Cesarean Section
Imaging of Acute and Chronic Complications

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Introduction

- Cesarean delivery accounts for approximately 1/3 of all US births
- Typical symptoms requiring acute post-operative imaging: fever with poor response to antibiotics over 2-3 days, dropping hemoglobin, unexpectedly heavy vaginal bleeding, pain
- Acute diagnoses: hematoma, abscess, wound infection and dehiscence, uterine rupture, pelvic thrombophlebitis
- Chronic findings: uterine adhesions, "niche", ectopic pregnancy, RPOC, endometriosis

Overview

- "Normal" acute post C-section appearance: US and CT
- Hematomas
  - Peritoneal: hemoperitoneum
  - Extraperitoneal: Bladder flap, subfascial, prevesical (space of Retzius)
  - Retroperitoneal
- Infections
  - Phlegmon and abscess
  - Uterine dehiscence
  - Superficial and deep incision infection and dehiscence
  - Sepsic pelvic thrombophlebitis
- Choice of imaging modality: Depends on clinical situation, cost, availability and contraindications for intravenous contrast

Normal CT Imaging post C-section

- Obvious uterine discontinuity common immediately postpartum
- Other common clinically un-important findings: small foci endometrial air and blood, small parametrial collections, small bladder flap hematomas (<2cm in thickness)
- Our recommendations:
  - If using CT for evaluation, IV contrast should be used if possible
  - Best to image perpendicular to plane of incision, using sagittal and coronal reconstructions

Normal US Imaging post C-section

- Small, often linear, echogenic foci within uterine incision represent continuous sutures in myometrium.
- Small indistinct mass-like region in incision represents small hematoma (a common "normal" finding)
- Small bladder flap hematomas not uncommon
- Endometrial clot, debris, occasional foci of air are common findings with endometritis; may be seen in normal healthy patients
- Our recommendation: Use a variety of frequencies and approaches to obtain optimal images: transabdominal (when uterus is still large) and transvaginal or transperineal for lower uterus and scar
Four different “normal” studies

CT and US in same patient with normal findings of small hematoma in myometrial incision

Small incisional hematoma 4 weeks post partum

“Normal” findings 4 days post C-section

Bladder Flap Hematoma

• A complication of a low uterine transverse incision.
• The uterine incision is covered by a fold of peritoneum that is incised from myometrium and bladder.
• Bleeding from uterine incision is usually confined by overlying peritoneum, but can spread to broad ligaments, retroperitoneum and peritoneum.
• Can be considered “normal” if less than 2-5 cm, and may occur in up to 50%.
• Surgical evacuation requires incision of peritoneum.
### Corresponding CT

#### Small bladder flap hematoma, hemoperitoneum

![CT images of a small bladder flap hematoma and hemoperitoneum](image)

* Classical transverse incision best visualized in sagittal plane

### Infected bladder flap hematoma

**Infected bladder flap hematoma**
gas containing (echogenic foci) 5 x 6 x 7 cm collection

**History:** Persistent pain and fever 9 days after C-section

![CT images of an infected bladder flap hematoma](image)

### Ruptured bladder flap abscess

**Ruptured bladder flap abscess**

**History:** Fever, abdominal pain and free air on CXR, 2 weeks after routine C-section

![CT images of a ruptured bladder flap abscess](image)

Bladder flap abscess contains gas (dotted arrow), associated with pneumoperitoneum (solid arrows), free fluid and infiltration of the omentum (dashed arrow).

### Subfascial Hematoma

- Extraperitoneal hemorrhage from inferior epigastric vessels
- Blood accumulates in prevesical space, posterior to rectus and transversalis muscles and anterior to peritoneum continuous with space of Retzius, potentially accommodating as much as 2.5 liters without a palpable mass
- May be evacuated without entering the peritoneum

#### Subfascial and abdominal wall hematomas

![CT images of subfascial hematomas](image)
Infected rectus/subfascial hematoma
Required surgical debridement

Uterine Dehiscence/Rupture

- Dehiscence: rupture through endometrium, myometrium, intact serosa
  - Large (> 5cm) bladder flap hematoma suspicious for uterine dehiscence
- Rupture: separation all layers uterine wall with uterine cavity communicating with peritoneum
  - Gas in uterine defect extending beyond uterus with hemoperitoneum increases likelihood
  - Difficult to differentiate partial from complete dehiscence
- Paucity of literature, MR may be preferred over CT
- Our recommendation is to look for gas in the uterine incision with possible extrauterine extension. Use sagittal and coronal reformatted images from multidetector CT.

Uterine Dehiscence
3 weeks post partum, DKA

Follow-up: Resolution of hematomas; tethered uterus

Endometritis → Uterine rupture
Hx: PROM, chorioamnionitis

Infected uterine defect
Infected bladder flap hematoma ileus
Infection resolved with conservative management including antibiotics and catheter drainage

Follow up CT several days later

Re-admitted 12 days later for purulent drainage, progression to large abscess, requiring hysterectomy

Other Complications

• Superficial hematomas
• Superficial abscess/ wound dehiscence
  – Frequency and severity of post partum infections significantly greater after Cesarean section compared to vaginal delivery
• Retained products of conception
• Septic thrombophlebitis

Superficial hematomas

Subcutaneous Wound Infection

* Sub-acute blood in endometrium

Subcutaneous wound infection with dehiscence, small left rectus hematoma required drainage

Stat C-section for fetal distress with left extension, post-op fever unresponsive to antibiotics
Increased bleeding and persistent fever one week post C-section

Retained products of conception = focal enhancing endometrial “mass” Abscess

Chorioamnionitis and failure to progress at 41 weeks gestation

Right ovarian vein septic thrombophlebitis Small focus retained products of conception

Ovarian and Pelvic Septic Thrombophlebitis

- 1/600 deliveries, though likely underestimated.
- Usually unilateral, right more frequent than left. Right ovarian vein thrombus may extend to IVC.
- CT and MR are techniques of choice. Sonography may be difficult due to bowel gas.
- Findings include enlarged ovarian and other pelvic veins with low-density thrombus within the lumen surrounded by an enhancing vessel wall. Inflammation may be present in surrounding fat.

Chronic Complications following Cesarean Section

Right ovarian vein thrombosis

Two different patients with diffuse septic pelvic vein thrombophlebitis

Thrombophlebitis - numerous veins with enhancing walls containing hypodense thrombus.
Overview

- Normal scar: ultrasound and CT examples
- Complications of Cesarean scar:
  - “Niche”
  - Malpositioned IUD
  - Ectopic pregnancy
  - Endometrial implant

Sonography and the Cesarean scar

- In some patients, the scar causes significant distortion of the normal uterine position
- When the cervix is elongated and the lower uterus is tethered to the anterior abdominal wall, transvaginal imaging allows excellent visualization of the cervix, but the corpus of the uterus is poorly demonstrated.
- In this situation, transabdominal imaging is also limited, because the distended bladder will not serve as a "sonographic window" to the body of the uterus.
- Our recommendation is to try a higher frequency curved transducer directly over the uterus, when the body habitus permits.

US and CT views of tethered uterus:
ovaries may also be pulled ventrally

Prominent scars may elongate cervix and lower uterus and tether uterus anteriorly, often with tenting of myometrium

Scar simulating a myoma

Endometrium may be pulled into the scar with thinning and irregularity of the overlying myometrium
Blood can accumulate in the scar, causing inter-menstrual bleeding.

Retroflexed uterus with fluid in scar – CT, MR, US

Blood in endometrial canal and scar

Fluid in scar after miscarriage

The Cesarean Scar “pouch” or “niche”

- Fluid may occasionally be present in scar during routine transvaginal scanning.
- By filling the scar with fluid, sonohysterography can better delineate the defect and measure the depth.
- Hysteroscopy correlates well with the findings on sonohysterography.
- Routine hysterosalpingography can also demonstrate the scar.
- The scar can act as a reservoir for blood and thus be a cause of abnormal bleeding.
- What percentage of women with prior C-section will have a demonstrable “niche” is unknown.

Endometrial polyp prolapses into C-section niche

IUD Malpositioned in Scar

Ultrasound requested to check for IUD

IUD mal-positioned in C-section scar
CT several days after C-section

Several months later patient is pregnant with bleeding

Cesarean Scar Ectopic Pregnancy

Ectopic Pregnancy in Cesarean Scar

- Gestation completely surrounded by myometrium and fibrous scar, but separate from endometrium and fallopian tube
- Incomplete healing of scar may contribute to this ectopic implantation
- Differential diagnosis: spontaneous abortion in progress and cervical ectopic
- Rupture can occur early and delayed diagnosis limits treatment options
- Because this type of ectopic pregnancy is so rare, no specific guidelines for treatment
- Distinctly different from placental implantation over the scar resulting in placenta accreta.

Live Cesarean scar ectopic @ 8w2d

Caesarean Scar Implantation

- Placenta/trophoblast implants at Cesarean scar
- Likely part of spectrum of myometrial invasion by trophoblast and placenta also resulting in placenta accreta,
  - Distance "A" < 5mm: 100% sensitivity for abnormal implantation
  - Distance "A" < 3mm: 100% specificity for abnormal implantation

From Moschos etal. JUM 2014;33:475-481
Study interpreted as spontaneous abortion in progress

9 days later, patient presents with bleeding and rising HCG levels
C-scar implantation with spontaneous abortion and retained products of conception

Use Doppler to evaluate implantation site

Placenta Accreta
(abnormally adherent placenta)

- Increased incidence after Cesarean delivery
- If placenta implants over scar, 29 – 40% incidence adherent placenta
- Complications include uncontrollable post partum hemorrhage
- US Findings: loss of normal hypoechoic sub-placental clear space, bulging and/or interruptions of uterine bladder interface, color Doppler may be helpful

Endometriosis in Scar - US

History of increasingly painful C-section scar with mass

Endometriosis in Scar - CT

Endometrial implant
Adhesions

Endometrial implant is a nodular subcutaneous lesion in the Cesarean section scar with enhancement greater than adjacent muscles.

Endometrial Implant in Scar

- Due to endometrial tissue spread outside of uterus during surgical procedure.
- Symptoms include: pain and tenderness, worsening symptoms with menses, cyclic bleeding.
- Variable appearance: cystic, mixed, solid; related to distribution of hemorrhagic and fibrotic material; often spiculated secondary to fibrosis.
- Color Doppler frequently demonstrates dilated vessels.
- Differential diagnosis: desmoid, mesenchymal tumors, hematoma.
- Typically enhance dramatically with contrast.
Uterus herniates at C-Scar

References


References (cont.)


• Roberts JS, Machtz RL. Ultrasound case of the day. Radiographics 1992;12:539-42.


References (cont.)

