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Research Article

HIGH ORDER REPEAT CESAREAN SECTIONS

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ABSTRACT

Objective: To assess maternal and neonatal risk associated with high order cesarean sections, a case-control study was conducted at King Abdulaziz University Hospital from 2000-2009.
Material and Methods: The outcome of 62 pregnancies of women undergoing cesarean section for the fifth time or more was compared with that of 210 women who underwent cesarean section for the first, second, third, or fourth time.
Results: The main outcome measures were maternal operative and postoperative morbidity, neonatal prematurity and its complications, Apgar scores, and the need for intensive care. Women undergoing multiple (≥5) cesarean sections did not have significantly more intra-abdominal adhesions than women sectioned for the second, third, or fourth time. The postoperative course was not adversely affected by multiple cesarean sections. A high incidence of preterm cesarean deliveries was noted in the study group. This was due to non-elective repeat cesarean delivery rather than to poor timing of scheduled cesarean sections.
Conclusion: High order repeat cesarean sections do not pose a serious threat to the fetus or increase the maternal morbidity in women without obstetric risk factors if standard care is provided.

INTRODUCTION

It is common practice in the developed world to offer sterilization to a woman after two or three caesarean sections (CS) because of the hypothetical increased risk of scar rupture and possible catastrophic complications during pregnancy after three or more CSs.[(1)]However, in countries where social and cultural norms encourage large families, most women refuse to get surgical sterilization.[(2)]

The popularity of vaginal birth after previous caesarean (VBAC) has increased over the past two decades, but rates have recently started to decline again.[(3)]One of the reasons for this decline is the concern over maternal morbidity, especially among patients who ultimately have a failed VBAC attempt, and then undergo a repeat caesarean delivery.

A number of recent observational studies have shown that when an emergency CS is required after attempting VBAC, both the patient and the infant are at risk of infection and morbidity.[(4)]Women with repeat CSs are at increased risk of morbidity and mortality regardless of the mode of delivery. Limited published data on the risks or safety of elective multiple repeat CSs are not useful for counseling women with two or more previous cesarean deliveries regarding delivery options. The conventional practice in the developed world has been to discourage pregnancy after three CSs, although there is no clear evidence in the literature to validate this position.

The number of CSs that a woman can safely undergo has long been debated among obstetricians. This question has gained urgency in current practice as a consequence of the steep worldwide rise in primary and secondary CS rates. The number of women who now require more than three successive CSs is growing rapidly because indications for primary and secondary CS have relaxed to the point where a woman's request is a sufficient reason to perform a cesarean delivery.

The present study was designed to evaluate whether three CSs represent a threshold beyond which further pregnancies and CS carry significantly higher morbidity and whether women should therefore be advised against pregnancy after the third cesarean section.

METHOD

The ethical committee of King Abdulaziz University approved this study (reference no #311-09). From 1999 to 2009,a total 43798 deliveries were documented at our hospital. Of these, 7900 deliveries (18.03%) were performed by CS.

The study group was defined as all women who had five or more CSs, whereas the control group (1:3randomization) included women who had less than five singleton live births

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delivered by CS. Both groups were matched by age, nationality, and body mass index (BMI).

Data from the clinical records of 62 women who had five or more CSs (i.e., the study group) were reviewed. The records of 210 randomly selected women who had less than five cesarean sections during the same period were similarly examined.

Nineteen predetermined variables abstracted from the files were used as indicators of maternal morbidity. Each morbidity variable was determined before generating composite scores. The mean values of the composite scores were used to compare morbidity between consecutive cesarean section groups. Risk of morbidity after five or more CSs was compared with the risk after four and fewer CSs.

It is the policy of the hospital's obstetric unit to perform elective CS on all women who have had at least two CSs; this is normally performed at 38–39 weeks gestation. However, some patients did not have regular antenatal follow up. Consequently, some patients were sectioned after the onset of labor.

The operations were performed by senior obstetricians or well-trained assistant doctors of the obstetric unit. Women with coexisting obstetric conditions, such as placenta previa, preterm labor or any other medical complication, were included in this study.

Pfannenstiel abdominal incisions were used in all study and control cases. A standard low transverse segment incision was made.

The data collected from patients' charts were reviewed by two of the authors. The following maternal indicators were considered:

- Age (years)
- BMI
- Nationality (Saudi or non-Saudi)
- Parity
- Number of term pregnancies
- Number of preterm pregnancies
- Number of abortions
- Antenatal risk factors(placenta previa, scar dehiscence, rupture, medical diseases, surgical complications, and preterm labor)
- Gestational age at delivery
- Type of CS(emergency or elective)
- Duration of CS (in minutes)
- Type of anesthesia (general or spinal)
- Level of operating surgeon(consultant, specialist, senior or junior resident)
- Estimated blood loss during delivery (in ml)
- Neonatal outcome(sex, weight, and Apgar score at five minutes)
- Intra-partum and postpartum complications (bleeding, organ injury, need for blood transfusion, need for hysterectomy, and post-operative febrile morbidity)
- Degree of adhesions
- Concomitant tubal ligation

Definition of variables

Major placenta previa occurred when the placenta partially or wholly covered the internal cervical os. Minor placenta previa occurred if the leading edge of the placenta was within three centimeters from the internal os by ultrasound examination performed in the last trimester.

Scar rupture was diagnosed if the scar tissue had separated throughout the length of a previous incision, with ruptured fetal membranes and all or part of the fetus extruded into the peritoneal cavity.

Scar dehiscence was present if a window existed in part of the scar but the peritoneum and fetal membranes were intact.

Bladder injury was defined as accidental cystotomy, and ureteric injury was defined as accidental whole or partial transection or ligation of the ureter. Bowel injury was defined as entry into the bowel lumen or if there was seromuscular damage requiring repair.

Postoperative pyrexia was present when body temperature exceeded 38 °C for 48 hours or longer.

Adhesions were described as severe if they were dense or caused fusion of the uterine surface to the anterior abdominal wall or if there was difficulty in reflecting the urinary bladder from the lower uterine segment.

Operating time was measured from induction of anesthesia to skin closure. Prolonged hospital stay was a postoperative period exceeding five days.

Wound dehiscence was diagnosed if there was separation of the skin and rectus sheath requiring re-suturing.

Wound hematoma was present if a blood collection in the abdominal wall layers was palpable or evident by ultrasound

Data analysis

Women were excluded from specific analyses if data on a given indicator were missing. The data were analyzed using the Statistical Package for Social Sciences (SPSS Inc., IBM, Chicago, IL, USA), version 16. Logistic regression was used to assess the effect of the number of CSs on maternal morbidity indicators. The significance level was set at $P< 0.05$.

RESULTS

Sixty-two women (0.8%) had five or more CSs (Group 1). The frequency of CSs was as follows in other groups: first CS (Group 2), n =65; second CS (Group 3), n=75; and third or fourth CS (Group 4), n=70 (Table 1).

Most of the patients were in their third decade of life, and most were Saudis.

Women in the study group had a significantly higher BMI than controls (p=0.039; Table 2). Similarly, women in the study group were significantly older than their peers in the control group (p=0.001).On the other hand, controls had a higher mean GA than those in the study group. No significant differences were found between the groups based on nationality. Most of the women delivered at term gestation; the remainder delivered between 34 and37 weeks of gestation, except for two women in the study group who delivered before 34 weeks of gestation: one at 32 weeks and the other at 33 weeks.(Table 1)

Table 1 Grouping of the samples by frequency of cesarean sections

Variables	Group 1 ≥ Fifth (N = 62)	Group 2 First (N = 65)	Group 3 Second (N = 75)	Group 4 Third and Fourth (N = 70)
Age (years)				
20-30	4	13	42	22
31-40	49	38	23	40
> 40	9	14	10	8
Nationality				
Saudi	38	42	40	54
Non-Saudi	24	23	35	16
Body mass index				
Normal	4	11	16	17
Overweight	40	34	50	28
Obese	18	20	9	30
Gestational age (weeks)				
< 34	2	0	0	0
34-37	32	8	11	12
> 37	28	57	64	58

Table 2 Demographic and clinical characteristics of the sample categorized by frequency of cesarean sections

Variables	Group 1	Group 2	Group 3	Group 4	*p*-value
Age, mean ± SD	36.22 ± 3.66	27.68 ± 4.01	29.8 ± 4.29	32.75 ± 4.28	0.001
Nationality					
Saudi, N (%)	38 (61.3)	47 (59.5)	55 (58.5)	37 (75.5)	0.21
Non-Saudi, N (%)	24 (38.7)	32 (40.5)	39 (41.5)	12 (24.5)	
Body mass index, mean ± SD	36.55 ± 7.25	34.20 ± 6.56	33.31 ± 5.7	34.47 ± 7.8	0.039
Gestational age, mean ± SD	37.11 ± 1.60	38.48 ± 1.08	38 ± 0.71	38.04 ± 0.97	< 0.001

Abbreviation: SD, standard deviation.

Neonatal outcome

No fetal or neonatal deaths were documented in the study or control groups. The median Apgar score was 9in all control subgroups, irrespective of the number of CSs. No significant association was found between Apgar scores and the number of previous CSs (Table 3). Similarly, the study and control groups did not differ significantly in birth weight.

Table 3 Obstetric and neonatal outcome characteristics of the sample stratified by frequency of cesarean sections

Variables	Group 1	Group 2	Group 3	Group 4	*p*-value
Gravidity, median (range)	7 (6-11)	2 (2-3)	3 (3-3)	4 (4-9)	< 0.001
Pre-term deliveries, median (range)	0 (0-3)	0 (0-0)	0 (0-1)	0 (0-3)	< 0.001
Live births, median (range)	5 (6-11)	1 (1-2)	2 (1-5)	3 (2-6)	< 0.001
Full-term births, median (range)	5 (6-11)	1 (1-1)	2 (1-5)	3 (0-6)	< 0.001
Birth weight, mean ± SD	2.85 ± 0.52	1.56 ± 0.49	1.54 ± 0.50	1.4 8± 0.50	< 0.001
Apgar score, median (range)	10 (2-10)	9 (7-10)	9 (2-10)	9 (7-10)	0.36

Qualification level of operating surgeon

Most of the procedures were performed by non-consultants in both the study and control groups. Residents performed 66.2% and 60.5% in the study and control groups, respectively; consultants performed 12.7% and 12.4% of the procedures in the study and control groups, respectively (Table 4).

Complications in the study group

Only four women in the study group had obstetric complications (6.5%) compared to five (2.3%) in the control group. In the study group, one patient who experienced accidental urinary bladder was injured due to dense adhesions. Another patient experienced bowel injury, one patient developed postoperative fever, and one had total abdominal hysterectomy (TAH) due to uncontrolled bleeding.

Table 4 Level of qualification of the clinician who performed surgery categorized by frequency of cesarean sections[1]

Qualification Level	Group 1	Group 2	Group 3	Group 4	*p*-value
Consultant	11(17.7)	11(13.9)	11(11.7)	5(10.2)	
Specialist	10(16.1)	20(25.3)	17(18.1)	23(46.9)	0.25
Resident	41(66.1)	48(60.8)	66(70.2)	21(42.9)	

[1]The data are presented as frequency (percent) unless otherwise specified.

Complications in the control group

Five patients in the control groups experienced obstetrical complications.

One patient with a history of previous one CS had an inverted T uterine incision due to difficulties in extracting the baby.

One patient with a history of previous two CSs had a ruptured uterus.

Two patients with a history of previous three CSs had obstetrical complications, one with a scar dehiscence while the other had TAH due to atonic bleeding. One patient had serosal bowel injury with a history of previous four CSs; the patient was admitted to intensive care for observation.

DISCUSSION

Although CS has become safer, it is still associated with a higher maternal morbidity and mortality than vaginal birth. A presumption, therefore, has always been that multiple CSs increase such risks and that pregnancy is contraindicated after three cesarean sections. [6,10,11,12] This study aimed to quantify this risk and to determine whether, in fact, there is no threshold after which the risk of morbidity is unacceptable.

Nationality is not a usual indicator for this type of study, but we include it because we have different provision in our health care system and because it is difficult to determine the race in our study population.

We assessed the risk of morbidity at five or more CSs relative to lower order cesarean deliveries. We examined trends in morbidity by comparing composite scores for indicators of risk between consecutive CS groups. Cesarean section morbidity was not compared to morbidity associated with vaginal delivery since women with multiple CSs do not usually have the option of a normal birth. Based on the 19 morbidity variables that we studied, the low risk of operative morbidity associated with high order repeat cesarean section (HORCS) is reassuring for women attending our hospital, although most of the procedures were performed by non-consultants.

The low risk of post-operative febrile morbidity can be attributed to the use of prophylactic antibiotics. [17]

Our results show that the risk for placenta previais higher in the HORCS group (8.1%) than in the control group (0.0%). These findings indicate that when a woman who has had multiple CSs becomes pregnant, secondary preventive management should

focus on minimizing complications due to abnormal placentation.

We found that scar dehiscence was increased in the study group (1.6%) compared to the control group(0.5%). In all women with uterine dehiscence, it was possible to repair the uterus rather than to perform a hysterectomy.

There were no reported cases of ruptured uterus in the study group, whereas one case of uterine rupture was reported in the control group (0.5%). In the study group, 6.5%of the women delivered before 37 weeks of gestation, whereas in the control group, all the women delivered after that gestational age. Although elective CS was the planned method of delivery for all women in both groups, the proportion of women who had an elective CS was higher in the control group (66.1% vs. 41.0%). Conversely, emergency CSs were higher in the study group compared to the control group (33.9% vs. 28.1%).

There was no significant difference in operation time between patients with five or more previous CSs and those with a history of four and fewer cesarean deliveries. Furthermore, we did not observe a significant increase in postoperative complications in the study group compared with the control group. The low risk of post-operative febrile morbidity can be attributed to the use of prophylactic antibiotics.[22,23]

There was no difference in operative or postoperative course between the two groups.[14]

Surprisingly, patients in the control group had significantly more adhesions than patients in the study group. There were no maternal or fetal deaths in our study.

Limitations

Limitations were in reviewing data retrospective

CONCLUSIONS

Overall, by collectively measuring maternal indicators, our study provides quantifiable evidence that maternal morbidity does not increase with the number of successive CSs performed on a woman. However, the third CS does not represent a threshold. Morbidity did not rise through the fourth and subsequent cesarean sections. Likewise, morbidity is not significantly increased with the fifth and subsequent CSs. After appropriate counseling, a woman may therefore make an informed choice to undergo subsequent CSs. However, repeated CSs neither poses serious threat to the fetus or increase maternal morbidity in women without other obstetric risk factors. Counseling women about their future pregnancies would be the best option and any decision regarding future pregnancies should be made on an individual basis, taking into account more than the number of previous CSs.

Conflict of Interest Statement

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in this manuscript.

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