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Research Article

Maternal complications of caesarean section on a scarred uterus: experience of the Nabeul Maternity Hospital, Tunisia

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Abstract:

Introduction: The global increase in the caesarean section rate, reaching 44.4% in Tunisia (MICS 2023), raises the issue of maternal complications during pregnancies on a scarred uterus. This study aimed to describe the prevalence of perioperative and postoperative complications of caesarean sections on a scarred uterus and to analyse their association with the number of previous caesarean sections.

Methods: A retrospective descriptive and analytical study was conducted at the Nabeul Maternity Hospital from 1 January to 31 December 2023. All parturients who delivered by caesarean section on a scarred uterus (single or multiple scars) at a gestational age ≥28 weeks were included. Demographic, obstetric, perioperative and postoperative data were analysed. Multivariate analysis was performed to identify independent risk factors for complications.

Results: Out of 2684 deliveries, 500 patients were included (mean age 32.4 years, mean BMI 27.8 kg/m²). The mean number of previous caesarean sections was 1.9 (48.2% with one, 17.2% with ≥3). Perioperative complications were: pelvic adhesions (26.8%), delivery haemorrhage (18.6%), uterine dehiscence/rupture (11.4%), placenta praevia (14.6%) and accreta (6.0%). Postoperative complications included: infections (15%), fever (12.4%) and haemostatic hysterectomy (3.6%). In multivariate analysis, the number of previous caesarean sections was a significant independent predictor of pelvic adhesions (OR = 6.01; $p < 0.001$), uterine dehiscence/rupture (OR = 4.19; $p < 0.001$), bladder/bowel injuries (OR = 6.55; $p < 0.001$) and prolonged hospital stay (OR = 2.68; $p < 0.001$). No significant association was found with perioperative haemorrhage, hysterectomy, infections or transfusion.

Conclusion: Maternal morbidity associated with caesarean sections on a scarred uterus is significantly correlated with the number of previous interventions, particularly for adhesions, uterine ruptures and visceral injuries. These findings argue for reducing non-medically justified caesarean sections and rigorous pregnancy planning in multiparous women.

Keywords: Scarred uterus, repeat caesarean section, maternal morbidity, uterine rupture, pelvic adhesions, Tunisia

Introduction

Caesarean section has become a routine operation around the world. The World Health Organization tells us that the global rate went from 7% in 1990 to 21% in 2018, but some countries are far above that average [1].

Tunisia is one of them. According to the latest MICS survey, our caesarean rate jumped from 20.5% in 2006 to 44.4% in 2023 – one of the highest in the region [2]. Better access to hospitals, wider use of fetal monitoring, and even women's own preferences have all contributed.

There is no doubt that caesarean sections save lives when there is real danger. But they leave behind a scarred uterus, and that scar can cause trouble in later pregnancies. International research has shown that repeat caesareans increase the risk of pelvic adhesions, placenta accreta, uterine rupture, and injuries to the bladder or bowel. After several caesareans, maternal morbidity can reach 15–25% [3,4]. However, most of those studies come from Western countries. We Tunisian obstetricians see many women who are highly multiparous and have short gaps between pregnancies – a very different picture. So we decided to look at our own experience at the Nabeul Maternity Hospital. Our aim was simple: to find out how often complications happen during and after caesarean sections on a scarred uterus, and to see whether the number of previous scars makes a real difference.

Methods

What we did and where

We carried out a retrospective descriptive and analytical study in the Department of Obstetrics and Gynecology of the Nabeul Maternity Hospital (Mohamed Tlatli Regional Hospital, North East Tunisia). This is a referral centre that handles complicated deliveries.

Who we studied

We included every woman who had a caesarean section on a scarred uterus (one or more previous caesareans) between 1 January and 31 December 2023, provided she was at least 28 weeks pregnant and her medical record was complete.

We did not include women with a healthy (unscarred) uterus, those who were less than 28 weeks pregnant, or those whose uterine scar came from a non-obstetric operation like a myomectomy. We also excluded women who were transferred to another hospital before or after delivery, and those whose records were missing too much information.

How we collected the data

We combed through delivery registries, medical charts, antenatal cards, operation reports, and anaesthesia records. We recorded everything on a standardised form:

Background: age, BMI, job, education, smoking, past medical problems (diabetes, high blood pressure, bleeding disorders).

Obstetric history: how many pregnancies, how many births, living children, previous curettage, number and type of previous caesareans, any complications during those caesareans.

Current pregnancy: how far along she was, whether the pregnancy was natural or assisted, number of antenatal visits, time since her last delivery, any pregnancy complications (pre-eclampsia, gestational diabetes), use of oxytocin, why she was admitted, the baby's condition and position, whether her waters had broken, and where the placenta was lying on ultrasound.

During surgery: how long it took from the decision to cut, whether the caesarean was planned or an emergency, type of anaesthesia, who did the operation, total time of surgery, time from incision to delivering the baby, whether the baby was hard to get out, how stuck the placenta was, any adhesions to other organs, how much blood was lost, and whether we used clotting medicines.

Complications during surgery: pelvic adhesions, scar opening (dehiscence or rupture), heavy bleeding after the placenta, shock, DIC, emergency hysterectomy, bladder or bowel injury, cardiac arrest, blood transfusion.

After surgery: fever, infections (wound, urine, womb lining, pelvis), haematoma, blood clots, re-operation, time in intensive care, total hospital stay.

Baby's outcomes: birth weight, Apgar scores, stillbirth, other problems, admission to the neonatal unit, whether the mother started breastfeeding.

Organisational issues: whether blood products were available and how long it took to get them.

How we analysed the numbers

We used SPSS software. For things like age and hospital stay, we calculated averages and standard deviations. For categories, we used percentages. We compared groups with Chi-2 tests (or Fisher's exact test) and t-tests. Then we ran a multivariate logistic regression to see which factors were independently linked to major complications. We adjusted for age, BMI, smoking, past medical history, parity, time between pregnancies, pregnancy complications, gestational age, emergency caesarean, and number of previous caesareans. We considered a result significant if $p < 0.05$.

Ethical side

We kept all patient information anonymous and confidential. Because this was a retrospective study using existing records, we did not need individual informed consent—this follows Tunisian regulations.

Results

The women in our study

Over the year, there were 2,684 deliveries. Of these, 1,061 (39.5%) were vaginal and 1,623 (60.5%) were caesarean sections. After applying our inclusion and exclusion criteria, 500 women with a scarred uterus remained.

Their average age was 32.4 years (ranging from 20 to 45), and most (40.2%) were between 31 and 35 years old. The average BMI was 27.8 kg/m² – 40.6% were overweight and 27.4% were obese. Only 5.8% smoked. Nearly 70% did not have a paid job, and half had only primary school education or less. About a third (30.4%) had a past medical problem: diabetes in 11.8%, high blood pressure in 16.2%.

Their obstetric history

On average, they had been pregnant 3.2 times and had given birth 2.8 times (12.4% were having their first baby, 35.8% were on their third delivery). They had an average of 2.5 living children. One in five (22.6%) had had a curettage in the past.

The average number of previous caesarean sections was 1.9: 241 women (48.2%) had one scar, 173 (34.6%) had two, and 86 (17.2%) had three or more (including 4.4% with four or five). The last caesarean had been a low transverse cut in 82.4% of cases, a corporal (vertical) cut in 8.6%, and we did not know in 9.0%. Complications during a previous caesarean were reported by 18.4%.

The current pregnancy

The average gestational age at delivery was 37.8 weeks (range 28–41). Nearly one in five (19.8%) delivered before 37 weeks. Almost all pregnancies (94.6%) were spontaneous. Women had an average of 6.4 antenatal visits, but 12.8% had fewer than four visits.

The time between the last delivery and this pregnancy averaged 28.5 months. However, 14.6% had an interval of less than 12

months, 32.8% had 12–24 months, and 34.2% had 25–36 months.
Pregnancy complications were present in 26.6%: pre-eclampsia in 8.2%, gestational diabetes in 12.6%, and other problems in 5.8%. Oxytocin had been given (as part of a failed trial of labour) in 15.4% of women.
Why were they admitted? Nearly half (45.6%) came for a scheduled caesarean. Another 38.2% had spontaneous labour that did not progress, and 16.2% were emergencies (bleeding, fetal distress). On admission, 97.2% of the babies were alive. Most (82.6%) were head down (cephalic), but 9.8% were breech and 6.4% were lying sideways. The membranes were still intact in 58.4%. Ultrasound showed placenta praevia (low-lying placenta) in 14.6% of women, and placenta accreta in 1.8% – that is, 6% of the praevias had accreta.
What happened during the operation
The time from deciding to do the caesarean to actually starting it averaged 32.6 minutes. In 18.4% of cases, the operation began in less than 15 minutes (true emergencies). Just over half (54.8%) of the caesareans were scheduled, and 45.2% were done as emergencies.
Spinal anaesthesia was used in 77.4% of women, general anaesthesia in 22.6%. A senior surgeon operated in 11.7% of cases, a senior resident (4th or 5th year) in 43.2%, and a junior resident in 45.1%.
The operation lasted an average of 48.3 minutes (from 25 to 90 minutes). Most – 42.4% – were between 30 and 45 minutes, and 35.8% between 46 and 60 minutes. The time from the first cut to delivering the baby averaged 8.9 minutes; in 71.4% of cases, it took more than 5 minutes. The baby was hard to extract in 21.6% of women.
We found extrauterine adhesions (stuck to the bladder or bowel) in 24.6% of women. The placenta came away normally in 98.4% of cases, but there was placenta accreta in 1.0% and placenta percreta in 0.6%.
Blood loss averaged 620.5 mL. One in ten women (10.8%) lost more than 800 mL, and 3% lost more than 1,000 mL. We used tranexamic acid (a clotting medicine) in 16.4% of cases.
Complications during surgery (perioperative)
Table 1 summarises the perioperative complications observed among the 500 parturients with a scarred uterus.

Table I. Per-operative Complications Among 500 Parturients with a Scarred Uterus

Complication	Number (%)
Pelvic adhesions	134 (26.8)
Dehiscence of previous scar	51 (10.2)
Complete uterine rupture	6 (1.2)
Delivery haemorrhage	93 (18.6)
Haemorrhagic shock	14 (2.8)
DIC	7 (1.4)
Haemostatic hysterectomy	18 (3.6)
Bladder injury	11 (2.2)
Bowel injury	5 (1.0)
Blood transfusion (red blood cells)	74 (14.8)

Among the women who had a delivery haemorrhage, the average blood loss was 950.2 mL. Those who needed a transfusion received an average of 2.5 units of blood (range 1–6).
Complications after surgery (postoperative)
Table 2 details the postoperative complications that occurred after caesarean section.

Table II. Postoperative Complications

Complication	Number (%)
Fever >38.5°C	62 (12.4)
Abdominal wound infection	28 (5.6)
Endometritis	19 (3.8)
Urinary tract infection	21 (4.2)
Pelvic peritonitis	7 (1.4)
Pelvic/abdominal haematoma	16 (3.2)
Thromboembolic event	8 (1.6)
Re-intervention	14 (2.8)
Admission to intensive care (average stay 0.4 days)	37 (7.4)

The total hospital stay averaged 4.8 days. Most women (42.6%) stayed 4–5 days; 4.6% stayed 8–10 days, and 1.8% stayed more than 10 days.
How the babies fared
The average birth weight was 3,150 g. One in five babies (21%) weighed more than 3,500 g. The average Apgar score at 1 minute

was 8.2, and at 5 minutes it was 9.4 – 84.2% of babies scored 9 or above at 5 minutes.

Sadly, there were 14 stillbirths (2.8%). Perinatal complications (breathing trouble, low blood sugar, infection) occurred in 10.4% of newborns, and 12.6% needed admission to the neonatal unit. Breastfeeding was started by 84.2% of mothers.

Does the number of previous caesareans matter?

First look (univariate analysis)

The number of previous caesareans was clearly linked to pelvic adhesions ($p = 0.02$), uterine scar problems ($p = 0.01$), bladder or bowel injuries ($p = 0.04$), and a longer hospital stay ($p = 0.02$). We did not find a significant link with heavy bleeding during surgery ($p = 0.97$), hysterectomy ($p = 0.27$), infections ($p = 0.54$), or blood transfusion ($p = 0.31$). Also, emergency caesarean was linked to uterine scar problems ($p = 0.035$), and higher parity was linked to hysterectomy ($p = 0.047$).

After adjusting for other factors (multivariate logistic regression)

After adjusting for potential confounders (age, BMI, smoking, medical/surgical history, parity, interpregnancy interval, pregnancy pathologies, gestational age, and emergency caesarean section), the number of previous caesarean sections remained a very strong independent predictor of several major complications. Specifically, each additional previous caesarean section increased the odds of pelvic adhesions by more than sixfold (OR = 6.01, 95% CI: 3.2–11.3, $p < 0.001$), the odds of uterine dehiscence or rupture by more than fourfold (OR = 4.19, 95% CI: 2.1–8.4, $p < 0.001$), the odds of bladder or bowel injuries by more than sixfold (OR = 6.55, 95% CI: 2.5–17.2, $p < 0.001$), and the odds of a prolonged hospital stay (>7 days) by more than two-and-a-half-fold (OR = 2.68, 95% CI: 1.5–4.8, $p < 0.001$). Emergency caesarean section was also independently associated with uterine dehiscence or rupture (OR = 2.08, 95% CI: 1.1–3.9, $p = 0.02$). For haemostatic hysterectomy, the independent predictors were pregnancy pathologies (OR = 3.42, 95% CI: 1.2–9.7, $p = 0.02$) and parity (OR = 1.76 per unit increase, 95% CI: 1.1–2.9, $p = 0.03$), but not the number of previous caesarean sections. No variable, including the number of previous caesarean sections, was significantly associated with perioperative haemorrhage, postoperative infections, or blood transfusion after adjustment.

Discussion

What we found

Our study from a regional Tunisian maternity hospital shows that women with a scarred uterus face a high risk of complications when they have another caesarean section. And the more previous caesareans they have had, the higher the risk—especially for adhesions, rupture of the scar, and injuries to the bladder or bowel. These findings are in line with international data, but they come from a country where the caesarean rate is far above what the WHO recommends [1,2].

How our results compare with other studies

Pelvic adhesions – We found adhesions in 26.8% of women, and each additional caesarean multiplied the risk by six (OR = 6.01). Tulandi and colleagues reported that the risk of significant adhesions rises from 20% after one caesarean to 40–50% after two or three [3]. Our rate is a bit lower, probably because we missed some mild adhesions in our retrospective records, but the strong link with the number of caesareans is the same.

Uterine rupture – The old scar opened up (dehiscence or complete rupture) in 11.4% of our women. Landon et al. estimated the risk at 0.5–1% after one caesarean and 2–3% after three [4]. Why is our rate so much higher? Because a large proportion of our patients (17.2%) had three or more previous caesareans, and 14.6% had very short gaps between pregnancies (less than 12 months). Bujold et al. showed that an interval of less than 18 months quadruples the rupture risk [5]. In Tunisia, Ben Temime and colleagues reported a rupture rate of 1.2% [6]—similar to our complete rupture rate (1.2%)—but their population was less heavily scarred.

Bladder and bowel injuries – These are rare but serious: bladder injury in 2.2%, bowel injury in 1.0%. The very strong link with the number of caesareans (OR = 6.55) makes sense: adhesions make dissection like walking through a minefield. Silver et al. found bladder injuries in 1.5% after three caesareans [7], close to our figure.

Bleeding and hysterectomy – Unlike some studies [7,8], we did not find a significant link between the number of previous caesareans and heavy bleeding during surgery or the need for hysterectomy. One reason is that we had only 18 hysterectomies—too few to show a clear statistical relationship. Also, bleeding is driven more by placenta accreta (which we saw in 6% of women) than by the number of scars alone. In our multivariate analysis, the real predictors of hysterectomy were pregnancy complications (OR = 3.42) and parity (OR = 1.76).

Infections and transfusion – One in seven women (15%) developed an infection, and 14.8% needed a blood transfusion. These rates did not rise with more caesareans. That may be because of effective routine antibiotic prophylaxis [9] and good blood management protocols. Blood products were available for 92.8% of women, with an average waiting time of 18.4 minutes.

Short interpregnancy interval – We confirmed that a gap of less than 12 months is a major danger, especially for uterine dehiscence (12.3% vs 9.0% overall). Stamilio et al. recommend waiting at least 18–24 months after a caesarean before trying for another baby [8]—advice that we strongly support.

Strengths and weaknesses of our study

Strengths – We had a large sample (500 women), we used a detailed multivariate analysis to sort out the effects of different factors, and we collected a wide range of information from before, during, and after the operation.

Limitations – Because this was a retrospective study, we could only use what was written in the records; some minor complications may have been missed. We did not have a comparison group of women with unscarred uteri. Our findings come from a single hospital in North East Tunisia, so they may not apply to other settings. Also, rare events like complete uterine rupture and bowel injury were too few to allow strong statistical conclusions.

What this means for everyday practice

Stop unnecessary first caesareans. Tunisia's 44.4% caesarean rate [2] is far above the WHO's recommended 10–15%. Every first caesarean that could have been avoided prevents a lifetime of potential scar-related problems.

Talk about family planning. Women need to know that after a caesarean, waiting at least 18–24 months before the next pregnancy greatly reduces the risk of rupture.

Extra care during pregnancy. For women with two or more previous caesareans, we should do a detailed ultrasound looking for the "sliding sign" (which tells us about adhesions) and checking the placenta's position (praevia, accreta). If we suspect accreta, an MRI can help plan the operation.

Schedule, don't rush. For women with three or more scars, plan the caesarean between 38 and 39 weeks. In our series, 45.2% of operations were emergencies—and emergencies are more dangerous.

Let the most experienced person operate. Adhesions and the risk of cutting into the bladder or bowel mean that a senior surgeon—or a senior resident under close supervision—should be the one doing the operation.

Be ready for bleeding. Any woman with placenta praevia or accreta should have at least four units of blood immediately available, and a large-bore IV line placed before the first cut.

Where do we go from here?

We need larger, multicentre studies that follow women forward in time (prospective) and include a control group. These would help confirm our findings and also measure the economic and psychological costs of repeat caesareans in Tunisia.

Conclusion

Caesarean sections on a scarred uterus come with a real risk of complications—adhesions, uterine rupture, injuries to nearby organs, and longer hospital stays. And the risk climbs with every additional scar. In Tunisia, where the caesarean rate now exceeds 44%, we have to act. That means avoiding caesareans that are not really needed, helping women space their pregnancies, and carefully planning the delivery for those who already have multiple scars.

What is already known on this topic

Repeat caesarean sections increase the risk of pelvic adhesions, placenta accreta, uterine rupture, and injury to nearby organs. After several caesareans, maternal morbidity can reach 15–25%.

International guidelines recommend avoiding unnecessary caesareans and carefully monitoring women with a scarred uterus.

What this study adds

This is the first large-scale study from a Tunisian regional hospital (500 women) to show exactly how much each additional scar raises the risk of specific complications. For example, the odds of pelvic adhesions multiply sixfold and the odds of bladder/bowel injuries more than sixfold per extra caesarean.

It provides local evidence that short interpregnancy intervals and high multiparity make things even worse, and it gives concrete recommendations for Tunisian maternity wards.

Competing interests

The authors declare no competing interests.

Authors' contributions

All authors contributed to the idea, data collection, analysis, writing, and final approval of the manuscript.

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