean Section, Outcome Assessment, Intraoperative Complications, Postoperative Complications



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Introduction

A cesarean section is one of the most common surgeries worldwide (1, 2). Data from 154 countries, which include about 94.5% of all live births in the world, show that about 21.1% of births are performed by cesarean section. This amount is about 31.7% in west Asia, where Iran is located. Also, statistics from 159 countries show that between 1990 and 2018, the cesarean section rate increased by 5%. This increase rate was 12.1% in West Asia (3). In Iran, the cesarean section rate is estimated to be 48% (4). In many centers, cesarean section because of a previous cesarean section is one of the most common causes of the surgery (5, 6). In Iran, about 25.42% of all cesarean sections are performed due to previous cesarean sections (4).

Cesarean sections are associated with potential risks (7, 8). The health of the mother and fetus, gestational age, the surgeon's and anesthetist's skill and technique, and the facilities of the treatment center play an important role in the occurrence of related complications (9, 10). The safety of cesarean sections has increased with advances in surgical techniques and patient care (11, 12). There are still considerations regarding the increased incidence of adverse maternal and fetal complications in patients undergoing a cesarean section due to a previous cesarean section, especially if the ones are repeated many times. Among these, we can mention the increase of both moderate and severe intraperitoneal adhesions, placenta previa, abnormal placental adhesion, blood transfusion,

cesarean hysterectomy, duration of operative time and hospital stay, and others. (13-16). These considerations may be important in organizing the operation of these patients for cesarean section, such as notifying colleagues from other fields, determining the operation time in such a way as to minimize the possibility of emergency cesarean section, choosing the delivery method (repeated cesarean section or vaginal delivery after cesarean section), and the need to suggest tubal ligation during repeated cesarean sections following a certain number of previous ones. Therefore, it is necessary to have information about the neonatal and maternal outcomes of a cesarean section because of a previous cesarean section in terms of the number of previous ones. Previous studies have mentioned different results regarding this issue. Some have confirmed the increase in severe complications with the increase in the number of previous cesarean sections. (14, 15, 17) and some have not confirmed serious morbidities (18, 19). In general, there is no accurate data on the maximum number of cesarean sections that are not associated with serious consequences for subsequent cesarean sections in a woman. This study was conducted with the aim of investigating maternal and neonatal outcomes in candidates for cesarean sections because of previous cesarean sections according to the number of previous sections.

Methods

This prospective descriptive study was conducted during April 2020 to June 2022 at Taleghani university hospital in Tehran, Iran. The proposal for this research was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (code: IR.SBMU.RETECH.REC.1399.1101). Since the beginning of the project, all candidates for cesarean section because of a previous cesarean section with Kerr incision and live fetus were included in the study. Exclusion criteria were multiple pregnancies, history of abdominal surgery other than cesarean section, and performing other surgeries at the same time with cesarean section. The purpose and protocol of the study were explained to the participants, and they were insured that their data would remain confidential and that they could leave the study at any time they desired, and their non-participation would not have any effect on the treatment process. Before the surgery, age (years), parity, gestational age (weeks), number of previous cesarean sections, hemoglobin (g/dL), presence of underlying disease in mother, type of skin incision, and emergency or elective cesarean section were recorded in the data collection form.

Immediately after the end of the operation the information were recorded in the data collection form including: the type of anesthesia, duration of the operation from the time of skin incision to the

complete restoration of the skin in minutes, the presence and degree of intraperitoneal adhesions (mild: membrane-like and thin adhesions that are easily separated and severe: dense and veined adhesions, and frozen pelvis, where the uterus cannot be removed from the abdominal cavity), uterine atony, placenta previa, abnormal placental adhesion (according to the pathology report if hysterectomy is required, or severe bleeding from the placental site if the placenta does not separate or is difficult to separate), dehiscence or rupture of the uterine scar, bowel injury (intestinal penetration or seromuscular injury requiring repair), bladder injury, cesarean hysterectomy, Apgar score of the newborn in first and fifth minutes, and weight of the newborn in grams. Before discharge of the patient, information about blood transfusion during or after the operation, the length of the patient's admission from the day of operation to the day of discharge in days, the mother's admission to the intensive care unit (ICU), the newborn's admission to the neonatal intensive care unit (NICU), and the patient hemoglobin six hours after the operation were recorded. Also, in the sixth week after the operation, the information related to the occurrence of infection or dehiscence of the wound, re-admission of the patient to hospital, and maternal death and its cause were checked by phone and recorded in the data collection form.

Statistical analysis was performed using SPSS version 18 (IBM, USA). Data were expressed as mean \pm standard deviation for continuous variables and number of cases and percentages for categorical variables. Descriptive analysis was utilized for demographic data. Continuous variables between groups were compared using Kruskal–Wallis, Categorical data were compared using the chi-squared and Fisher's exact test. A p-value < 0.05 indicated statistical significance.

Results

From April 2020 to June 2022, 740 cesarean sections were performed in Taleghani Hospital in Tehran, of which 345 cases (46.6%) were due to repeat cesarean sections. Of these 345 persons, 257 (74.5%) had a history of 1 previous cesarean section, 73 (21.2%) had a history of two previous cesarean sections, and 15 (4.3%) had a history of three or more previous cesarean sections. [Table 1](#) shows the demographic and surgical information, and maternal outcomes, and [Table 2](#) shows the neonatal outcomes according to the number of previous cesarean sections. No cases of bowel injury, cesarean hysterectomy, or maternal death due to cesarean section complications were observed. Also, only one case of bladder injury was observed in the group that had a history of two previous cesarean sections, which was repaired without leaving any complications.

Table 1. Demographic and surgical characteristics and maternal outcomes in 345 candidates for cesarean section according to the number of previous cesarean sections.

Variable	One previous cesarean section n:257	Two previous cesarean sections N:73	Three or more previous cesarean sections N: 15	P value
Age (year)*	27.1 ± 2.7	32.5 ± 5.2	34 ± 4.1	0.038
Gravidity *	2.4 ± 0.3	3.7 ± 0.6	4.9 ± 0.9	<0.001
Gestational age (week)*	37.83 ± 1.2	38.26 ± 1.9	37.8 ± 1.2	0.838
Maternal underlying disease [^]	14 (5.45)	7 (9.59)	2 (13.33)	<0.196
Emergency surgery [^]	57 (22.18)	19 (26.03)	4 (26.67)	0.749
Spinal anesthesia [^]	244 (94.94)	70 (95.90)	14 (93.33)	0.9
Surgery duration (min)*	51.78 ± 21.32	58.16 ± 20.05	64.17 ± 20.99	<0.001
Intra or post operation uterine atony [^]	14 (5.44)	5 (6.85)	1 (6.67)	0.893
Placenta previa [^]	12 (4.67)	4 (5.48)	2 (13.33)	0.339
Pfannenstiell incision [^]	256 (99.61)	71 (97.26)	15 (100)	0.201
abnormal placental adhesion [^]	3 (1.17)	3 (4.11)	1 (6.67)	0.012
dehiscence or cesarean scar rupture [^]	8 (3.11)	3 (4.11)	0	0.705
Intra or post operation blood transfusion [^]	7 (2.72)	3 (4.11)	1 (6.67)	0.616
Maternal hospital stay (day)*	1.8 ± 0.8	2.1 ± 0.4	2.3 ± 0.2	0.127
change of hemoglobin level before and after the operation*	1.2 ± 1.09	1.17 ± 1.22	1.4 ± 1.05	0.173
Maternal ICU admission [^]	12 (4.67)	3 (4.11)	1 (6.67)	0.911
wound infection or dehiscence [^]	7 (2.72)	2 (2.74)	0	0.811
Maternal re-hospitalization [^]	9 (3.50)	3 (4.11)	0	0.731
Intraperitoneal adhesion [^]	74 (28.80)	32 (43.84)	11 (73.33)	<0.001
Severe intra peritoneal adhesion [^]	19 (7.39)	11 (15.07)	2 (13.33)	0.196

*: mean ± standard deviation [^]: number (%)**Table 2.** Neonatal outcomes in 345 candidates for cesarean sections due to previous cesarean section according to the number of previous cesarean sections.

Variable	One previous cesarean section n:257	Two previous cesarean sections N:73	Three or more previous cesarean sections N: 15	P value
5-minute Apgar score less than 7 [^]	9 (3.50)	2 (2.74)	0	0.732
Birth weight (g)*	3182.32 ± 423.45	3134.31 ± 399.34	3101.92 ± 133.54	0.176
Neonatal NICU admission [^]	69 (26.85)	21 (28.77)	4 (26.67)	0.947

*: mean ± standard deviation [^]: number (%)

The results showed that women in the three groups were not significantly different in terms of gestational age, presence of underlying disease, frequency of emergency cesarean, use of spinal anesthesia for

cesarean, or surgery with a Pfannenstiell incision (P>0.05). Also, data showed that the frequency of uterine atony, placenta previa, dehiscence or cesarean scar rupture, blood transfusion, ICU and NICU

admission, wound infection or dehiscence, re-hospitalization, 5-minute Apgar score less than 7, average birth weight, duration of maternal hospitalization, and the change in hemoglobin level before and after the operation were not significantly different between the three groups ($P>0.05$).

Also, the results showed that the three groups were significantly different in terms of maternal age ($P = 0.038$), number of pregnancies ($P<0.001$), and duration of surgery ($P<0.001$). The frequency of abnormal placental adhesion was 1.17%, 4.11% and 6.67% in three groups with a history of one time, two times and three or more previous cesarean sections, respectively, which had a significant difference ($P=0.012$). The frequency of intraperitoneal adhesions in the groups was 28.80%, 43.84% and 73.33%, respectively, which was significantly different between the three groups ($P<0.001$). In terms of severe adhesion in the groups, 19 patients (7.39%), 11 patients (15.07%) and two patients (13.33%) had severe adhesion, respectively. However, these three groups were not significantly different in this respect ($P=0.196$). In the case of combining two groups with a history of two and three or more previous cesarean sections and comparing them with the group with a history of one previous cesarean section, a significant difference was seen between them ($P=0.039$). Also, the results of the study showed that an increase in the number of previous cesarean sections does not cause a significant change in neonatal outcomes ($P>0.05$).

Discussion

As expected, the results of this study showed that the average maternal age and number of pregnancies in the three groups increased with an increase in the number of cesarean sections, and these three groups were significantly different in this regard. Also, the study showed that the prevalence of intraperitoneal adhesions in the groups increased with an increase in the number of previous cesarean sections, and the groups were significantly different in this regard. The prevalence of severe intraperitoneal adhesions in patients with a history of two or more cesarean sections was significantly different from that in women with a history of one previous cesarean section. It seems that the increase in duration of surgery, along with the increase in the number of previous cesarean sections, is due to an increase in the adhesions. Because dissection of the abdominal wall and separation of the bladder from the lower segment take more time (18). Although in this study, the rate of abnormal placental adhesion increased with the increase in the number of previous cesarean sections, the increase in the number of cesarean sections did not cause a significant increase in other major complications such as placenta previa, blood transfusion, cesarean hysterectomy, ICU admission, and adverse neonatal outcomes. Considering that uterine atony, uterine rupture, and placental adhesion disorders are among the most

common indications for cesarean hysterectomy, the subjects of these three groups did not differ significantly in terms of uterine atony and uterine rupture; and although there was a significant difference in terms of placental adhesion disorders, the number of patients suffering from this complication was low (7 patients); therefore, the lack of difference in the rate of cesarean hysterectomy can be justified.

Some other studies also confirm the results of our study about the lack of a significant difference between most maternal and neonatal outcomes with an increasing number of cesarean sections. In Lynch's study, the medical records of 250 women who underwent elective cesarean sections due to two or more previous cesarean sections were reviewed. The results showed that 12 (4.8%) had placenta previa; two of them underwent cesarean hysterectomy; and four needed transfusions. The rate of wound infection in these patients was 6.3% and the rate of urinary infection was 11.2%. The researchers concluded that the rate of major maternal complications in repeated cesarean sections is low and is often related to the presence of placenta previa. They also found that the occurrence of maternal complications is not related to the number of previous cesarean section. (20).

In a study from Saudi Arabia, the records of 150 women who underwent cesarean sections for the fourth time or more (two for the eighth, 15 for the seventh, 20 for the sixth, 40 for the fifth, and 78 for the fourth time) were compared with those of 140 women who underwent cesarean sections for the second or third time (20 for the second and 120 for the third time). The results showed that these two groups were significantly different in terms of severe intraperitoneal adhesion ($P=0.0000$) and for this reason, the duration of surgery in the case group was longer than the control group ($P=0.0000$). But these two groups did not differ significantly in terms of placenta previa ($P=0.4818$) and placental adhesion ($P=0.6922$) and therefore the researchers concluded that performing repeated cesarean sections for the fourth to eighth time is as safe as the second and third cesarean sections (21).

The study of Uygur and his colleagues, in which 301 women with a history of one previous cesarean section were compared with 301 women with a history of two or more cesarean sections, showed that these two groups were significantly different in terms of the presence of severe intraperitoneal adhesions ($P=0.016$) and uterine dehiscence or rupture. ($P=0.030$). However, the rates of cesarean hysterectomy, bowel, ureter, and bladder injury, blood transfusion, and hemoglobin drop were not significantly different in the two groups ($P>0.05$). The researchers concluded that increasing the number of cesarean sections to 3 or more does not increase the rate of serious neonatal and maternal complications (19).

In a retrograde study, 308 women with a history of five to nine cesarean sections were compared with 306 women with a history of three or four cesarean

sections. The study showed that the duration of surgery and severity of intraperitoneal adhesions and hemoglobin drop after surgery were significantly different in the two groups ($P < 0.05$), but there was a significant difference between the two groups in terms of the newborn's Apgar score and the hospitalization rate of the newborn. There was no cesarean hysterectomy, uterine scar rupture, placenta previa, placenta accreta, bladder injury, postoperative fever, wound infection, or urinary infection (22). Although this study showed changes in hemoglobin level before and after surgery in two groups, and the absence of a significant difference in the frequency of placenta accreta was different from our study, the rest of the results were similar to our study. It should be noted that this study was conducted in women with a history of at least three previous cesarean sections, and maybe this was the reason for the lack of a different rate in placental adhesion disorder. This means that maybe after the increase in the amount of placenta accreta in the second and third repeated cesarean sections, the further increase in the number of cesarean sections does not cause a significant increase in the frequency of placental adhesion. It should be noted that other studies have shown that the probability of placental invasion abnormalities increases with the increase in the number of cesarean sections (5, 23, 24). But the present study and some other studies did not show this. (18, 22).

In contrast, some other studies have confirmed the increase in complications with an increase in the number of previous cesarean sections. A national population-based prospective cohort study in England showed that in 94 women who had a cesarean section for the fifth time or more, especially in the presence of placenta accreta, compared to 175 women who had a cesarean section for the second to fourth time, bleeding more than 1500 cc, visceral injury, and ICU admission were more common. Also, the results showed that the probability of preterm birth and its complications was higher in the group with five or more cesarean sections (OR: 6.15, CI 95% 2.56-15.78) (23).

In a retrospective case-control study in Saudi Arabia, the pregnancy outcomes of 394 women who had a fourth or more cesarean sections were compared with those of 394 women who had a second or third cesarean section. The results showed that placenta previa in two groups was 3.8% vs. 0.3% ($P < 0.001$), placenta accreta was 10.2% vs. 3.6% ($P < 0.001$), the average intraperitoneal adhesion rate was 26.1% versus 10.7% ($P < 0.001$), severe adhesion was 27.4% versus 10.7% ($P < 0.001$), intraoperative bleeding over 1000 cc 2.3% versus 6.1% ($P = 0.013$), blood transfusion rate 5.6% versus 2% ($p = 0.016$), maternal ICU admission 2.5% versus 0.3% ($P = 0.015$) were significantly different (13).

A retrospective study by Biler et al. showed that in 244 women with a history of four or more previous cesarean sections compared to 1074 women with two

or three previous cesarean sections, the intraperitoneal adhesion rate ($P < 0.001$), number of blood units transfused ($P = 0.044$), duration of surgery ($P = 0.012$), and hospital stay ($P < 0.001$) were significantly higher (18).

Another retrospective study by Sobande et al. showed that in 115 women with a history of two or more previous cesarean sections compared to 256 women with one previous cesarean section, the presence of dense adhesions during surgery ($P < 0.05$), and bladder injury ($P = 0.023$) were significantly higher (25).

A systematic review and meta-analysis that included 21 studies showed that the rate of hysterectomy, blood transfusion, intraperitoneal adhesions, and surgical injuries increased with the number of previous cesarean sections. The prevalence of placenta previa increases from 10 per 1000 births in women with one previous cesarean section to 28 per 1000 in women with three or more previous cesarean sections. Also, this study showed that the risk of placenta accreta, cesarean hysterectomy, and any maternal complication increases significantly in women with placenta previa and a history of three or more previous cesarean sections compared to women with placenta previa and no history of cesarean sections. The result of the study showed that the rate of serious maternal complications increases with the number of previous cesarean section (14).

Although these studies have shown an increase in some complications with an increase in the number of cesarean sections, it should be noted that in most of them, this increase in complications was associated with an increase in the number of fourth or higher cesarean sections, and perhaps this is the reason for their difference with our study because in our study, most of the research subjects had undergone cesarean sections for the second and third time.

This study was done prospectively, so the probability of incomplete or inaccurate data was low. But the main limitation of the study was the small number of people with three or more previous cesarean sections in this study, which reduced the power of the study. Therefore, it is suggested to conduct multicenter studies or in geographical areas with higher childbearing rates where it is possible to access samples with a history of a greater number of previous cesarean sections. It should also be noted that this study was conducted in a university hospital where physicians are experts and the facilities are sufficient, and the results may be different in centers with less experienced physicians and insufficient equipment.

Conclusion

Overall, the results of this study showed that the rate of major complications among people with a history of one, two, three or more previous cesarean sections is not significantly different from each other, but due to

the lack of women with a history of more cesarean sections, it is not possible to determine the maximum number of cesarean sections not associated with serious complications in a woman.

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Conflict of Interest

The authors declared no conflict of interest.

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