

Maintenance

- Warm IV and irrigation fluids; keep room and the pt warm.
- Monitor for signs of anaphylaxis: tachycardia, hypotension, and/or bronchospasm.

Extubation

- If concern for angioedema with airway involvement exists, evaluate the airway before extubation with a FOB or video laryngoscope; can perform cuff-leak test.

Postoperative Period

- Monitor for possible delayed urticarial reactions (atypical cold urticaria).

Anticipated Problems/Concerns

- Laryngeal/oropharyngeal angioedema may compromise the airway, which can make intubation and securing the airway challenging.

- Localized areas of urticaria and/or angioedema are usually benign, but serious widespread edema can compromise the airway or lead to systemic shock.
- Maintaining core body temperature can also be challenging due to redistribution while under general anesthesia and radiant heat loss to the environment.

Uterine Rupture

Benjamin T. Cobb | John Kissko III

Risk

- Incidence varies; 1:1500 women for all pregnancies; 1:8400 for unscarred uteri.
- Incidence of rupture with prior uterine scar (i.e., cesarean, myomectomy) ranges from 0.5–2% in developed countries.
- Maternal mortality is between 0.1–1% of cases.
- Risk factors: Uterine scar (e.g., prior classical cesarean, prior low transverse cesarean, previous uterine myomectomy), congenital uterine anomalies, multiparity (especially previous cesarean deliveries), fetal macrosomia, uterine instrumentation, uterine trauma, rapid progression of labor, polyhydramnios, abnormal placentation (e.g., accreta, percreta), placenta previa, pharmacologic induction, or augmentation of labor

Perioperative Risks

- Potentially catastrophic for pt and fetus. Maternal morbidity is ~0.1% and includes hemorrhage, shock, and hysterectomy. If the fetus is delivered within 10–37 min of diagnosis, fetal morbidity is improved but still includes hypoxemia and/or acidosis, depressed Apgar scores, and a neonatal ICU admission.
- Dx is difficult and usually delayed owing to nonspecific symptoms. Physicians should have a low threshold for diagnosing pts with risk factors given the increased maternal morbidity and mortality over time.
- Hemodynamically stable pts can become unstable quickly.

Worry About

- Massive hemorrhage in the pregnant pt

- Fetal morbidity due to hypoperfusion and hypoxemia or anoxia
- Amniotic fluid embolism and DIC

Overview

- Because of a breach in the myometrium, which is often secondary to separation of a previous cesarean scar, uterine rupture can occur antepartum, intrapartum, or postpartum. At term, the lower uterine segment contains mostly connective tissue and little placental tissue. Therefore ruptures of the lower uterine segment can be asymptomatic and not result in maternal and/or fetal compromise. However, ruptures of the upper uterine segment where placental tissue is involved can lead to massive bleeding, with resultant need for emergent cesarean delivery and/or laparotomy.
- Vaginal delivery is preferred over cesarean delivery as there is less maternal blood loss and maternal morbidity.
- The American Congress of Obstetricians and Gynecologists (ACOG) advocates for a trial of labor after cesarean (TOLAC) in pts with a previous low transverse uterine scar. TOLAC is discouraged by ACOG in pts being induced with prostaglandins or with a history of a classical cesarean because the risk of rupturing is greatly increased. Additionally, TOLAC is discouraged in hospitals where emergency cesarean delivery cannot be performed within 20–30 min.
- Uterine rupture is usually a clinical Dx since there is often not enough time for ultrasound, CT, or MRI.
- Diagnosis: Prolonged late decelerations, recurrent variable decelerations, and fetal bradycardia are the most common presenting symptoms (87%). Other

symptoms include diminished uterine contractility; reduced baseline uterine pressure; abdominal, lower back, or shoulder pain; halting or retracting of the presenting fetal part; vaginal hemorrhage; and hypotension or shock. Abdominal pain remains a reliable sign even in the presence of a labor epidural, as a low-dose local anesthetic is typically used.

Etiology

- Separation of the scar from a previous uterine surgery, often during TOLAC, is technically “uterine dehiscence,” but as they have similar presentations, they are considered together here.
- Rupture of myomectomy scar (highest incidence of rupture).
- Weak or stretched uterine muscles due to grand multiparity, polyhydramnios, multiple gestations, abnormal placentation, fibroids.
- Rapid labor or prolonged labor with pharmacologic augmentation.
- Traumatic rupture.

Usual Treatment

- When a uterine rupture occurs antepartum or during labor, urgent or emergent laparotomy with cesarean delivery and uterine repair (or possibly even hysterectomy) is the only treatment. Urgency is determined by the speed of diagnosis and maternal and fetal stability. Once rupture is diagnosed, the cesarean should begin within 20–30 min.
- If rupture is diagnosed incidentally postpartum, the pt may undergo close observation without surgery.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	Tachycardia, hypotension, shock		BP, HR, orthostasis	
RESP	Discomfort with breathing due to diaphragmatic irritation	Shortness of breath	Tachypnea, labored breathing	
GU	Vaginal bleeding	Abdominal pain, shoulder pain, absence of contractions	Abdominal tenderness, presenting fetal parts	Hgb/Hct
HEME	DIC		Widespread bleeding especially at the IV site	Platelets, TEG, coagulation factors
FETUS	Category 2 or 3 fetal distress			FHR monitor

Key References: Nahum GG: Uterine rupture in pregnancy, *Medscape* <<http://reference.medscape.com/article/275854-overview#showall>>, 2016 (Accessed 15.03.16); Rossi AC, Prefumo F: Pregnancy outcomes of induced labor in women with previous cesarean section: a systematic review and meta-analysis, *Arch Gynecol Obstet* 291(2):273–280, 2015.

Perioperative Implications

Preoperative Preparation

- In TOLAC, monitor fetal heart rate tracing continuously.
- Strongly consider placing at least two 18-gauge IV lines for high-risk pts in labor.
- Identify high-risk pts for early epidural placement to confirm adequate anesthesia.
- Continuous epidural during labor can be advantageous in that it can be dosed for surgical anesthesia

- if a repeat cesarean is indicated. Use a combination of low-dose local anesthetic and opioid to reduce the likelihood of an instrumented delivery or mask the pain symptoms of uterine rupture.
- If an epidural is not present when uterine rupture is diagnosed or time for dosing is inadequate, GA may be necessary for an emergent repeat cesarean.
- Consider the following for the anesthetic management of suspected or confirmed uterine rupture:
 - Two large-bore IV lines.

- Typed and cross-matched blood products.
- Arterial line.
- Large-bore central line if peripheral access is poor.
- Fluid warmer.
- Quick access to laboratory values (point-of-care blood gas analyzer).

Monitoring

- ASA monitors; consider invasive monitoring of BP and CVP.

Induction/Airway

- If pt is grossly unstable and does not have an epidural, GA will likely be needed.
- Reexamine the airway, as this can change through labor; consider video laryngoscopy.
- Rapid sequence induction.
- If pt is severely hypovolemic, consider blood transfusion with a hemodynamic-sparing induction technique.

Maintenance

- If pt is hemodynamically stable, may consider neuraxial anesthesia.
- For general anesthesia, 100% FIO₂ with volatile anesthetic at 0.5 MAC or less (to minimize uterine relaxation) plus nitrous oxide throughout the procedure as maternal BP tolerates. If an arterial line is present, can use PO₂ from ABG to measure oxygenation while using nitrous oxide to minimize the volatile agent.

- Restore blood volume to keep Hgb >7–8 g/dL and BP stable.
- If pt is stable after delivery, consider midazolam and titrating opioids.
- Fetus may require intensive resuscitation; have neonatologist present.

Extubation

- Standard extubation criteria: Pt awake, full return of neuromuscular function, hemodynamically stable, no continuous bleeding, baseline acid/base and electrolyte status

Postoperative Period

- Consider admission to ICU.
- EBL may be 3000–6000 mL, so follow the trend of CBC and coagulation factors q2h for at least 8 h.
- Consider IV PCA or postop epidural if coagulation status is normal.

Anticipated Problems/Concerns

- Consider other more common causes of antepartum hemorrhage (e.g., placenta previa, placental abruption).
- Pregnant pts who hemorrhage can develop DIC quickly. Monitor coagulation factors and platelets.
- Symptoms of uterine rupture may be vague or misleading. Obstetricians and anesthesiologists must possess a high index of suspicion to diagnose uterine rupture in a timely fashion.
- Rupture of classic cesarean scar or previous upper uterine surgery scar is much more likely to result in severe hemorrhage.

Varicella-Zoster Virus

Lee A. Fleisher

Risk

- Prevalence: <10% of adults seronegative
- Usually contracted during childhood.

Perioperative Risks

- Minimal additional risk to pts unless immunocompromised.
- Risk of infection for caregivers.

Worry About

- Encephalitis in immunocompromised pt
- Potential nosocomial transmission
- Acyclovir-induced nephrotoxicity
- Transmission to pregnant woman

Overview

- Viral cause of varicella (chickenpox) and herpes zoster (shingles).
- Caused by both nosocomial transmission and direct contact.
- Development of herpes zoster is common in immunocompromised pts and may be a forerunner of AIDS.
- Zoster is a reactivated form of varicella from neural ganglion cells and can be associated with severe pain.
- May lead to congenital abn if contracted during first trimester of pregnancy.

Etiology

- Herpes group of viruses

Usual Treatment

- Varicella immune globulin.
- Vaccine is available but controversial.
- Antiviral medications decrease the duration of symptoms and the likelihood of postherpetic neuralgia, especially when initiated within 2 d of the onset of rash.
- Most common treatment is acyclovir; valacyclovir, penciclovir, and famciclovir are also available.
- Corticosteroid use is controversial for postherpetic neuralgia in pts with herpes zoster; controlled-release oxycodone was superior to placebo in the early period of pain.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
RESP	Pneumonia	Dyspnea	Rhonchi	CXR
HEME	Thrombocytopenic purpura	Bleeding		Plts
DERM	Rash		Erythematous macules, papules, vesicles	
RENAL	Acyclovir nephrotoxicity			Cr
CNS	Encephalitis Optic neuritis; transverse myelitis	MS changes Vision changes		CT scan
PNS	Zoster shingles		Shingles in single dermatome Multiple dermatomes in immunocompromised	
IMMUNE	Associated with AIDS			HIV tests; CD4 titer

Key References: Christo PJ, Hobelmann G, Maine DN: Post-herpetic neuralgia in older adults: evidence-based approaches to clinical management, *Drugs Aging* 24(1):1–19, 2007; Philip A, Thakur R: Post herpetic neuralgia, *J Palliat Med* 14(6):765–773, 2011.

Perioperative Implications**Preoperative Preparation**

- Consider isolation precautions.

Monitoring

- Routine

Airway

- Routine

Induction/Maintenance

- Routine
- Pts may require modification of periop pain management regimen if treatment for postherpetic neuralgia.

Extubation

- Routine

Anticipated Problems/Concerns

- Multiple dermatomes may indicate immunocompromised individual.
- Avoid exposing pregnant individuals to virus.