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## Relationship between prelabour uterine rupture and previous placenta previa diagnosis: case reports and review of literature

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### INTRODUCTION

Uterine rupture (UR) is a discontinuous area inside the uterine wall, including its serosa (overlying peritoneum) and possibly involving the bladder and wide ligament [1]. Uterine dehiscence often precedes UR, but it does not involve the serosa or the gestational sac.

Thus keeping the umbilical cord, placenta and fetus inside the uterus, leading to a lower rate of

### ABSTRACT

**Background.** The number of Caesarean sections is growing worldwide, intensifying the risk of complications in subsequent pregnancies and leading to increased maternal and fetal morbidity and mortality. In particular, the literature shows a higher risk of uterine rupture in subsequent pregnancy with trial of labor after caesarean section. Furthermore, there are few data about pre-labor uterine rupture in scarred uteri.

**Objective.** Since the key factor for management is timing, the aim of this case report was to describe the accuracy of prenatal ultrasound of scars in the early determining of pre-labor UR risk in two cases with a previous Caesarean sections during their subsequent pregnancy.

**Case presentation.** We reported two cases of uterine rupture occurring outside of labour in patients with a history of caesarean section due to placenta previa. In the current cases was reported how a higher hysterotomy, combined with some risk factors, could increase the prevalence of UR in the subsequent pregnancy.

**Conclusions.** In these cases, a higher uterine incision due to placenta previa or isthmic myoma seems to be correlated with a major risk of UR. Therefore, although in a limit experience, we report that the periconceptual prenatal ultrasound examination of previous cesarian section level could represented a useful predictive factor of pre-labor uterine rupture in subsequent pregnancies.

maternal-fetal complications [2]. UR is an obstetric emergency that can be related to adverse neonatal (intrapartum death, ischemic-hypoxic encephalopathy, etc.) and maternal outcomes, (severe haemorrhage, requiring blood transfusion, repeated laparotomy, hysterectomy) [3]. In the last few years, the incidence of UR has significantly increased both in women without a previous hysterotomy (due to labour management, especially when medically induced) and in those with a previous caesarean sec-

tion (CS), mostly when combined with risk factors [4]. Indeed, despite conflicting opinions, the literature reports specific risk factors for UR [5]. Because of the increasing rate of CS in recent years and its complications, it is clear why the incidence of UR among women with a previous CS enhanced from 0.22 to 0.5% in developed countries [6].

We report two cases of spontaneous UR out of labour in women with a history of CS performed for placenta previa and hysterotomy performed more cranially from the low uterine segment (LUS).

We informed both patients about the use of their personal data for scientific purposes, under the protection of the Privacy Act, and they accepted and signed a related informed consent.

## CASE PRESENTATIONS

### Case 1

A 35-year-old patient with no relevant medical history, para 0/1/0/1 had a previous pregnancy terminated with an emergency CS due to a central placenta previa abruption at 32 weeks of gestational age; a placental flap was extending anteriorly over the LUS for 3 cm and a transverse hysterotomy was performed more cranially than usual.

After 2 years, the woman was pregnant again and at 32 gestational weeks, she presented to our obstetric emergency unit because of a severe abdominopelvic pain: she was conscious, pale and asthenic with BP: 100/60 mmHg, HR: 100 bpm, rhythmic pulse and obstetric shock index (OSI): 0.9 (normal value < 1). There was evidence of generalised tenderness, but no vaginal bleeding or amniotic fluid leakage was observed; because examination of the vaginal fornices was very painful, it was not possible to complete the obstetric digital examination. Both a transvaginal and a transabdominal scan were performed and thus reported: cervical length was 3 cm, single pregnancy, normal heart beat, fetal movements were detected, amniotic fluid index was normal, placenta was normally implanted on the anterior uterine wall. We observed fluid into the Morison's pouch and heterogeneous material both into the Douglas and the recto-uterine pouch. We could not determine the origin of the haemoperitoneum, as well as we could not exclude an extra-pelvic aetiology. Therefore, an emergency CS was performed with lower midline incision approximately 1000 ml of blood were drained. The gestational sac was outside the uterus, bulging through a dehiscence

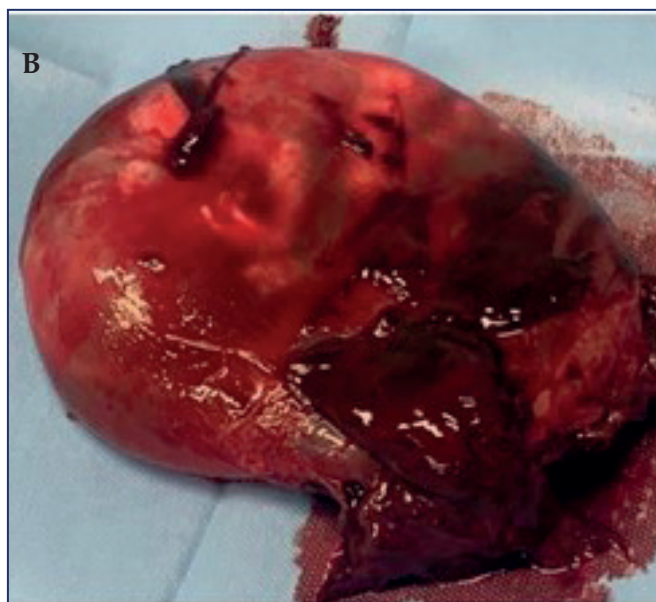
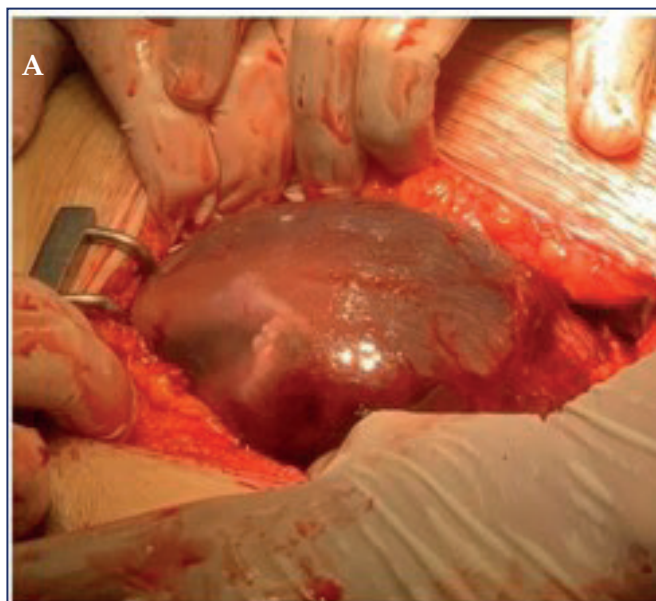
hysterotomic breach with sclerotic edges, which was partially removed and sent for histological examination (**Figure 1 A, B**). After removing the gestational sac and placenta, which was almost totally detached from the uterine wall, the breach was sutured with interrupted stitches and a good haemostasis was obtained, thus a conservative approach was feasible. The haemoglobin decreased from 9.6 gr/dL before surgery to 8.5 gr/dL on the day of surgery and 7.8 gr/dL on the first post-operative day: two units of packed red blood cells (pRBC) were transfused. The woman was discharged on day five with antibiotics, antithrombotics, iron and uterotonic. The histological examination confirmed the presence of scar tissue over the breach edges. The fetus reported no abnormalities and the growth was found to be consistent with the gestational age. The placenta was normal as well.

### Case 2

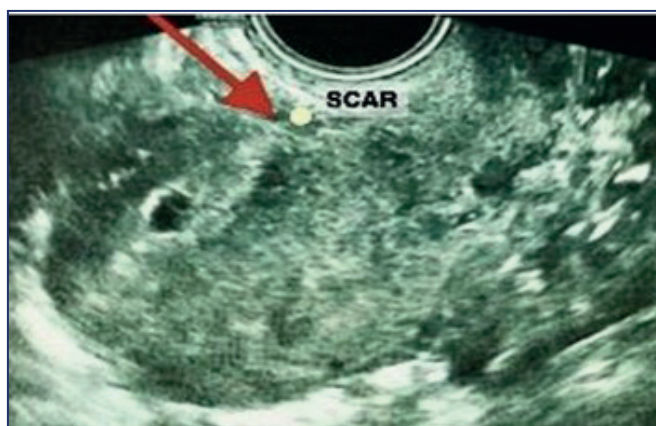
A 34 years old woman with no relevant medical history, para 1/0/1/1, had an elective CS at 39 weeks of gestational age due to an anterior placenta previa that required a transverse hysterotomy above the LUS.

After two years she was pregnant again and an ultrasound at 7 gestational weeks showed the higher CS scar location (**Figure 2**). At 36 gestational weeks the patient presented to our obstetric emergency unit because of severe and abdominopelvic pain which was worsening in the last three hours. She presented conscious, nervous, asthenic and pale. Blood pressure was 95/50 mmHg, heart rate was 85 bpm, rhythmic pulse and OSI: 0.8.

A superficial and deep abdominal palpation revealed a generalised tenderness and the digital examination of the vaginal fornices was painful, especially when exploring the area close to the pouch of Douglas; the cervix was not dilated and vaginal bleeding / amniotic fluid leakage was not observed. A CTG examination pointed out fetal bradycardia (80 bpm for 8 minutes) and no uterine contractions; a transabdominal scan confirm fetal bradycardia, but did not provide any further information. An emergency CS with a Pfannenstiel laparotomy over the previous scar. After draining 1500 ml of blood, the fetus was found outside of the uterus. After removing the placenta, almost totally detached from the uterine wall and bulging into the abdomen, a large breach over the middle third of the anterior wall was noted and sutured with interrupted stitches. Because the haemostasis



**Figure 1.** CASE 1. (A) Gestational sac expelled through the dehiscent hysterotomic breach and immediately visible when opening the abdomen. (B) Gestational sac outside the uterus.



**Figure 2.** CASE 2. Ultrasound assessment (gestational age: 7 weeks) shows the previous CS-scar located above the lower uterine segment.

was good, we opted for a conservative approach. Three units of pRBC and two units of plasma were infused during the CS because of the huge amount of blood collected into the abdomen and the low haemoglobin level (8.5 gr/dL). Soon after the CS, the haemoglobin was stable (9.5 g/dL) but the following day it decreased to 7.8 gr/dL, so another administration of pRBC was required. The patient was discharged on day four with antibiotics, anti-thrombotic and iron. Regarding fetal outcome. The new-born was a male, 2500 g, Apgar score 3 at 1 minute and 5 at 5 minutes, umbilical artery. PH was 6.8 - Lactate 12.8 mmol/L - BE 20mmol/L. He was immediately transferred to Neonatal Intensive Care Unit. Magnetic resonance performed 30 days after birth diagnosed a hypoxic-ischemic encephalopathy with severe neurological sequelae.

## DISCUSSION

UR usually occurs during the late gestational age and commonly involves the LUS area (scarred uterus 92.1% - unscarred uterus 63.63%), less resistant than the uterine corpus and fundus [7].

In this manuscript, there are reported two cases with uterine rupture in both cases out of labor, in women underwent cesarean section in previous pregnancy with an incision performed more cranially of usual and far from the lower uterine segment for the presence of a placenta previa.

In these situations, we suppose that a different mechanism of scarring is involved and consequently it could be considered a risk factor in order to prevent UR complications.

Indeed, in most cases, UR is an intraoperative diagnosed pregnancy complication; it may be suspected by performing a detailed gynaecological and ultrasound examination, but only a surgical evaluation can confirm the diagnosis [8].

Moreover, the clinical onset is often nonspecific, only later becoming more typical with abdominal pain, haemorrhagic shock and absence of fetal heart activity [9].

The first case presented with a nonspecific clinical pattern and the ultrasound examination was not supportive either. The prompt surgery reduced the risk of maternal complications but the fetal outcome was sealed by the early gestational age (19 weeks). For our second case, clinical evaluation was delayed by about three hours. Despite the unclear preoperative diagnosis, clinicians wisely decided to carry out a surgi-

cal treatment in a short time. Nevertheless, the patient's late presentation finally resulted in a worse maternal and fetal outcome (intraoperative blood transfusion and hypoxic-ischemic fetal encephalopathy).

According to our experience and other Authors' opinion, in order to improve the maternal-fetal outcome, high-risk patients (previous CS, abdominal pain, sickness, signs of peritoneal irritation and pelvic effusion) should be promptly identified and referred to adequate obstetric emergency units for urgent surgical treatment [10].

Moreover, Literature reports that in case of myomectomy, is more frequent the uterine rupture during pregnancy course and not during labor, compare to uterine rupture after cesarean section in which the uterine rupture is more frequent during labor [11].

Actually, the relative weight of every risk factor is not defined, but in case of fetal surgery it is 14% for both uterine dehiscence and UR [12]. A previous T or J uterine incision moves the risk of UR from 4% to 9%, double that of a previous vertical incision over the LUS and five times that of a transverse one. Actually, a "low" transverse uterine incision over the LUS is related to a low risk (0.4-0.7%), while the consequences of a "high" transverse incision over the LUS are not well detailed. Some Authors give it no relevance, while others state that every incision of the uterine contractile tissue increases the risk of UR [13]. Therefore, the importance of detailing the height of a CS scar in the patient's discharge letter becomes clearly evident, necessary to plan a proper management of the next pregnancy. This is the case with both our patients, with a previous CS due to placenta previa and a hysterotomy performed more cranially than usual, involving the uterine contractile tissue and possibly increasing the risk of UR [14]. Moreover, ultrasound measurement of the distance between the CS scar and the internal uterine orifice may screen patients with a high risk of UR, both during preconception counselling and early pregnancy.

Actually, the role of ultrasound in the prediction of uterine rupture is not demonstrate yet, and it is necessary caution in the interpretation of data.

However, all the possible risk factors for UR should be investigated when counselling these patients.

Regarding our cases:

- the first patient had a CS at 32 weeks due to placenta previa abruption, thus statistically increasing the risk of UR, even in the case of LUS hysterotomy (1.8% pre-term Vs 0.4% term-pregnancy) [15];
- the second patient had an elective CS at 39 weeks that should be taken in account as well;

also in these cases the risk of UR is increased, related to a suboptimal scar healing [16].

The last statement has two possible explanations: firstly, an incision over a less developed LUS can be related to a deeper myometrial damage; secondly, without a cervical dilatation and a full uterine drainage, there is a higher risk of post-partum infection, phlogosis, abnormal scar healing and UR [5]. The amount of time from the last CS is another important risk factor; in our cases, it was of 16 and 21 months respectively. By reviewing the current literature, the importance of this detail is clear, but a standard "safe" range of time is not reported. Some studies suggest a 6 to 19 month period, while other Authors prefer an interval of 12 or 18 months. An observational study focuses on 1500 women and, removing all the biases (type of stitches, oxytocin induction, and epidural anaesthesia) but still preserving an odds ratio for UR of 2.65 (95% CI 1.08-6.46), suggests a period of 24 months as optimal [17]. Finally, the literature confirms the higher risk of UR for patients with a recent CS, and a period of 18-24 months appears to be the safest one [18]. This evidence points out another risk factor for our patients, probably contributing to the final outcome and confirming again the importance of detailed pre and post-delivery counselling.

## CONCLUSIONS

When counselling patients with a previous CS, detailed information about the short and long-term related risks factors should be investigated and collected, including the length of time (less than 18-24 months) since the last CS and the type of hysterotomy performed. Ultrasounds can measure the distance between the CS scar and the internal uterine orifice or the vesicovaginal pouch, useful for patients who had an incision higher than usual: this parameter is not yet standardized but it could detect the height of the CS scar to assess the risk of UR [19]. Ongoing pregnancies should be investigated for all the possible anamnestic risk factors: reason for CS, type of hysterotomy, other uterine surgeries, gestational age at the time of CS, emergency or planned surgery, range of time from the last pregnancy, and height of the incision (also assessable by ultrasounds). Through this approach, we can perform a proper risk assessment and schedule serial follow-ups to early detect and treat a possible UR. This could reduce the time between diagnosis and surgery, thus

having more time to manage safely the emergency (expert clinician, promptly available blood products, and well-equipped facilities) [10]. Therefore, the early screening of potentially at-risk pregnancies would allow to plan a periodic follow-up of these patients and the rapid detection of UR symptomatology. This could be extremely important, since a preventive diagnosis and early intervention may significantly improve maternal and fetal outcome.

## COMPLIANCE WITH ETHICAL STANDARDS

### *Authors contribution*

M.D.: Writing – original draft. F.M.C.: Data acquisition. A.C.R.: Writing – review & editing. H.X.: Formal Analysis. R.T.: Analysis tools. E.C, A.V.: Analysis design.

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### *Study registration*

N/A

### *Disclosure of interests*

The authors declare that they have no conflict of interests.

### *Ethical approval*

All procedures performed in this study were in accordance with the Helsinki Declaration. In addition, the patient was also informed that the data collected for this study are protected by the Privacy Act.

### *Informed consent*

The data were collected and used after written subscription of further informed consent aimed at obtaining the written authorization from each patient to the use of personal data for scientific purposes only.

### *Data sharing*

For any information related to the data you can refer to the corresponding author who presents the raw.

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