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INFANT OUTCOME AFTER COMPLETE UTERINE RUPTURE

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ABSTRACT

Uterine rupture in pregnancy is rare and often a catastrophic complication with a high risk of fetal and maternal morbidity and mortality. Rupture of the uterus can occur in a scarred or an unscarred uterus. The prevalence of rupture uterus tended to be lower for countries defined by the United Nations as developed than the less or least developed countries. For women with a previous cesarean section, the prevalence of uterine rupture reported 1%., the risk varies according to the type and location of the previous uterine incision.1 An interval of fewer than 6 months was associated with increased risk of uterine rupture.2 Rupture uterus can involve adjacent organs most common being the urinary bladder which is an acute obstetric emergency.

KEYWORDS: Outcome, uterine rupture.

INTRODUCTION

Rupture of the pregnant uterus is a rare disorder that occurs in less than 0.05% of pregnancies. Reports of spontaneous uterine rupture in the early trimesters are rare[1]. The uterine rupture caused by separation of the uterine myometrium is a life-threatening condition for the mother and fetus. Complete uterine rupture cannot usually be predicted and occurs suddenly during labor or delivery. During the pre-viable period, it is not known whether cesarean section, uterine repair or hysterectomy represents the best approach.[2]

Complete uterine rupture is a rare peripartum complication often associated with a catastrophic outcome for both mother and child. However, little has been written based on large data sets about maternal and infant outcome after complete ruptures. This is partly due to the rarity of the event and the serious maternal and infant outcome; it is also partly due to the use of international diagnostic codes that do not differentiate between the less

catastrophic partial rupture and more catastrophic complete uterine rupture. As uterine rupture is expected to increase due to increased cesarean delivery rates worldwide, it is important to know more completely about the outcome following complete uterine rupture.[3]

Complete uterine rupture is a rare peripartum complication often associated with a catastrophic outcome for both mother and child.[4] A scarred uterus, predominantly due to a previous cesarean delivery (CS), substantially increases the risk of uterine rupture.[5] Previous studies describing maternal and perinatal outcomes after complete uterine rupture are limited, most likely due to the rarity of the event. Most previous studies were based on registries using international diagnostic codes that did not differentiate between complete and partial rupture. Basing studies on clinical records often results in a small sample underpowered for detecting any associations between risk factors and outcomes following the rare event of uterine rupture. Previous studies have generally concentrated on the outcome of uterine rupture only in scarred uteri, and few have described the outcome in unscarred uteri.[6]

To achieve a large sample, we studied complete rupture of scarred and unscarred uteri after the start of labor over 41 years based on population-based registry data. All medical records were reviewed for accuracy of diagnosis. In Norway, all mothers with 1 previous CS are offered a trial of labor unless there is an absolute contraindication against vaginal delivery. The trial of labor rate after previous CS is high with 64%.6 Among those with a trial of labor, 80% undergo vaginal birth.[7]

BACKGROUND

The rate of Cesarean deliveries continues to increase worldwide. Cesarean delivery, in particular when repeated, is associated with an increased risk of several complications in subsequent pregnancies, including uterine rupture and uterine dehiscence.[8] Rupture of a uterine scar is defined as a disruption of the full thickness of the uterine wall including the overlying visceral peritoneum (uterine serosa). It occurs most frequently in women who have undergone previous uterine surgery (e.g. Cesarean delivery, myomectomy) but may also occur in an unscarred uterus.[9] It is a rare complication estimated to occur in 0.07% of pregnancies. Uterine rupture is associated with a high incidence of fetal and maternal morbidity that includes significant blood loss, fetal distress, protrusion or expulsion of the fetus and/or placenta into the abdominal cavity, need for a prompt cesarean delivery and uterine repair or hysterectomy Uterine scar dehiscence is a disruption and separation of a preexisting uterine scar.[10]

It is more common than uterine rupture and seldom results in major maternal or fetal complications. This is mainly due to the fact that when the defect in the uterine wall is limited to scar dehiscence, it does not disrupt the overlying visceral peritoneum and does not result in clinically significant bleeding from the edges of the preexisting uterine scar. Furthermore, the fetus placenta and umbilical cord remain contained within the uterine cavity.[11] Following uterine rupture or dehiscence, it is common to advise women to avoid future pregnancies. However, some women become pregnant again, either accidentally or deliberately. The available information on pregnancy outcomes in such women is limited. Data is derived from small case series comprised of women who had undergone repair of ruptured uterus and became pregnant again.

In 2007 Usta et al.[12] after reviewing patients' charts from the previous 25 years, identified 37 women who had experienced uterine rupture and reported pregnancy outcome in 12 women who became pregnant again. The recurrence rate was 33% (eight of 24 pregnancies in five of the 12 women).[13] Recently, Fox et al.[14] reported that in a case series of 44 women with a history of prior uterine rupture or dehiscence they followed during subsequent pregnancy the rate of recurrence was only 6.7%. There was one recurrence in 20 pregnancies (5%) in the 14 women with a history of uterine rupture and four recurrences in 40 pregnancies (7.5%) in 30 women who had prior dehiscence. The wide range in the estimation of the risk of recurrence suggests that additional information is needed so that clinicians can provide counseling to these women.

The most concerning risk of TOLAC is a uterine rupture. If the patient has a high risk of rupture, TOLAC should not be offered.[15]

For some patients, their high-risk status will be clear—for example, if the patient has a previous classical or T-incision, prior uterine rupture, or extensive transfundal uterine surgery. For others, the possibility of uterine rupture must be calculated from the totality of the circumstances. Factors that increase the risk of uterine rupture include:[16]

- Having had a single-layer closure in a previous C-section
- Having had more than one or possibly two previous C-sections
- Being induced with misoprostol
- Failing the current trial of labor
- Increased maternal age
- Having a high body mass index

- Having a short interpregnancy interval (less than six months).[17]

Women who have had a prior vaginal delivery are less likely to have a uterine rupture. Although these factors appear to statistically increase or decrease an individual's risk for uterine rupture, it cannot be absolutely predicted or ruled out. Therefore, even if the patient seems to have a low probability of uterine rupture, clinicians still need to maintain a high index of suspicion for it during TOLAC.

A successful TOLAC has a lower rate of maternal injury, as well as decreased rates of complications in future pregnancies, compared to ERCS, but both have risks, including maternal hemorrhage, infection, operative injury, thromboembolism, hysterectomy, and death.[18]

For a woman undergoing TOLAC, the greatest risk of injury occurs when a repeat C-section becomes necessary. Consequently, the risk of maternal injury is integrally related to the mother's probability of achieving VBAC.[19]

Evidence suggests that a woman with at least a 60 to 70 percent chance of VBAC will have maternal morbidity equal to or less than a woman undergoing ERCS. On the other hand, a woman who has a lower than 60 percent chance of VBAC has a greater chance of morbidity than a woman undergoing ERCS.[20]

Factors that decrease the probability of a successful trial of labor include:[21]

- Gestational age greater than 40 weeks
- High neonatal birth weight
- Previous labor dystocia
- Current need for labor induction or augmentation
- Increased maternal age
- Non-white ethnicity
- High body mass index
- Preeclampsia
- Short interpregnancy interval

Factors that increase the probability of successful TOLAC include a prior successful VBAC and current spontaneous labor.[22] An online tool that estimates the probability of successful VBAC for women with one prior cesarean. Uterine Rupture and Perinatal Morbidity Just as a

failed TOLAC is linked to an increased risk of maternal morbidity and mortality, it is also linked to adverse perinatal outcomes, including stillbirth and neonatal death, hypoxic-ischemic encephalopathy (HIE), respiratory distress syndrome, pneumonia, acidosis, intraventricular hemorrhage, and subgaleal bleeding.[23]

The rate of perinatal death associated with TOLAC is approximately per 1,000 and 3.4 per 1,000 with ERCS—a difference of approximately 1 in 417.5 Although this may seem like a small number to an outside observer, to a woman making the informed decision between TOLAC and ERCS, it is probably going to be significant.[24]

And although it is estimated that the risk of injury to the fetuses of the patients with the highest probability of VBAC is about equal to the risk of injury to fetuses born by repeat C-section,1 for many patients, ERCS will be the safest option for the fetus. The Informed Consent Process Informed consent is an important part of any medical procedure. For TOLAC and VBAC, it is imperative that the woman understand that TOLAC may not result in the vaginal birth of a healthy baby.[25]

It is imperative that the obstetrician begin patient education early in the pregnancy, covering TOLAC, the risks associated with TOLAC and VBAC, and the patient's own risk factors. The patient must understand that uterine rupture is an unpredictable event that can happen to any woman who chooses TOLAC, and that uterine rupture can be devastating to both her and her infant. She needs to have the best possible understanding of the risks of TOLAC and VBAC versus the risks of an ERCS, and place them in the context of her future pregnancy planning. An additional part of the obstetrician's informed consent process should be informing the parturient as to whether the hospital where she plans to deliver provides 24/7 in-house obstetrician, anesthesiologist, neonatologist, and operating room nursing staff services for an emergency cesarean delivery.[26]

Should anesthesiologists inform the parturient that an epidural has the potential to mask the persistent pain (between contractions) associated with the 10 to 30 percent of uterine ruptures that do result in pain?6 In the most recent edition of his textbook, Chestnut states that "epidural analgesia does not delay the diagnosis of uterine rupture.[27] Furthermore, in an earlier edition of his textbook, Chestnut stated that "epidural anesthesia may improve the specificity of abdominal pain as a symptom of uterine scar separation or rupture. Of note, escalation of frequency of epidural dosing may be a marker/clinical sign for impending

uterine rupture, suggesting that parturients under epidural analgesia may retain the perception of pain associated with uterine rupture.[28] If the patient declines regional analgesia in favor of unmedicated labor, then it may be difficult to distinguish pain caused by uterine rupture from the severe pain experienced by most women during labor. Informed consent should acknowledge and emphasize that FHR abnormalities (present in 71 to 100 percent of ruptures9) and changes in fundal tone and fetal station are more reliable signs than pain in signaling rupture.

If the parturient can weigh those risks in a meaningful way, then she can make informed decisions. She should not be going into TOLAC thinking, "My doctor is making me do this" or "Internet websites say that VBAC is safe, so I'll be fine." Recognizing the Signs of Uterine Rupture The rate of uterine rupture during TOLAC is approximately 0.5 to 0.9 percent for women with low-transverse uterine incisions.1 Uterine rupture is usually sudden and there are no fail-safe antenatal predictors for it.[29]

Although the signs and symptoms of acute uterine rupture vary, they may include:

- Fetal bradycardia and variable decelerations (FHR abnormality has been associated with 70 percent of uterine ruptures.)
- Increased uterine contractions.
- Vaginal bleeding.
- Loss of fetal station (decrease of fetal head engagement within the pelvis) or a sudden shift in the position of the fetus (the rupture leads to intra-abdominal fetal presentation). Note that decreased uterine tone is most accurately monitored via an intrauterine pressure catheter.
- New onset of intense uterine pain that does not diminish between contractions.[30]

This pain may be breakthrough in nature (requiring more than the usual epidural dosing), in the area of a prior uterine scar (such as that of a myomectomy), or even shoulder pain (from blood under the diaphragm).

Obstetricians also tend to have differing opinions when interpreting FHS. One study showed that when four obstetricians examined 50 FHS, they agreed in only 22 percent of the cases.[31] When they reviewed the same 50 tracings two months later, the obstetricians interpreted 21 percent of the tracings differently than they had initially. Furthermore, a reviewer is more likely to find evidence of fetal hypoxia if he or she knows that there was a poor outcome.[32]

This issue can make a seemingly defensible birth injury case unpredictable because it will be up to a jury (based on the opinions of experts) to determine whether the defendant health care professionals reacted to the evidence of fetal distress and uterine rupture in a time frame that is consistent with the standard of care. Epidural analgesia is not contraindicated during TOLAC, and in fact, as outlined above, has been cleared of causing a delay in diagnosing uterine rupture or of adversely affecting the likelihood of successful VBAC.[33]

Modern labor analgesic techniques typically utilize lower concentrations of local anesthetics, typically in combination with an opioid. Pain that is unusual, sudden in onset, severe, or persistent in nature should signal the obstetrician to evaluate for possible uterine rupture. The anesthesiologist should alert the obstetrician if the patient has atypical analgesic requirements, suggesting the need for an evaluation for uterine rupture. Anesthesiologists should be proactive participants, not just reactionary technicians.[34]

MATERIALS AND METHODS

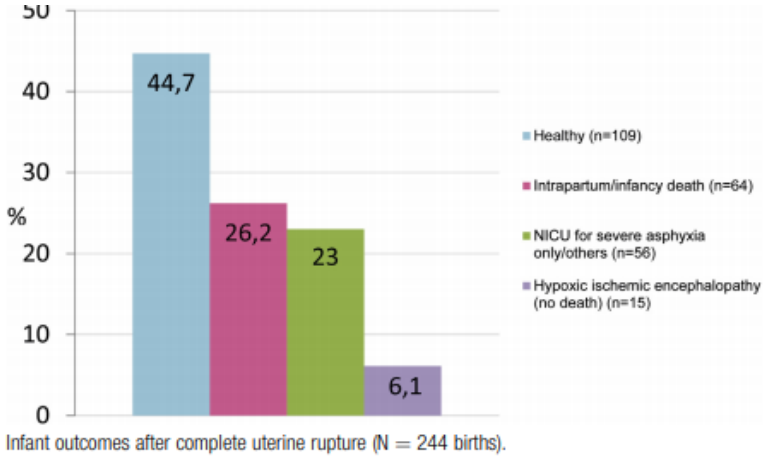
All cases of uterine rupture after the start of labor were identified through diagnostic codes in the Medical Birth Registry of Iraq from all 48 maternity units and the Patient).

We included births with complete uterine rupture after the start of labor in all maternity units in Iraq during the period 1999 through 2018 (n ¼ 244 births), identified among 2,455,797 births. Uterine ruptures were identified and further studied through a review of medical records. We estimated the associations between infant outcomes and demographic and labor risk factors using logistic regression analyses. Odds ratios with 95% confidence intervals for each risk factor were determined after adjustment for demographic factors and period of birth. The main outcome measures was infant outcome: healthy infant, intrapartum/infant deaths, hypoxic ischemic encephalopathy, and admission to the neonatal intensive care unit.

RESULTS

We identified 109 (44.7%) healthy infants, 56 (23.0%) infants needing neonatal intensive care unit admission, 64 (26.2%) intrapartum/ infant deaths, and 15 (6.1%) infants with hypoxic-ischemic encephalopathy. The highest number of intrapartum/infant deaths occurred in 1967 through 1977 (51.6%) and the fewest in 2000 through 2008 (15.0%). Unscarred uterine ruptures did not significantly increase intrapartum/ infant deaths compared to scarred uterine ruptures. Placental separation and/or fetal extrusion had the highest odds ratio for

intrapartum/ infant deaths (odds ratio, 17.9; 95% confidence interval, 7.5e42.4). Time-to-delivery interval 30 minutes vs.



Infant outcomes after complete uterine rupture (N = 244 births).

DISCUSSION

Several reports have been published regarding the repair of uterine rupture in the second trimester by suturing and/or patching.[35] The subsequent pregnancy outcome after conservative management of uterine rupture was only been studied in small case series, among which the prevalence of recurrence ranged from approximately 0 to 33%.[36] Risk factors for third-trimester uterine rupture in labor are well known; nevertheless, data on spontaneous second- and early third-trimester uterine rupture before labor remain very limited.[37] This brief review identified a previous cesarean section as the main risk factor for uterine rupture.[38] However, three of the 10 cases of uterine rupture had no demonstrable risk factors. Rupture of the unscarred pregnant uterus is a rare event, estimated to occur in one in 5700 to one in 20,000 pregnancies.[39] An unscarred uterine rupture is a rare event that usually occurs in late pregnancy or during labor. Risk factors for this condition include high parity, placental abnormalities, and uterine anomaly, but none of these factors were present in this series. Although rare, primary uterine rupture is particularly morbid.[40] Uterine rupture can occur at any time during gestation and may be difficult to predict.[41]

Therefore, uterine rupture must be considered in differential diagnoses of severe abdominal pain, even in the early second trimester. Clinical signs of uterine rupture in early pregnancy are nonspecific and must be distinguished from acute abdominal emergencies to days prior to the diagnosis of uterine rupture. The patient in this case report was evaluated for non-obstetric diagnoses related to upper abdominal pain because she presented with minor acute signs and symptoms in addition to normal sonographic appearances of the uterus and fetus.

Another issue is silent uterine rupture; this has potential risk for complete uterine rupture, which leads to acute life-threatening complications for both the mother and baby. It is difficult to determine whether to manage complete uterine rupture expectantly or surgically, including repair of the uterine wall or termination of the pregnancy, especially in the early second trimester.[42] Early correct diagnosis and proper management are necessary to decrease the high maternal and fetal mortality and morbidity rates associated with uterine rupture. An emergency laparoscopy or laparotomy is needed for correct diagnosis and to allow the appropriate treatment to take place. Early surgical intervention is usually the key to successful treatment of uterine rupture. This brief review found no differences between single-, two- and three-layered sutures on maternal and fetal outcomes, but the sample size was very small. Treatment will primarily depend on the extent of the lesion; parity, age and condition of the patient; and expertise of the surgeon. However, this brief review found that it was possible to delay delivery in all cases, thus improving neonatal outcome. Repair of a ruptured uterus can lead to prolongation of pregnancy, and consequently, yield favorable maternal and fetal/ neonatal outcomes. The lack of extremely preterm deliveries and good neonatal outcomes encourage attempts to repair the uterus after second-trimester rupture.[39]

The clinical presentations of concomitant uterine and bladder rupture at the time of VBAC are variable and depend on the time, location and type of uterine rupture that extends onto the adjacent organs. Severe signs and symptoms can result when a complete rupture occurs intrapartum, including a non-reassuring fetal heart tracing, loss of the presenting part on pelvic examination, change in uterine shape, cessation of uterine contractions, abdominal pain, vaginal bleeding, and even maternal shock.[44]

Rupture of a previous cesarean section scar is frequently diagnosed on the basis of altered fetal heart rate pattern, vaginal bleeding, maternal tachycardia or unusual pain during labor. In most cases which occur in a hospital setting, timely laparotomy results in the safe delivery of the baby and repair of the uterus. A recent review of uterine rupture limited to women with previous cesarean section in developed countries reported an increased risk of uterine rupture and perinatal death for women undertaking a trial of labor compared with elective repeat cesarean section.3. A major factor in uterine rupture is obstructed labor. In less and least developed countries, uterine rupture is more prevalent than in developed countries.

CONCLUSIONS

- Apatientshouldnot is offeredaTOLACina facilitywherepractitioners capable of performing cesarean sections, anesthesiologists, pediatricians, nurses, and technical staff is not in place in a time frame that adequately protects maternal and neonatal safety in the event of an emergency.
- The personnel necessary for an emergency cesarean section should be aware that a VBAC candidate is in labor, and all the personnel should be immediately available during TOLAC.
- There should be agreement on the definition of "immediately available." • Members of the labor and delivery team should know how to contact the anesthesiologist in case of an emergency.
- The anesthesiologist should be contacted in the event of any maternal bleeding, FHS indicating fetal intolerance of labor, abnormalities in maternal vital signs, change in fundal tone/fetal station/progress of labor, or atypical need for pain relief.
- A sterile "crash" cesarean operative tray should be immediately available in the event of a uterine rupture.
- There should be regular emergency cesarean drills to ensure that all team members can meet targeted decision-to-incision goals.
- A rapid response protocol for obstetric emergencies should be developed.
- In settings where the staff needed for emergency delivery are not "immediately" available, the process for gathering needed staff when emergencies arise should be clear, and all centers should have a plan for managing uterine rupture and other obstetric emergencies.

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