The Post-Cesarean Uterus

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Our patient…

• LD is a 33 yo woman, G4P2, with a prior history of two Cesarean deliveries (C/S).

• She asks, “What effect could my C/S have on any future pregnancies?”

• Let’s review Cesarean deliveries and explore the imaging of their more dangerous sequelae.

• And hope for a good outcome for LD.
Normal pregnancy and the risks of C/S

Normal

- Implantation
- Placentation
- Uterine integrity

Sequelae of C/S

- Ectopic implantation
- Placenta previa and accreta
- Dehiscence and rupture
Cesarean deliveries: increasingly common

• The 1990s: efforts to curb increasing rates of cesarean deliveries.

• But since 1996: 40% increase in C/S rates
  – Now 30% nationwide
  – Approaching 40% at the BIDMC

• Britney Spears and her 21st Century poster child
Overview of cesarian incisions

Most risky as LUS expands in late pregnancy

www.emedicinehealth.com/articles/12168-8.asp
Sonographic assessment of LD’s uterus post C/S
LD: C/S scar on sonohysterogram

TV view

Cervix

Scar defect

Thinned anterior myometrium

Intact Posterior myometrium

TV SCSH SAG PACS - BIDMC

Pre

T1

T2

T3

Del
C/S scar defect

Anechoic filling defect w/ enhanced through transmission
C/S scar defects are common

- Fluid collections in cesarean scars
- Present in 42-58% of women with prior C/S\(^1,2\)
- Ultrasound is an accurate diagnostic tool\(^1\)
  - Real time TV US: 100% se 100% sp
  - Stored image review of TV US: 87% se 100% sp
- Clinical significance: reservoirs of menstrual blood
  - Associated with spotting and bleeding

LD is pregnant

- Six months later, a urine hCG level confirms that LD is pregnant.
- Let’s verify proper implantation with an Early Obstetric US ...
LD: Normal implantation near uterine fundus

Confirmation: Size = Dates
CL: A pregnant patient with C/S scar

- CL is a 34 year old woman
- prior history of C/S
- +ve hCG
CL: Ectopic pregnancy in C/S scar

SONOGRAPHIC CRITERIA:
1. Trophoblast between bladder & ant uterine wall
2. No fetal parts within uterine cavity
3. Discontinuity in uterine ant wall on SAG view running through the amniotic sac

Thinned 0.3 mm anterior myometrium in lower uterine segment
Fetal pole
Decidual reaction
M-Mode confirms fetal HR
Ectopic pregnancy in C/S scar

• Rare

• **Diagnosis:** TV Ultrasound +/- MRI

• **Life threatening**
  – Risk of rupture
  – Risk of excessive hemorrhage

• **Differential Diagnosis:**
  – Cervical pregnancy,
  – Cervico-isthmic pregnancy
  – Spontaneous abortion in progress

Management of C/S scar pregnancy

• **Surgical:**
  – Excise sac and repair scar
    • Laparoscopic \(^1\)
      – allows simultaneous repair of uterine defect by suturing.
    • Mini-laparotomy

• **Medical:**
  – KCl + MTX +/- curettage \(^2\)
    • Systemic MTX preferred over local since less risk rupture and hemorrhage

US-guided reduction of ectopic pregnancy

1. Hyperechoic needle
   - Injection of KCl
   - Aspiration of fluid
   - Injection of MTX

Confirmation of Reduction 4 d later
LD in second trimester

- LD returns for a Full Fetal Survey early in the second trimester.

- Let’s evaluate her placenta.
  - Imaging ideal in 2nd Trimester since placenta formed but fetus remains small
Normal placenta at 18 wk US

No hyperechoic placenta discernible overlying internal cervical os -

Hyperechoic placenta in uterine fundus

Cervical length

3.39cm
MK : Vaginal spotting at 18 wks

• MK, a 28 year old G5P2123

• Prior history
  • C/S x2, w/ complete previa x 2
  • Ectopic pregnancy x1, s/p D&C

• MK presents at 18 wks gestation complaining of vaginal spotting
MK: Complete placenta previa

- Abnl placenta? (More to follow)
- Cervix closed
- Fluid in cervix
- Placental tip covers internal cervical os

TV US SAG
PACS - BIDMC

2.86cm

BIDMC
Placenta previa

- **Incidence:** Complicates 4/1,000 pregnancies after T2

- **Risk Factors:**
  - Age & parity, C/S, Abortions

- **Complications:**
  - Bleeding in T3
  - dDx T3 bleeding:
    - Abruptio (31%)
    - Previa (22%)
    - Other (47%)

Types of Previa:

- Marginal
- Complete
- Low-lying

www.obfocus.com/images/previa.gif
Companion image: placenta previa with Doppler

Placental blood flow adjacent to internal os
Companion image: Placenta previa on MRI

- Complete placenta previa
- Placental blood clot
- Cervix

T1-weighted MRI SAG
BIDMC - Atlas of Fetal MRI
www.bidmc.harvard.edu
MK cont’d: Vaginal bleeding at 28 wks

- Presents to Ob Triage c/o vaginal bleeding
- Clot expressed by obstetrician on call
- MK maintained on bed rest
- At 30 wks: sudden gush of vaginal bleeding
MK: Placenta accreta

Placental flow abutting bladder
No discernible hypoechoic myometrium
Placenta accreta

- **Abnormal attachment of placenta to uterine wall**
- **Incidence**: formerly 1/3000 deliveries, now 1/500 deliveries
- **Risk factors**: prior C/S, placenta previa, AMA
- **Complications**:
  - Hemorrhage at time of attempted placental separation
  - With bladder invasion: hematuria and uterine rupture

Grades of placenta accreta

Chorionic Villus invasion ...

Into serosa: Placenta percreta (5%)

Into myometrium: Placenta increta (15%)

In contact w/ myometrium:
  Placenta accreta (80%)

Placenta:
  Abnormal outer contour
  ? lacunae

Fetal skull with distal shadowing
Companion image: Placenta accreta on MRI

- MRI: soft tissue detail to enhance US findings
- US: 63% se 43% sp 76% PPV

Ill-defined placental-myometrial junction

MK: Complications of placenta accreta

- Emergency C/S at 30 wks
  - Supracervical hysterectomy
  - Blood loss anemia
  - Hypovolemic shock
  - Dilutional coagulopathy

- Hospital-associated complications
  - Ventilator-associated pneumonia
  - Clostridium difficile colitis

- But... a healthy baby was born.
LD is now 32 wks pregnant

- Imaging reveals normal placentation
- However...
LD: Uterine thinning at 32 wks

Myometrial wall thinning
Thickness: 2.6 mm

Full bladder
Fetal skull

TV US TRV

0.26 cm
LD: MRI confirms uterine thinning

Marked myometrial wall thinning in LUS
Thin black line = myometrium
A thinned LUS risks rupture

- **Prior C/S** primary risk factor for thinned LUS\(^1\)

- **Adverse outcomes in 4% C/S scars** \(^2\)
  - 10 dehiscences (loss of 80% myometrial depth)
  - 15 ruptures (risk incr from 0.4% to 3% w/ C/S)

- **Threshold myometrial thickness of LUS @ 36-38 wks**
  - **4 mm** threshold at BIDMC
  - < 3.5 mm - risk of rupture or dehiscence
    - Sens 88%, specificity 73.2%, PPV 11.8*, NPV 99.3%\(^2\)
  - < 2 mm:
    - 74% women had uterine dehiscence\(^3\)
  - < 1.5 mm - risk of paper thin or dehisced LUS
    - Se 88.9%, sp 59.5%, PPV 32% and NPV 96.2%\(^4\)

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Companion image: Uterine rupture on CT

Extrusion of contents w/ fluid throughout abdominal cavity

Myometrium interrupted
Companion US: Uterine scar s/p rupture

Hyperechoic line from endometrium to serosa
How should LD be managed?

• **Repair:**
  - Combined laparoscopic and vaginal repair of uterine scar dehiscence s/p C/S in 5 patients\(^1\)
  - Abdominal repair of uterine dehiscence at 28 wks and delivery at 34 wks after FLM\(^2\)

• **Imaging in expectant management:**
  - At the BIDMC: Uterine dehiscence documented on US and MRI in a patient at 20 wks. Managed on modified bed rest. At 31 wks C/S performed due to fetal HR decels. \(^3\)

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LD delivers

• At 32 weeks, LD is placed on bed rest
• At 36 wks, she c/o pain over LUS
• Cesarean delivery, without trial of labor
• A healthy girl is born
• Uncomplicated post-op
Summary: The risks of C/S

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- Implantation
- Placentation
- Uterine integrity

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Not covered:
Abscess, infectious necrosis
References

- Gotoh H, Masuzaki H, Yoshida A, Yoshimura s, Miyamura T and Ishimaru T. Predicting incomplete uterine rupture with vaginal sonography during the late second trimester in women with prior cesarean. *Obstet Gynecol* 2000 95:596-600
References (Cont’d)

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