

Multiple cesarean section

The impact on maternal and fetal outcome

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ABSTRACT

Objectives: To evaluate the complications, and to determine maternal and fetal risks in women who undergo 3 or more cesarean sections (CS), compared to those with one or 2 cesarean deliveries.

Methods: A retrospective analysis of 2276 CS performed between 1 January 2003 and 31 April 2005. We divided patients into 3 groups: Group 1 = with 1 previous CS (n=1183); Group 2 = 2 previous CS (n=781); and Group 3 = ≥ 3 previous CS (n=312).

Results: Compared to women with one or 2 cesarean deliveries, women who had ≥ 3 CS show significant increase in terms of prolonged operative time, uterine scar dehiscence, uterine rupture, placenta previa, placental adherence, and mild adhesion formation. We found

no significant differences between the 3 study groups in terms of injury to surrounding structures, need for blood transfusion, anesthesia complications, hematoma formation, thromboembolism, and incisional hernia. Apgar score >7 at one and 5 minutes, neonatal intensive care unit, multiple pregnancy rate, premature delivery rate and perinatal death rate, all were similar in the 3 groups.

Conclusions: Women with multiple CS (≥ 3) are significantly prone to have uterine scar rupture and abnormal placentation in the subsequent pregnancies compared to those with one or 2 previous cesarean deliveries. Despite that, maternal and neonatal outcome did differ from patients with lower-order cesarean sections.

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The problem of increasing family size still exists in many developing countries where factors such as religion, culture, and socioeconomic status are predominant.^{1,2} Increased parity was found to be associated with adverse pregnancy outcome, and to increase the cesarean section (CS) rate.¹⁻³ Repeat CS accounts for one third of all cesarean deliveries.⁴ The incidence of maternal pre-operative, intra-operative and postoperative complications varies in the literature, depending on the definition of morbidity. The complication rate is higher in the emergency cesarean delivery than in the elective one.⁵⁻⁸ However, only a small number of studies have

been conducted to assess the maternal and fetal risks and the complication rates associated with repeated CS.⁹⁻¹⁶ Of these, the majority of studies showed that high order repeat CS carry no specific additional risk to both mother and fetus when compared to lower order cesarean deliveries.⁹⁻¹⁴ On the contrary, others reported that the overall maternal and fetal morbidity rises linearly with each successive CS.^{15,16} We conducted this study to evaluate the complications, and determine the maternal and fetal risks in women who underwent 3 or more CS compared to those who had one or 2 cesarean deliveries.

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Methods. This study was conducted retrospectively at Prince Rhashed Hospital (PRH), Irbid, Jordan between January 2003 and April 2005. During the study period, 13762 deliveries took place, of these 2276 were by CS. Data were obtained from the delivery logbooks and patient's medical files. Information abstracted included the maternal age, parity, number of previous CS, type of CS, type of the abdominal and uterine incision, time of operation, preoperative complications, intraoperative findings and complications, postoperative complications, and days of hospital stay. Fetal characteristics including the gestational age, birth weight, Apgar score, and the outcome was also recorded. Patients who underwent CS were divided into 3 groups: Group 1 with one previous CS (n=1183); Group 2 with 2 previous CS (n=781); and Group 3 with ≥ 3 previous CS (n=312). Demographic data, operative data, complications, and fetal characteristics and outcome were analyzed according to the number of previous CS performed. Emergency CS was defined as an operative delivery carried out for unplanned reasons, and elective CS when the operation was scheduled at completed 38 weeks gestation. Pfannenstiell incision was performed in the majority of patients, except those with previous vertical incision or if there were a history of severe pelvic adhesions. Indications for classical uterine incision were placenta previa centralis, transverse lie with back down, premature labor with underdeveloped lower segment, and aggressive adhesions of the lower

uterine segment with bladder or anterior abdominal wall. Uterine rupture was diagnosed when fetal parts were found within the abdominal cavity after full thickness separation of the previous scar. Uterine scar dehiscence was defined as a window in the lower segment with intact peritoneum and membranes. Placenta previa was diagnosed when ultrasonography showed a placenta partially or totally covering the internal os. Adherent placenta was defined as abnormal, partial or complete adherence of placenta to the underlying uterine wall. Severe adhesions were considered when these adhesions interfere with the course of operation, increasing the time of operation, blood loss, and maternal and fetal complications. Blood loss exceeding 1000 ml was considered significant and was estimated by the surgeon at the end of the operation. The operating time was estimated in minutes from induction of anesthesia to completion of skin suturing. Wound infection was diagnosed when a wound drained purulent material or serosanguineous fluid associated with induration, warmth, and tenderness. Endometritis was defined as fever of $>38.5^{\circ}\text{C}$ associated with uterine tenderness and leucocytosis. Perinatal mortality is defined as the sum of stillbirths and neonatal deaths in the first week after delivery. Results expressed as mean + SD were compared using one-way analysis of variance (ANOVA) performed by SPSS version 9.0. Results expressed as percentages were compared using Chi-Square test (χ^2). Significant differences were considered when $p < 0.05$.

Table 1 - Demographic and operative data of the study groups.

Demographic	Group 1 n=1183	Group 2 n=781	Group 3 n=312	P-value
Maternal age (year)	28 \pm 5.1	29 \pm 4.8	33.2 \pm 4.8	<0.01
Parity	1.5 \pm 0.6	1.6 \pm 0.7	3 \pm 1.1	<0.01
Body mass index (kg/m ²)	77 \pm 12.6	78.5 \pm 13	78 \pm 13.9	NS
Type of CS (%)				
Emergency	998 (84.4)	162 (20.7)	53 (17)	<0.001
Elective	185 (15.6)	619 (79.3)	259 (83)	NS
Abdominal incision (%)				
Pfannenstiell	1152 (97.4)	755 (96.7)	269 (86.2)	NS
Midline	31 (2.6)	26 (3.3)	43 (13.8)	<0.001
Uterine incision (%)				
Lower transverse	1178 (99.6)	777 (99.5)	304 (97.2)	NS
Classical	5 (0.4)	4 (0.5)	8 (2.5)	<0.001
Time of operation (min)	43 \pm 9	44 \pm 8.2	47 \pm 9.2	<0.05
Days of hospital stay	2.8 \pm 0.4	2.8 \pm 0.7	3 \pm 0.6	NS
Values are mean \pm SD. Group 1 - previous 1 CS, Group 2 - previous 2 CS, Group 3 - previous ≥ 3 CS, NS - Not significant, CS - cesarean sections				

Results. Table 1 shows the demographic and operative data of the 3 study groups. Women who had ≥ 3 previous cesarean deliveries were significantly older with significantly higher parity compared to those who had one or 2 previous CS. Furthermore, women in group 3 showed a significant increase in terms of midline abdominal incision, classical uterine incision and time of operation as compared to groups 1 and 2. However, the incidence of emergency CS was significantly higher in women who had one previous CS when compared to those in

groups 2 and 3. No significant differences between the 3 groups were observed in the body mass index and days of hospital stay. Maternal morbidity and mortality are summarized in Table 2. Women in group 3 had a significant increase in terms of uterine scar dehiscence, uterine rupture, placental adherence, and mild adhesion formation as compared to the other 2 groups. There were no significant differences between the 3 groups in the rates of intra-operative and post-operative complications, except for endometritis, which was significantly higher in group 1 when

Table 2 - Maternal morbidity and mortality in the study groups.

Complications	Group 1 n=1183	Group 2 n=781	Group 3 n=312	P-value
<i>Preoperative complications</i>				
Uterine scar dehiscence	1 (0.1)	2 (0.2)	7 (2.2)	<0.001
Uterine rupture	2 (0.2)	2 (0.2)	4 (1.3)	<0.05
Placenta previa	27 (2.3)	19 (2.4)	14 (4.5)	NS
Placental adherence	4 (0.3)	3 (0.4)	5 (1.6)	<0.05
<i>Adhesions:</i>				
Mild	246 (20.8)	272 (34.8)	169 (54.2)	<0.001
Severe	63 (5.3)	51 (6.5)	22 (7)	NS
<i>Intraoperative complications</i>				
Bladder injury	2 (0.2)	0	1 (0.3)	NS
Bowel injury	0	1 (0.1)	1 (0.3)	NS
Need for blood transfusion	84 (7.1)	61 (7.8)	26 (8.3)	NS
Cesarean hysterectomy	3 (0.3)	2 (0.2)	3 (1)	<0.05
Anesthesia complications	2 (0.2)	1 (0.1)	0	NS
<i>Postoperative complications</i>				
Urinary tract infection	49 (4.1)	35 (4.5)	13 (4.2)	NS
Endometritis	29 (2.5)	3 (0.4)	2 (0.6)	<0.05
Wound infection	34 (2.9)	7 (0.9)	3 (1)	<0.05
Wound dehiscence	11 (0.9)	4 (0.5)	2 (0.6)	NS
Hematoma	9 (0.8)	4 (0.4)	4 (1.3)	NS
Thromboembolism	2 (0.2)	1 (0.1)	0	NS
Incisional hernia	4 (0.3)	2 (0.3)	3 (1)	NS
Maternal death	1 (0.1)	0	0	NS
NS - not significant, CS - cesarean sections, Group 1 - previous 1 CS, Group 2 - previous 2 CS, Group 3 - previous ≥ 3 CS				

Table 3 - Fetal characteristics and outcome.

Fetal characteristics	Group 1 n=1197	Group 2 n=790	Group 3 n=315	P-value
Gestational age (week)	38.5 \pm 2.1	38.1 \pm 2.4	37.9 \pm 1.8	NS
Birth weight (g)	3302 \pm 411	3321 \pm 399	3289 \pm 403	NS
<i>Apgar score >7 (%)</i>				
At 1- minute	1057/1197 (88.3)	705/790 (89.2)	287 (91.1)	NS
At 5-minute	1101/1197 (92)	751/790 (95.1)	298 (94.9)	NS
Neonate intensive care unit (%)	7/1197 (0.6)	5/790 (0.6)	2 (0.6)	NS
Multiple pregnancy (twins) (%)	14/1183 (1.2)	11/781 (1.4)	3 (1)	NS
Premature delivery (%)	105/1183 (8.9)	77/781 (9.9)	30/312 (9.6)	NS
Perinatal death (%)	21/1197 (1.8)	9/790 (1.1)	4 (1.3)	NS
Values are mean \pm SD. NS - not significant, CS - cesarean sections, Group 1 - previous 1 CS, Group 2 - previous 2 CS, Group 3 - previous ≥ 3 CS				

compared to groups 2 and 3. A single maternal death occurred in group one and was due to pulmonary embolism. **Table 3** shows the fetal characteristics and outcome in the 3 study groups. No significant differences were observed between the 3 groups in the gestational age, birth weight and one and 5-minute Apgar score, and neonatal intensive care unit. Also, there were no significant differences in the rates of multiple pregnancy, premature delivery and perinatal death among the groups.

Discussion. In developing countries, for reasons such as religion, culture or socioeconomic, the number of women requiring repeated CS is increasing. Limited numbers of studies have been published concerning the safety and risks of multiple repeated CS.⁹⁻¹⁶ A considerable obstetrical hazard of repeated CS is the increased incidence of antepartum and postpartum uterine scar rupture with subsequent increase in both maternal and fetal morbidity and mortality. The results of our study showed that the incidence of uterine scar dehiscence and rupture were significantly increased in women who had ≥ 3 cesarean deliveries as compared to those who had one or two. This finding is in agreement with that reported by Uygur et al¹¹ but in contrast to others who reported no increase in the incidence of uterine scar rupture with increasing number of cesarean sections.^{10,14-16} A possible explanation for this disagreement is the difference in the sample size of the control group, which is larger in our study, and provides statistical power for the accurate rate in our study groups. Another preoperative risk of multiple repeat CS threatening the life of both mother and fetus is placenta previa, especially when placentation is abnormally adherent. The incidence of placenta previa and placental adherence including placenta accreta and increta was significantly higher among women who had 3 or more cesarean deliveries compared to those with lower number of CS. Similar results were reported by others.^{4,9,15} It has been reported that the rate of intraperitoneal adhesions is increased with number of repeated abdominal surgery.⁹⁻¹⁶ Furthermore, it has been found that presence of severe adhesions can adversely affect the course of a subsequent abdominal surgery increasing the time of operation, the need for blood transfusion, and the injury to the surrounding structures including bowel, ureter and bladder. Although the incidence of mild adhesions in our study was significantly higher in women who had ≥ 3 CS, the incidence of severe adhesions did not differ significantly among the 3 groups, contrary to the above mentioned studies, suggestive that some patients are more susceptible than others to form dense intraperitoneal adhesions

by unknown mechanisms. In our study, severe pelvic adhesions were responsible for bladder injury in 2 cases in group one, and in one case in group 3, and for bowel injury in one case in group 2 and in another one case in group 3. Many studies focused on postoperative infectious morbidity in patients undergoing multiple repeat CS such as urinary tract infection, wound infection and endometritis.^{10,11,13-15} Investigators, in these studies found no significant difference in the rates of postoperative infectious morbidity between high-order and low-order repeat CS. In contrast to these studies, women in our study who had one previous cesarean delivery showed significant increase in the rates of wound infection and endometritis as compared to those who had ≥ 2 CS. This is possibly because 84% of women in group one underwent the second CS as an emergency operation, and had risk factors such as rupture of membranes, frequent vaginal examination, and longer duration of labor before surgery that increased the rate of postoperative infection. Furthermore, it has been reported that risk of postoperative infection is proportional to volume of blood loss during CS, as high blood loss increases the tissue damage from prolonged retraction and manipulation, and more sutures.¹⁷ Twenty-three patients out of 34 (67.6%) in group one had blood loss >1000 mL, and needed blood transfusion. Other postoperative complications of CS include hematoma formation, thromboembolism, and incisional hernia. The rate of these complications in our study was similar among the 3 groups. Similar results were reported by others.¹¹⁻¹⁴ The association between the fetal outcome and number of previous CS has been discussed previously by other investigators. Rashid et al,¹⁰ studied 614 women who had a repeat CS reported that there were no significant differences in the Apgar score of delivered babies, neonatal admission to intensive care unit and in the perinatal death rate. In a more recent study, Uygur et al¹¹ with a similar number of patients ($n=602$) had similar findings. The results of our study are consistent with those of the above mentioned studies. Contrary to our findings, Seidman et al¹² reported that low Apgar scores were significantly related to the number of previous CS, and the need for intensive care unit was increased significantly because of the significant increase in the prematurity rate. This disagreement might be related to the smaller size (334 patients) of their study compared to ours.

In summary, results of this study indicate that preoperative complications including abnormal placentation, uterine scar dehiscence and rupture were increased significantly by increasing the number of CS. The rate of intraoperative complications including

bowel injury, bladder or ureteric injury, and blood loss showed no correlation with number of previous CS. The postoperative course was not adversely affected by multiple CS.

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