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The Impact of Repeated Cesarean Sections on Perioperative Maternal Morbidity

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ABSTRACT

Background: Rates of cesarean delivery vary internationally, but generally, it has shown a worldwide increase. Repeated cesarean deliveries was found to be associated with increased maternal morbidity, including placenta previa, placenta accreta, hysterectomy, adhesions, bladder injury, postoperative hemoglobin deficit and need for blood transfusion.

Objective: In our study, we evaluated the outcome of emergency cesarean deliveries conducted at Bani Suef General Hospital and the impact of repeated cesarean deliveries on that outcome.

Patients and methods: We recruited 300 patients admitted at the Casualty Department. The patients were divided equally into 3 groups (100 patients in each group) as follows: group 1: Patients with previous one cesarean delivery, group 2: Patients with previous two cesarean delivery and group 3: Patients with previous three or more cesarean deliveries.

Results: The operative duration was statistically significantly longer in patients with previous three or more cesarean deliveries (group 3) than patients with previous one cesarean delivery (group 1) or previous two cesarean delivery (group 2) [74.4, 44.4, 56.4 min respectively, $p < 0.001$]. The estimated blood loss was found to be higher in group three than one and two attributed to higher incidence of placenta previa and placenta accrete in group three. The incidence of adhesions (omental and bladder) was significantly higher in group three, but the incidence of bowel adhesion was the same in group three and two (which was statistically not significant)**.**

Conclusion: The rate of complications was higher in group three (bladder and bowel injuries, scar dehiscence, placenta previa, placenta accreta, hysterectomy and post-operative ICU admission).

Keywords: Repeated, Cesarean delivery, Morbidity.

INTRODUCTION

Cesarean delivery is defined as the delivery of a fetus through surgical incisions made through the abdominal wall (laparotomy) and the uterine wall (hysterotomy). It represents an alternative route for delivery when vaginal delivery might pose a risk to the mother or the fetus [(1)]. Rates of cesarean delivery vary internationally, but generally, it has shown a worldwide increase [(2)].

There are several factors contributing to the increased rates of cesarean delivery including: increasing maternal age, increasing rates of induction of labour, a decline in vaginal birth after cesarean delivery due to risk of uterine rupture, decline in vaginal breech delivery, decreased use of operative vaginal delivery and fear from medical-legal concerns [(3)].

There are various indications for cesarean delivery which may be performed for maternal indications or fetal indications or both. However, the leading indications are previous cesarean delivery, breech presentation, dystocia, and fetal distress. These indications are responsible for 85% of all cesarean deliveries [(4)]. Despite the advancement in anesthesia and surgical techniques making cesarean delivery safer than it has ever been, it can still be associated with short term and long term complications. Compared with a vaginal delivery, maternal mortality and especially morbidity is increased with cesarean delivery to approximately twice the rate after a vaginal delivery [(3)].

Repeated cesarean deliveries were found to be associated with increased maternal morbidity, including placenta previa, placenta accreta, hysterectomy, adhesions, bladder injury, postoperative hemoglobin deficit and need for blood transfusion. One major complication of repeated cesarean delivery is uterine scar rupture during pregnancy with subsequent adverse fetal and maternal consequences [(5)].

In view of the complications associated with repeated cesarean delivery, in developed countries, women are usually offered sterilization at the 3rd cesarean delivery. However, this is not applicable in eastern cultures where large families are usually desired and any attempt to limit cesarean deliveries to 2-3 is likely to be rejected resulting in facing high order cesarean deliveries [(6)].

AIM OF THE WORK

In our study, we evaluated the outcome of emergency cesarean deliveries conducted at Bani Suef General Hospital and the impact of repeated cesarean deliveries on that outcome.

PATIENTS AND METHODS

This was a prospective cross sectional study conducted at the Casualty Unit of Obstetrics and Gynecology Department, Bani Suef General Hospital in the period from October, 2018 to March, 2019. A total number of 300 patients were divided equally into 3 groups (100 patients in each group) as follow:

- **Group 1:** Patients with previous one cesarean delivery.

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- **Group 2:** Patients with previous two cesarean delivery.
- **Group 3:** Patients with previous three or more cesarean deliveries.

Ethical approval and written informed consent :

An approval of the study was obtained from Al-Azhar University Academic and Ethical Committee. Every patient signed an informed written consent for acceptance of the operation.

Inclusion criteria:

- Maternal age from 20 to 35 years
- singleton pregnancy

Exclusion criteria:

- Patients with bleeding tendencies
- Patients with potential infection e.g CS after prolonged ROM
- Patients with multiple gestations

All patients in the three groups were subjected to the following:

A- Preoperatively:

- Detailed history and clinical examination were performed.
- Routine ultrasound examination to confirm viability, gestational age, estimated fetal weight, presentation, location of the placenta and amount of amniotic fluid.
- Laboratory investigations:
- Low risk cases had at least complete blood count and high risk cases had full investigations including: complete blood count, coagulation profile, liver function tests, and kidney function tests. Cases at risk for bleeding (placenta previa, suspicion of placenta accreta, arrangements for cross matching was made to ensure that blood is available in case transfusion is required
- All patients underwent their informed consent to perform the procedure after proper counseling.

B- Intra-operative data sheet containing all the intra-operative details including:

- Type of anesthesia used(regional or general and if general why)
- Operative time (surgeon, 1st assistant, 2nd assistant).
- Layers of closure of the abdomen.
- Operative findings: Estimated blood loss (number of sacked towels and units of blood and plasma), adhesions, scar dehiscence, placenta previa or placenta accrete.
- Occurrence of intra-operative complications: uterine atony, hysterectomy, bladder injury, ureteric injury, bowel injury and APGAR score after 1 and 5 min.

C- Postoperative data sheet:

We followed up patients during hospital stay till discharge. We reported on the following:

Return to theatre, duration of hospital stay, intensive care unit admission, drop in hemoglobin, occurrence of postpartum hge and Ileus (time of bowel opening after surgery).

Outcomes:

- **Primary outcomes:** Evaluation of complications of repeated cesarean sections on the mother and fetus
- **The surgical outcome:** Adhesions formation, scar dehesince, prolonged operative time, fetal extraction, increased intraoperative blood loss and post-partum haemorrhage.
- **Secondary outcome parameters** (other outcomes to be assessed): Cesarean hysterectomy rate, incidence of placenta previa and accrete, intestinal, bladder or ureteric injury and fetal APGAR scoring.

Statistical analysis

Recorded data were analyzed using the statistical package for social sciences version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean ± standard deviation (SD). Qualitative data were expressed as frequency and percentage. The following tests were done:

- Independent-samples t-test of significance was used when comparing between two means.
- Chi-square (x^2) test of significance was used in order to compare proportions between two qualitative parameters.
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. The p-value was considered significant as the following:
- Probability (P-value)

- P-value <0.05 was considered significant.
- P-value <0.001 was considered as highly significant.
- P-value >0.05 was considered insignificant.

RESULTS

This was a prospective observational study conducted at the Casualty Unit of Department of Obstetrics and Gynecology, Bani Suef General Hospital in the period from October, 2018 to March, 2019.

A total number of 300 patients (full term pregnancy 37 weeks) were included. Patients were divided equally into 3 groups (100 patients in each group). Groups were as follow:

- **Group 1:** Patients with previous one cesarean delivery.
- **Group 2:** Patients with previous two cesarean delivery.
- **Group 3:** Patients with previous three or more cesarean deliveries.

The baseline characteristics of patients in the three groups are shown in table (1). As regards medical history of the three groups that may affects surgical intervention, the three groups were comparable. This table showed that the three groups were comparable as regards BMI and gestational age.

Table (1): Baseline characteristics of the patients*

	Group 1 (Previous CS)	Group 2 (Previous 2 CS)	Group 3 (≥ Previous 3)	*p* Value
Maternal age (yrs)	26.8 ± 6.7	27.5 ± 5.5	31.2 ± 4.6	<0.001
BMI (Kg/M2)	32.5 ± 3.4	33.3 ± 4.3	34.7 ± 5.3	0.051
Gestational age(wks)	37.2 ± 2.7	37.8 ± 1.7	36.7 ± 2.8	0.008

Data are presented as mean ± SD.

Surgical team:

Table (2): Comparison between the three groups regarding the surgeon

	Group 1	Group 2	Group 3
Mid Senior resident	94	88	69
Senior resident	6	8	20
Assistant specialist	0	4	8
Specialist	0	0	5
Consultant	0	0	2
***p* value**	<0.001		

Results in table (2) showed that in group 3 senior staff members were more involved from the start of surgical intervention than the other 2 groups. P value is 0.000 which is statistically significant.

Table (3): Comparison between the three groups regarding the senior staff take over

	Group 1	Group 2	Group 3
Incidence (%)	0	3	8
***p* value**	0.001		

The results in table (3) showed that no cases in group 1 were taken over by senior staff member while in group two 3 cases & in group three 8 cases were taken over by senior staff member due to surgical difficulties. P value is 0.001 which is statistically significant.

Anaesthesia:

Table (4): Comparison between the three groups regarding the type of anaesthesia

	Group 1	Group 2	Group 3
Spinal anaesthesia	95	85	67
General anaesthesia	5	15	33
P value	< 0.001		

Data presented as percentages

Results showed the type of anaesthesia in each group. In group one, 95% were spinal anaesthesia and 5% were general anaesthesia. In group two, 85% were spinal anaesthesia and 15% were general anaesthesia. In group three, 67% were spinal anaesthesia and 33% were general anaesthesia. This showed that there was statistically significant shift to general anaesthesia in group three (P value is 0.000) which was statistically significant. This shift is due to prolonged operative time.

Surgical outcome:

Table (5): Surgical outcome

	Group 1	Group 2	Group 3	P value
Estimated Blood Loss(ml)	462.5 ± 171.19	493.25 ±188.74	1285 ±4056	0.020
HB drop (gm)	0.936 ± 0.63	1.093 ± 0.65	1.665 ±1.04	<0.001
Operative duration(min)	45.35 ± 14.85	55.35 ± 14.25	73.4 ± 33.6	<0.001
Time of regaining the bowel movement after surgery(hrs)	5.91 ± 1.087	6.81 ± 1.134	8.54 ± 2.384	<0.001
Duration of hospital stay(days	1.26 ± 0.686	1.27 ± 0.649	2.93 ± 3.762	<0.001

*****Data are presented as mean (± SD)

Operative duration (calculated from time of skin incision till closure of skin)

Table (5) showed that there was statistically significant increase in estimated blood loss, HB drop and operative duration in group 3 due to prolonged time needed for dissection of adhesions. The duration of hospital stay

was significantly increased in group 3 due to ICU admission in most cases.

Table (6): Comparison between the three groups regarding the operative findings.

	Group 1	**Group 2**	**Group 3**	***p* value**
Bowel adhesions	2	2	2	0.363
Omental adhesions	0	13	52	<0.001
Bladder adhesions	3	9	52	<0.001
Placenta previa	4	3	21	0.01
Placenta accreta	0	0	13	<0.001
Scar dehiscence	0	7	13	0.004

The Bowel, Omental and Bladder adhesions were statistically increased in group three due to repeated CS. Incidence of placenta previa and accreta were significantly increased in group three (Table 6).

Table (7): Complications of cesarean delivery in each group

	Group 1	**Group 2**	**Group 3**	***p* value**
Intraoperative blood transfusion	2	1	17	<0.001
Postoperative blood transfusion	1	1	14	<0.001
Uterine laceration	1	4	3	0.407
Hematoma	4	0	3	0.149
Uterine atony	0	0	1	0.367
Hysterectomy	0	0	13	<0.001
Bowel injury	0	1	2	0.364
Bladder injury	0	1	8	0.001
Ureteric injury	0	0	1	0.604
ICU admission	0		10	0.002

Table (7) showed statistically significant increase in the incidence of intraoperative blood loss, uterine lacerations, uterine atony, hysterectomy, bowel injury and bladder injury in group three than the other groups.

Apgar score:

Table (8): Comparison between the three groups regarding the Apgar score

	Group 1	**Group 2**	**Group 3**
Normal (7-10)	72	65	26
Low (4-6)	20	28	58
Critically low (0-3)	8	7	16
***p* value**	0.007		

This table showed that comparison between the three groups regarding the Apgar score was statistically significant.

DISCUSSION

We conducted this study to compare the surgical details between patients with previous one cesarean delivery (group1), those with previous two cesarean deliveries (group2) and those with three or more cesarean deliveries (group3).

Our results showed that the involvement of senior staff was significantly higher in group 3 due to surgical difficulties. Likewise, **Magne *et al.*** [7] reported that more senior staff (Consultants) operated on cases with four or more cesarean deliveries than on cases with three or less cesarean deliveries (32.6 Vs22.2%), this is due to increased incidence of adhesions. Also, **Magne *et al.*** [7] reported that intraperitoneal adhesions increased as the number of caesarean deliveries rise. Massive adhesions were encountered in 45.7% of patients who had four or more cesarean deliveries against 13.9% in the group of patients who had three or less cesarean deliveries. Similarly, **Althabe *et al.*** [8] reported that patients with three or more cesarean deliveries were significantly more likely to have a consultant surgeon than in patients with one cesarean delivery. **Gungorduk *et al.*** [9] also reported the same results regarding the status of the surgeons (consultants) who operated on patients with multiple cesarean delivery (more than 3) (32.6%), compared to other groups with lower number of CS, (22.2%).

Regarding the type of anesthesia used for cesarean delivery in our study, the majority of cases had spinal anesthesia. The incidence of change from spinal to general anaesthesia was statistically significantly higher in group 3 (33%) than in group 1 and 2 (p value

<0.001). This was attributed to increased operative duration due to operative difficulties and intra operative complications. Similarly**, Gungorduk *et al.* [9]** reported that the incidence of change from spinal to general anaesthesia was statistically significantly higher in group with multiple CS (more than three) than other groups with lower number of CS. This is in contrast to the study conducted by **Sabourin *et al.* [10]**, which was done in Nigeria and in which the majority of patients had general anesthesia that might be explained by having higher incidence of repeated cesarean delivery.

The operative duration was statistically significantly longer in patients with previous 3 or more cesarean deliveries (group 3) than patients with previous one cesarean delivery (group 1) or previous 2 cesarean delivery (group 2) [74.4, 44.4, 56.4 min respectively, p <0.001]. Also, the hospital stay was statistically significantly longer in group 3 than in group 1 or 2. (2.90, 1.29, 1.27 days respectively, p <0.001). **Althabe *et al.* [8]** reported that there was no statistical difference between the women who had three or more caesarean deliveries with those with previous one cesarean delivery regarding duration of surgery, or the duration of postoperative hospital stay. **Sabourin *et al.* [10]** also reported the same result regarding the operative duration which was longer in patients with multiple cesarean deliveries however the study reported no difference regarding the hospital stay, as the majority of the women in both groups stayed more than seven days in the hospital. The reason for prolonged hospital stay was not only due to the increased morbidity that is associated with caesarean delivery, but also due to post-operative anaemia, hypertensive disorders and low birth weight babies.

In the current study, the estimated blood loss was found to be higher in group 3 than in 1 and 2 attributed to higher incidence of placenta previa, placenta accrete in group three (mean of estimated blood loss was 1284 ± 4056, 495.25 ± 188.74 and 460.5 ± 171.19 ml in groups 3, 2 and 1 respectively) (p value is 0.001 which is statistically significant). Similar to our results, **Cook *et al.* [11]** reported that incidence of bleeding and blood transfusion in women undergoing multiple repeated cesarean deliveries (more than three) is higher compared with women having lower number of caesarean deliveries due to a significant increase in the rates of placenta previa and placenta accreta.

In our study the incidence of adhesions (omental and bladder) was statistically significantly higher in group 3 in comparison with group 1 and group 2, but the incidence of bowel adhesions was the same in group three and two (which was not statistically significant). This came in agreement with a study by **Sinha *et al.* [12]**, which reported that chances of developing adhesions increased with each cesarean delivery, not only the rate of adhesions but also the intensity of them. The most commonly seen adhesions were between parietal peritoneum and anterior surface of uterus and between bladder and uterus. Also **Sabourin *et al.* [10]** reported that intraperitoneal adhesions increased as the number of caesarean deliveries rose. Massive adhesions were encountered in 45.7% of patients who had four or more cesarean deliveries against 13.9% in the group of patients who had three or less cesarean deliveries. This concurred with **Althabe *et al.* [8]** study**,** which showed that there were significantly more adhesions in the patients with three or more caesarean deliveries than in those with previous one cesarean delivery. This was expected because repeated surgery might be associated with postoperative infection and subsequent adhesion formation. On the other hand, some studies do not agree with our findings. This includes the study by **Rashid and Rashid [6]** in which they reported that there was no significant difference in adhesions between patients with ≤ three cesarean deliveries and those with > three cesarean deliveries. **Qublan and Tahat [13]** reported that the incidence of severe adhesions did not differ significantly among the three groups (previous one, previous two and previous three and more cesarean deliveries) suggestive that some patients are more susceptible than others to form dense intraperitoneal adhesions by unknown mechanisms.

In our study, surgical complications like bladder and bowel injuries, were higher in group 3 than in other groups. **Stivanello *et al.* [14]** reported similar results that the incidence of severe intraperitoneal adhesions progressively increased with increased number of cesarean deliveries making difficult abdominal entry and may result in organ injury especially bladder which is often attached cranially. Similarly **Althabe *et al.* [8],** reported that the incidence of bowel and bladder injuries were higher in patients with repeated cesarean delivery. In disagreement with our results, is the study by **Qublan and Tahat [13]** in which complications were similar in the three groups of patients (previous one, previous two and previous three or more cesarean deliveries). Although, it was not statistically significant.

Our results showed that the incidence of scar dehiscence was higher in group 3 in comparison to group 2 (statistically significant). Another study that agrees with ours the scar dehiscence was 75.3% in repeated cesarean deliveries (more than three) versus 25.9% in lower number of cesarean delivery, with a p-value of less than 0.001 **[4].** Similar to our study, **Qublan and Tahat [13]** reported that the incidence of uterine scar dehiscence and rupture was significantly increased in women who had ≥ three cesarean deliveries as compared to those who had one or two.

Our study showed that the incidence of placenta previa and placenta accreta was statistically significantly higher in group 3 than in group 1 and 2. Similar to our findings, a previous reports concluded that placenta previa and morbidly adherent placenta (placenta accreta and increta) were significantly higher among women who had three or more cesarean deliveries compared to those with lower number of cesarean delivery **[14]**. This is

also in agreement with former studies [13, 15]. **Schiff *et al.*** [16], reported that the presence of scar due to previous 4 or more cesarean deliveries increase the risk of placenta accreta (8-9) folds compared to (1.284) in case of previous one cesarean delivery. However **Althabe *et al.*** [8] reported no difference in the incidence of placenta previa and placenta accreta between patients with three or more caesarean deliveries and those with previous one cesarean delivery. Also, **Rashid and Rashid** [6] found no difference in the incidence of placenta previa and placenta accrete between high order (five–nine) cesarean deliveries and lower order (three–four) cesarean deliveries.

In our study the higher incidence of placenta previa and accreta in group 3 contributed to more intra-operative complications (bleeding, blood transfusion, hysterectomy and post-operative ICU admission) in that group (p value <0.001). **Cook *et al.*** [11] also reported similar findings as they found a significant increase in the rates of placenta previa (16%), placenta accreta (14%), blood transfusion (17%), hysterectomy (9%) and critical care admission (13%) in women undergoing multiple repeated cesarean delivery compared to women having caesarean deliveries after fewer previous procedure. **Silver *et al.*** [17] reported the same results where the incidence of placenta previa and placenta accreta was higher in women undergoing multiple repeat cesarean deliveries. Other surgical morbidities including bleeding, blood transfusion of four units or more, hysterectomy and the need for (maternal) postoperative ventilation, intensive care unit (ICU) admission, also was increased with increasing number of cesarean deliveries. On the contrary **Biler *et al.*** [18] reported that there was no difference in the incidence of hysterectomy in the two groups of their study (the study group with four or more cesarean deliveries and the control group with three or less cesarean delivery).

CONCLUSION

Repeated cesarean delivery was found to be associated with increased maternal morbidity including placenta previa, placenta accreta, hysterectomy, adhesions, bladder injury, post-operative hemoglobin deficit and need for blood transfusion.

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