

ORIGINAL ARTICLE

Uterine Rupture – Clinical Analysis of a Case Series in Riga Maternity Hospital

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Summary

Introduction. Uterine rupture is a tearing of uterine wall during pregnancy or delivery. There are two types of uterine rupture described in literature: symptomatic (SUR) and asymptomatic (AUR) uterine rupture. In case of SUR there is a full thickness uterine wall tear which leads to clinical symptoms and high perinatal and maternal morbidity and mortality. In case of AUR the visceral peritoneum remains intact and it is typically diagnosed during Cesarean section. Rupture of previously intact uterus is very rare and is associated with extensive uterine damage, severe hemorrhage and in most cases leads to hysterectomy. Fetal complications include admission to neonatal intensive care unit, hypoxic - ischemic injury and death. Maternal complications include hemorrhage, hypovolemic shock, bladder injury, hysterectomy and maternal death. The incidence and prevalence of uterine rupture as well as the perinatal and maternal rate of complications in Latvia is unknown.

Aim of the Study. Aim of the study is to analyze clinical cases of SUR and AUR, calculate the incidence and prevalence and detect the risk factors (RFs) and diagnostic difficulties of clinical cases which occurred in Riga Maternity Hospital from year 2010 to 2017.

Material and methods. A case series study of 41 uterine ruptures which occurred in Riga Maternity Hospital from the 1st of January 2010 until the 31st of December 2016 was performed. An average birth rate for this time period was 6554 live births per year.

Results. Over the time period 41 women with uterine rupture were diagnosed in Riga Maternity Hospital. AUR was diagnosed in 33 patients during Cesarean section. SUR occurred in seven patients, but in total there were eight cases of SUR, because one of the patients had a uterine rupture twice. SUR incidence in Riga Maternity Hospital is 1.7 per 10000 deliveries (8 per 45875 deliveries) and the prevalence is 0.0175%. In three cases SUR was diagnosed after labor and in five cases - during emergency laparotomy. SUR most frequently manifested with hypovolemic shock and/or acute abdomen. In two cases uterine defect was repaired and in six cases hysterectomy was performed. One patient had acute kidney injury and there was one case of maternal death. Nine babies were delivered and the Apgar score after the 1st minute was ≥ 7 in three cases and < 7 in three cases, but after the 5th minute it was ≥ 7 in five cases and < 7 in one case. There were three intrauterine fetal demises. All the patients with either SUR or AUR had multiple RFs for uterine rupture.

Conclusions. Uterine rupture is associated with multiple RFs. If trial of labor after Cesarean section is the preferred mode of delivery it is necessary to detect all of the RFs. Antenatal measurement of lower uterine segment thickness seems unreliable but further research should be carried out with statistical data analysis. For the safety of patients trial of vaginal delivery in patient with uterine scar should be performed in appropriately equipped and staffed medical facilities.

Key words: uterine rupture; uterine scar; obstetric emergency.

INTRODUCTION

Symptomatic uterine rupture (SUR) is a full thickness tearing of uterine wall during pregnancy or delivery (6). According to World Health Organization (WHO) prevalence varies from extremely low, i.e. 0.006%, in patients with intact uterus in developed countries to 25% in patients with obstructed labor in developing countries. Patients with uterine scar due to previous Cesarean Section (CS) have higher prevalence - about 1% (< 1 per 10000 deliveries) in developed countries to extremely high with high maternal mortality in sub-Saharan Africa and Bangladesh (6; 21). The major risk factor (RF) for uterine rupture is previous CS, but other RFs include maternal age > 30 ; multiparity; interpartum interval < 18 months; induction of labor; labor augmentation with oxytocin; operative vaginal delivery; obstructed labor; uterine overdistension (4; 10; 17; 18). RFs and etiology of uterine rupture differs in developed countries and developing countries. In low

income countries, poor perinatal and maternal outcome is due to absence of appropriately equipped and staffed setting (13).

Two types of uterine rupture are described in literature - SUR and asymptomatic uterine rupture (AUR) (11; 12). A full thickness uterine wall disruption including myometrium and visceral peritoneum is called SUR because the patient usually has clinical symptoms. AUR is separation of myometrium with intact serosa. Patients with AUR usually are oligosymptomatic or asymptomatic. This type of uterine rupture sometimes is defined as uterine scar dehiscence or silent uterine rupture (7) and there is no consensus on defining this type of loss of uterine wall integrity as uterine rupture. SUR is a catastrophic clinical event, which can lead to perinatal and maternal mortality. Consequences of uterine rupture also differs and depend on type of rupture and time interval between onset and treatment of uterine rupture. Fetal complications

include: admission to neonatal intensive care unit (NICU), hypoxic - ischemic injury and death. Maternal complications include hemorrhage, hypovolemic shock, bladder injury; hysterectomy and maternal death (14; 20).

RF estimation during antenatal care and during labor is the most reliable safety strategy at this point (15). Ultrasound (US) measured lower uterine segment thickness (LUST) is a strong predictor for possible uterine rupture (8). The optimal cut-off value varies from 2.0 to 3.5 millimeters for full LUS thickness and from 1.4 to 2.0 millimeters for myometrial layer.

The incidence and prevalence of uterine rupture in Latvia is unknown and there is no published data on RF presence and labor outcome. This paper is an attempt to look through the clinical cases of uterine rupture in Riga Maternity Hospital and to start the discussion on this clinical problem on national level.

AIM OF THE STUDY

Aim of the study is to analyze clinical cases of SUR and AUR, to calculate incidence and prevalence, to detect the RFs and diagnostic difficulties of clinical cases which occurred in Riga Maternity Hospital from year 2010 to 2017.

MATERIAL AND METHODS

A case series study of 41 uterine ruptures which occurred in Riga Maternity Hospital from the 1st of January 2010 until the 31st of December 2016 was performed. An average birth rate for this time period was 6554 live births per year.

We divided all the clinical cases of uterine rupture in two groups: AUR group and SUR group. RFs such as uterine scar, previous curettage, maternal age > 30 y/o, multiparity, interpartum interval < 18 months, labor induction, oxytocin use for labor augmentation, uterine overdistension, abnormal placentation were identified in both patient groups. Data analysis was performed with MS Excel.

RESULTS

Over the time period of seven years 41 cases of uterine ruptures were diagnosed in Riga Maternity Hospital. AUR was diagnosed in 33 patients during CS (Figure 1). All of the patients with AUR had multiple RFs: uterine scar or repetitive uterine scars (100%) in combination with other RFs (interpartum interval < 18 months (21%, n=7); uterine overdistension (18%, n=6), abnormal placentation (12%, n=4). 14 patients didn't have their LUST measured. Of the 19 patients who did get the measurements done during third trimester of pregnancy, the results were: <2.0 millimeters in 53%, 2.0-2.4 millimeters in 10% and >2.4 millimeters in 37% of the patients.

SUR was diagnosed eight times in seven patients (one patient had uterine rupture twice). SUR incidence in Riga Maternity Hospital is 1.7 per 10000 deliveries (8 per 45875 deliveries) and the prevalence 0.0175%. The average age of the patients with uterine rupture

was 35 years (+/-3.4SD), they were multigravidas and multiparas (G3+/-1.9SD, P2.5+/-1.1SD). There were three cases of premature labor, three cases of term labor and two cases of post-date delivery. Uterine rupture was diagnosed after delivery in three cases and during emergency laparotomy in five cases. Uterine rupture mostly manifested as hypovolemic shock with or without symptoms of acute abdomen. In two cases uterine rupture was repaired and in six cases hysterectomy was performed. One patient developed acute kidney injury postoperatively and one case of maternal death due to hypoxic - ischemic injury secondary to hemorrhage occurred. Nine babies were delivered and the Apgar score after the 1st minute was ≥ 7 in three cases and < 7 in three cases, but after the 5th minute it was ≥ 7 in five cases and <7 in one. There were three intrauterine fetal demises.

All the patients with both SUR and AUR had multiple uterine rupture RFs. Further we describe all of the SUR clinical cases for better understanding of the clinical problem.

Case No. 1

Patient, 32 years old, Gravida II, Para II, 41+ 2 weeks of gestation, with history of previous CS due to *placenta previa* eight years ago. Patient wanted to undergo trial of labor after Cesarean section (TOLAC). Third trimester ultrasound suggested LUST of 1,9 millimeters. On admission, patient was in hypovolemic shock and had clinical signs of acute abdomen. Fetal body parts were palpable under patients' skin. Patient did not have vaginal bleeding. Due to suspected uterine rupture 1st category CS was performed seven minutes after admission. During laparotomy fetus and placenta was found to be expelled into abdominal cavity and 0.7 liters of blood in abdominal cavity was noted. Total blood loss was 2 liters. Uterine rupture started from the right corner of previous CS scar and extended until the fundus of the uterus (Figure 2). It was not possible to salvage the uterus and total hysterectomy with left side salpingectomy and right side adnexectomy was performed (Figure 3). Postoperative period was without any complications.

A boy with Apgar score of 2/4/4 in 1st, 5th and 10th minute accordingly was delivered. He was brought to NICU and therapeutic hypothermia was initiated. On 5th day of life he was transferred to Neonatology clinic for further evaluation and treatment. The neonate passed away on 15th day of life due to severe hypoxic - ischemic encephalopathy.

Case No. 2

38 y/o patient, Gravida II, Para II, 40+3 weeks of gestation presented to the Emergency department with contractions every four to five minutes. Patient had previous CS due to *placenta previa* 14 years ago. Patient wanted to undergo TOLAC. US scan performed on 37+5 weeks of gestation showed low-lying placenta and LUST of 2.7 millimeters. Labor was uncomplicated and healthy boy was delivered. The patient developed atonic

postpartum hemorrhage (PPH) with hypovolemic shock. Due to PPH manual revision of uterine cavity was performed and two centimeters long uterine rupture in the left corner of previous CS scar was diagnosed. Patient was transferred to surgical theater and emergency laparotomy was performed 10 minutes after diagnosis was made. In addition, 2.5 centimeters long defect on left side of urinary bladder, hematoma under vesicouterine fold was noted. Uterine wall and urinary bladder were closed in 2 layers. The integrity of urinary bladder was examined by filling it with methylene-blue and flow into abdominal cavity was not noted. B-lynch hemostatic suture was applied and balloon tamponade of uterine cavity was performed due to PPH. Total blood loss was 1.8 liters. Foley catheter was left for two weeks until the urinary bladder was completely healed.

Case No. 3 and No. 4

In year 2011, 30 y/o patient, Gravida I, Para I, 27 weeks of gestation was admitted to the hospital due to malaise, irregular pain in lower abdomen and bloody discharge from vagina. On admission, patient was pale but general status demonstrated no signs of hypovolemic shock. This was *in vitro* fertilization (IVF) twin pregnancy after double embryo transfer. In year 2007 the patient had a right side adnexectomy and in year 2011 she underwent diagnostic and therapeutic laparoscopy (myomectomy in uterine posterior fundal region with coagulation of myometrium after myomectomy for bleeding control). On ultrasound examination, there were no recordable heart sounds in both fetuses, free fluid in abdomen was noted and placental abruption was diagnosed. 1st category CS was performed 1 hour and 21 minutes after admission. During surgery 0.1 liters of blood clots, two female fetuses in amniotic sacks and placenta were found in abdominal cavity. 8 to 10 centimeters long uterine rupture in posterior fundal wall of the uterus was noted. Uterus was repaired and its reproductive function preserved. Total blood loss was 0.6 litres. The postoperative period was without any complications and the patient was discharged on 6th postoperative day.

In year 2015 the same patient, at that time 34 y/o, Gravida II Para II with singleton IVF pregnancy, was hospitalized at 28 weeks of gestation due to pain in lower abdomen and history of uterine rupture in 27th week of gestation four years ago. Patient was admitted for observation and treatment of threatened premature delivery. On 31st week of gestation patient suddenly developed acute abdomen and hypovolemic shock. Uterine rupture was suspected and 1st category CS was performed 10 minutes after the diagnosis was made. Laparotomy was performed, hemoperitoneum of 2 litres of blood was noted, and premature fetus was evacuated after LUS hysterotomy. After delivery 8 centimeters long uterine rupture in left fundal posterior region was noted (Figure 4). A neonate with Apgar score of 5/7 in 1st and 5th minute accordingly was delivered. Uterus could not be salvaged and decision to perform subtotal hysterectomy and left side salpingectomy due to hematoma in parametrium was made. Neonate had

some complications of prematurity, but overall had a good recovery.

Case No. 5

33y/o Gravida VI, Para IV, 40+0 weeks of gestation was admitted to the hospital in active phase of labor. The patient had two induced abortions but all deliveries were vaginal and spontaneous. Intervals between each of the last three pregnancies were less than 1.5 years. Patient used heroin and then switched to methadone maintenance treatment. During pregnancy, patient was smoking approximately 10 cigarettes per day. The patient was infected with hepatitis C virus. She received insufficient antenatal care due to socio - economical RFs. Oxytocin for labor augmentation was used.

The 1st stage was 11 hours long and the 2nd stage was 7 minutes long. Cardiotocography (CTG) didn't show oxytocin induced hyperstimulation of the uterus. She developed profuse PPH. During manual revision of uterine cavity uterine rupture that was extending from cervical tear was diagnosed. During laparotomy uterine rupture on left side of uterus was diagnosed. During surgery, massive hematoma and imbibition of left parametrium was noted. Hematoma under vesicouterine fold expanded to the pelvic wall. Postpartum hysterectomy with left side adnexectomy was performed. Total blood loss was 2.8 liters. After surgery patient's state deteriorated and bleeding from surgical wound started. Disseminated intravascular coagulopathy (DIC) syndrome was diagnosed. The patient passed away 16 days after the event due to hypoxic - ischemic injury secondary to hemorrhage.

Case No. 6

35 y/o Gravida II, Para II was hospitalized for induction of labor due to prolonged pregnancy of 41+5 weeks of gestation. The patient had prior vaginal delivery and no confirmed uterine scar. Patient had uterine cavity curettage after first labor. Before the transfer to delivery department, patient received misoprostol for induction of labor. During 1st stage of labor amniotomy was performed as a method of labor augmentation continued with oxytocin infusion. Neonate of 4490 grams was delivered with cephalohematoma in both parietal regions and fracture of the right clavicle. 15 minutes after delivery of placenta PPH with hypovolemic shock developed. During manual revision of uterine cavity rupture on right uterine wall was diagnosed. The patient was transferred to surgical theater afterwards and emergency laparotomy was performed. Due to surgical findings decision to perform subtotal hysterectomy with right side adnexectomy and left side salpingectomy was made. Total blood loss was 4 litres. Laboratory findings revealed decreased serum potassium and elevated serum creatinine up to 133 mmol/L, suggesting acute kidney injury. Further patient recovery was uneventful.

Case No. 7

38y/o patient, Gravida VI, Para IV, 38+2 weeks of gestation was admitted because elective CS was planned on the next day. Patient previously had three CS in

year 1997, 2004 and 2013. Last emergency CS was due to placental abruption at 34th week of gestation. Third trimester ultrasound suggested LUST of 2.6 to 2.9 millimeters. The night before surgery patient went into active labor and decision to perform 2nd category CS was made. During the placement of a catheter in the bladder hematuria was noted in urine drainage system and uterine rupture was then suspected. Neonate weighting 3700 grams was born with Apgar score 6/7/8. During laparotomy two centimeters long uterine rupture was noted in the site of uterine scar. Due to atonic uterine hemorrhage and patient's will not to preserve the reproductive function hysterectomy and salpingectomy was performed. Total blood loss was 1.1 liter.

Case No 8.

40 y/o patient, Gravida III, Para III (two CS in history due to bicornuate uterus), 34+3 weeks of gestation was admitted, complaining of severe pain in lower abdomen and bloody discharge from vagina, approximately 0.3 litres for 1 hour. Due to suspected uterine rupture 1st category CS was performed 11 minutes after admission. During CS 5 centimeters long uterine rupture in previous CS scar region and hemoperitoneum was noted. Estimated amount of blood in peritoneal cavity was 1.2 liters. Total hysterectomy without adnexectomy was performed. Total blood loss was 2.5 liters. During pregnancy, all ultrasound scans showed niche in LUS scar but there is little evidence for relationship between the presence or size of niche and uterine rupture (2). Third trimester ultrasound suggested LUST of 2.9 millimeters.

Major RF for uterine rupture, i.e., uterine scar, was documented in 6 cases (75%) and in two patients previous uterine curettage was detected as the main risk factor (25%). Oxytocin for labor augmentation was used in two (25%) cases (in patients with curettage in anamnesis). Other RFs like misoprostol for labor induction, uterine structural anomaly, extension of cervical tear, abnormal placentation and previous uterine rupture were noted in combination with uterine scar or curettage. All of the SUR patients had multiple RFs. Case No. 1 had four RFs: maternal age > 30 y/o; multiparity; uterine scar and prolonged pregnancy. Case No. 2 had four RFs: maternal age > 30 y/o; multiparity; uterine scar and abnormal placentation. Case No. 3 had two RFs: uterine scar; uterine overdistension due to multiple gestations and on second presentation in Case No. 4 the patient had high risk for uterine rupture - previous uterine rupture in combination with maternal age > 30 y/o; multiparity. Case No. 5 had six RFs: maternal age > 30 y/o; multiparity; short interpartal interval; repetitive uterine curettages; oxytocin use for labor augmentation. Case No. 6 had six RFs: maternal age > 30 y/o; multiparity; uterine curettage; uterine overdistension due to fetal macrosomia; misoprostol and oxytocin use. Case No. 7 had three RFs: maternal age > 30 y/o; multiparity; uterine scar; Case No. 8 had four RFs: maternal age > 30 y/o; multiparity; structural anomaly of the uterus and uterine scar.

DISCUSSION

Our study detected low prevalence of SUR. In our report incidence of SUR in Riga Maternity Hospital is 1.7 per 10000 deliveries (8 per 45875 deliveries) and the prevalence 0.0175%. According to WHO data in developed countries the incidence is < 1 per 10000 deliveries and the prevalence should not exceed 1%. Due to increasing rate of CS the rate of uterine rupture increases also (16). As it was demonstrated in the Nordic Obstetric Surveillance Study the incidence of uterine rupture is 7.8 per 10000 deliveries in Finland and 4.6 per 10000 deliveries in Denmark. However, the incidence is not associated with CS rate, but with TOLAC (3). National rates of uterine rupture increased with increasing rates of planned TOLAC. It lead to an increase in the national uterine rupture rate by 35% (relative risk 1.35, 95% confidence interval [CI] 1.04, 1.70) per 1% increase in the population rate of TOLAC. In the subpopulation of women with previous CS, uterine rupture rate increased by 4% per 1% increase in the rate of intended vaginal delivery. The national uterine rupture rate decreased by 15% (RR 0.85, 95% CI 0.75, 0.97) per 1% increase in elective repeat caesarean. All of our patients had multiple RFs - two and more. Patients with uterine scar had additional RFs, but patients with uterine curettage in past medical history had labor induction and oxytocin use for labor augmentation. Unfortunately, in some of the cases risk factors were underestimated - such as prolonged pregnancy and possible high hysterotomy due to previous *placenta previa* in preterm CS, so these cases were potentially preventable. Before the TOLAC it is necessary to know the type of previous hysterotomy to estimate the potential risk of uterine rupture. However, vaginal delivery can be safely performed after laparoscopic myomectomy and the incidence of uterine rupture was reported low, e.g., 0.6% (9). In some cases, patient consultation should be performed and informed consent should be received before planning the pregnancy in case of previous uterine rupture (5). It's the combination of RFs that can lead to adverse obstetrical outcomes.

Signs and symptoms of SUR are specific in patients with intact uterus: 58.7% of patients had abdominal pain and/ or tenderness, 61.2% had cessation of uterine contractions, in 73.1% fetal compromise occurred, 42.1% of patients had palpable fetal parts, 34.3% presented with hypovolemic shock, 15.3% demonstrated vaginal bleeding (1). Clinical signs of uterine rupture in patients with uterine scar could be unspecific and usual include pathological CTG with or without lower abdominal pain (21).

For the safety of patients, individual RF assessment before making a decision about the mode of delivery, as well as informed consent is necessary. Delivery in patients with RFs for uterine rupture is recommended in medical setting where facilities for critical CS are available, which means that CS can be performed in less than 10 minutes after the diagnosis has been made. Neonatal resuscitation and intensive care facilities should be available at that moment.

All attempts should be performed to avoid critical CS to decrease the risk of uterine rupture in subsequent pregnancy and deliveries to improve future obstetrical and perinatal outcome (19).

Further research on uterine rupture and its RF prevalence and incidence should be continued on national level.

CONCLUSIONS

1. Uterine rupture associates with multiple risk factors with most important being the uterine scar;
2. Antenatal lower uterine segment thickness measurements seem unreliable but further research should be carried out with statistical data analysis;
3. For the safety of patients trial of vaginal delivery in patient with uterine scar should be performed in appropriately equipped and staffed medical facilities.

Conflict of interest: None

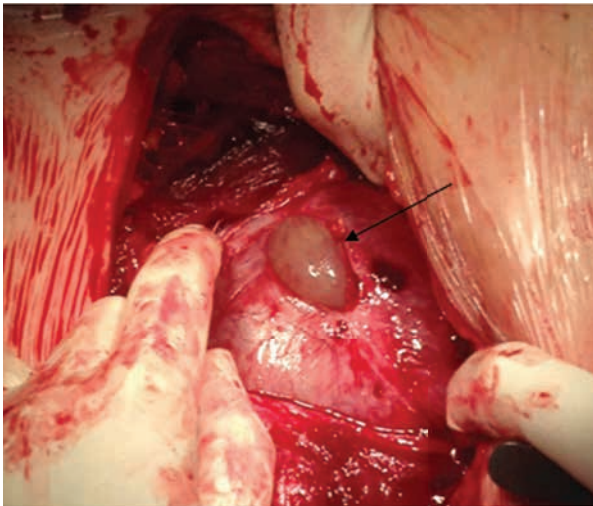


Fig. 1. Asymptomatic uterine rupture (uterine scar dehiscence). Patient with uterine scar after previous preterm CS was admitted for elective CS at term

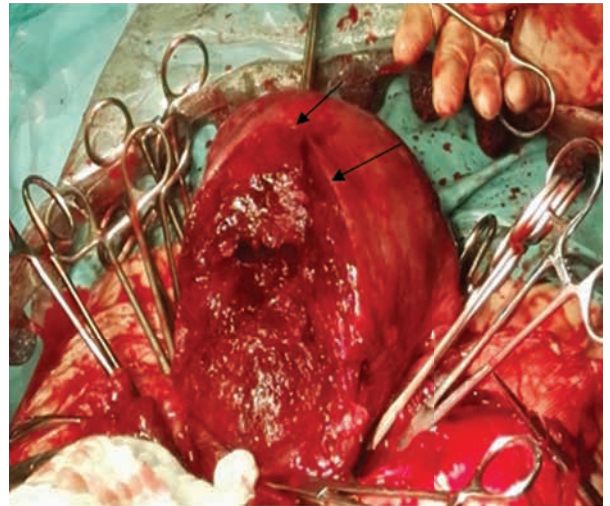


Fig. 2. Symptomatic uterine rupture in case No. 1. Extension of uterine rupture at post-term pregnancy

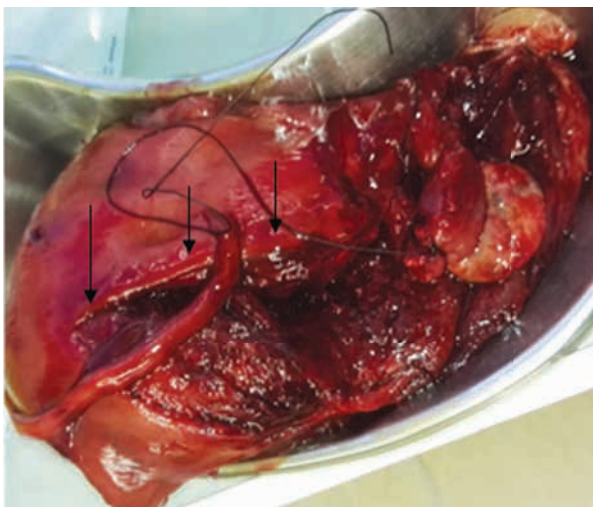


Fig.3. Uterus and right adnexa after hysterectomy in case No. 1

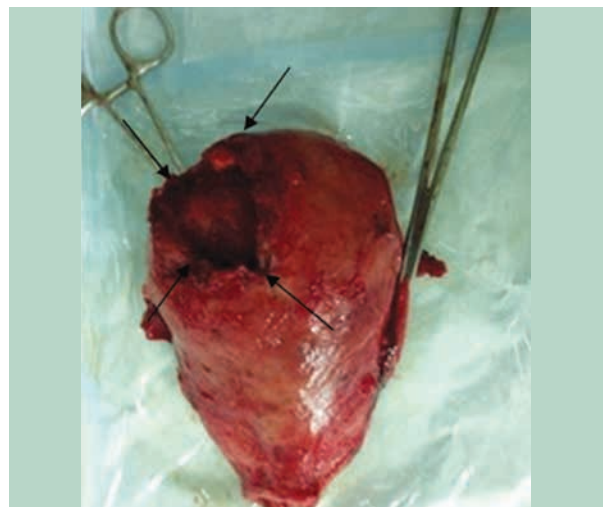


Fig. 4. Postoperative specimen of the uterus showing large defect in the left posterior fundus region

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