The diagnosis and management of Caesarean scar pregnancies

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Declaration of Interest

- Conflict of interest – None
Topics to cover

- Diagnosis
- Natural history
- Review of treatments reported in the literature
- Body of evidence from King’s & UCH cohort of scar pregnancies

Diagnosis: AEPU 2013 case

- 32 year old
- 2 x previous LSCS
- PV bleeding in early pregnancy
- 6/60 TVS – ‘sac at level of CS scar’
- No mention of placenta at 12/40 scan
- Anomaly scan 20/40 low lying placenta
- 22/40 collapsed at home
Diagnosis: cautionary tale

- Blue light to A&E – c/o severe backache & diarrhoea
- Shocked on arrival & PEA arrest 10 minutes later
- 18 mins CPR until output obtained
- Emergency laparotomy – ruptured uterus due to placenta percreta, hysterectomy & 8l blood loss
- Acute renal & hepatic failure, necrotising pancreatitis, ischaemic colitis, second laparotomy D2
- 15 days on ITU
- Intra-abdominal collections & pneumonia
- Inpatient for two months
English Literature

Diagnosis: scar implantation
Diagnosis: scar implantation
Diagnosis: scar implantation

Diagnosis: scar implantation
No absolute consensus on diagnostic criteria
- Empty uterine cavity
- Discontinuity of the anterior uterine wall on longitudinal section of the uterus
- Gestational sac located anteriorly at the level of the internal os covering the visible or presumed site of the previous lower uterine segment Caesarean section scar
- Demonstrable peritrophoblastic blood flow & degenerating trophoblast
- Disruption of endometrial / myometrial interface by trophoblast

Additional features:
- Placental lacunae
- Wedge shaped gestational sac
Diagnosis: scar implantation
Diagnosis: scar implantation

Diagnosis: scar implantation
First trimester caesarean scar ectopic pregnancy evaluation using MRI

Categories of caesarean scar ectopic pregnancy based on magnetic resonance imaging (MRI).

<table>
<thead>
<tr>
<th>Type</th>
<th>MRI findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>A thin-walled diverticulum is visible at the CSS defect. The GS is fully or mostly embedded in the diverticulum.</td>
</tr>
<tr>
<td>II</td>
<td>A thin-walled diverticulum is visible at the CSS defect. The GS is partially embedded in the diverticulum and partially growing into the uterine cavity.</td>
</tr>
<tr>
<td>III</td>
<td>A niche is visible in the CSS defect. The GS is mainly embedded in the isthmus.</td>
</tr>
</tbody>
</table>

CSS, caesarean section scar; GS, gestational sac.

Natural History?

- Some will be non viable pregnancies
  - Spontaneous miscarriage
  - Surgical intervention – with or without haemorrhage / perforation
  - Gradual resolution of a highly vascular mass of trophoblast (‘AVM’) over months +/- PV bleeding
- Viable pregnancies
  - Uterine rupture
  - Miscarriage & haemorrhage
  - Placenta praevia +/- accreta / percreta

Natural History?

Case reports of the natural history of ongoing CSP prospectively diagnosed in the first trimester.

<table>
<thead>
<tr>
<th>Study</th>
<th>GA</th>
<th>N</th>
<th>outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abraham 2012</td>
<td>7</td>
<td>1</td>
<td>SROM 24/40, APH 28/40, Emergency CS, haemorrhage, Emergency hysterectomy</td>
</tr>
<tr>
<td>Ben Nagi 2005</td>
<td>5</td>
<td>1</td>
<td>El CS at 37/40, haemorrhage, Emergency hysterectomy</td>
</tr>
<tr>
<td>El Matary 2007</td>
<td>6</td>
<td>1</td>
<td>SROM 31/40, APH 36/40, Emergency CS, haemorrhage, Emergency hysterectomy</td>
</tr>
<tr>
<td>Herman 1995</td>
<td>7</td>
<td>1</td>
<td>Acute abdominal pain 35/40, laparotomy, haemorrhage, hysterectomy, internal iliac ligation</td>
</tr>
<tr>
<td>Jurkovic 2003</td>
<td>6</td>
<td>1</td>
<td>haemorrhage 16/40, hysterectomy</td>
</tr>
<tr>
<td>Sinha 2012</td>
<td>9</td>
<td>1</td>
<td>Elective LSCS 37/40 haemorrhage, emergency hysterectomy, abdominal packing ITU</td>
</tr>
<tr>
<td>Timor-Tritsch 2012</td>
<td>3</td>
<td>1</td>
<td>haemorrhage 25/40, Emergency hysterectomy</td>
</tr>
<tr>
<td>Timor-Tritsch 2014</td>
<td>5</td>
<td>12</td>
<td>3 second trimester ruptures, 1 second trimester haemorrhage and hysterectomy, 8 third trimester hysterectomies</td>
</tr>
<tr>
<td>Wong 2005</td>
<td>6</td>
<td>1</td>
<td>37 weeks CS and hysterectomy</td>
</tr>
</tbody>
</table>

n = 20
Natural History?

Case reports of the natural history of ongoing scar implantation prospectively diagnosed in the first trimester.

<table>
<thead>
<tr>
<th>Case</th>
<th>GA presentation</th>
<th>GA delivery</th>
<th>Hysterectomy?</th>
<th>EBL (ml)</th>
<th>Urinary tract injury?</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4+4</td>
<td>32</td>
<td>yes</td>
<td>3500</td>
<td>no</td>
<td>accreta</td>
</tr>
<tr>
<td>2</td>
<td>5+0</td>
<td>26</td>
<td>no</td>
<td>1400</td>
<td>no</td>
<td>none</td>
</tr>
<tr>
<td>3</td>
<td>8+0</td>
<td>37</td>
<td>yes</td>
<td>2500</td>
<td>bladder</td>
<td>accreta</td>
</tr>
<tr>
<td>4</td>
<td>9+1</td>
<td>37</td>
<td>no</td>
<td>3500</td>
<td>bladder</td>
<td>none</td>
</tr>
<tr>
<td>5</td>
<td>5+4</td>
<td>29</td>
<td>yes</td>
<td>13000</td>
<td>bladder &amp; ureter</td>
<td>percreta</td>
</tr>
<tr>
<td>6</td>
<td>6+1</td>
<td>35</td>
<td>no</td>
<td>1000</td>
<td>no</td>
<td>none</td>
</tr>
<tr>
<td>7</td>
<td>7+5</td>
<td>35</td>
<td>yes</td>
<td>1500</td>
<td>bladder</td>
<td>increta</td>
</tr>
<tr>
<td>8</td>
<td>8+6</td>
<td>38</td>
<td>no</td>
<td>3000</td>
<td>no</td>
<td>none</td>
</tr>
<tr>
<td>9</td>
<td>8+4</td>
<td>29</td>
<td>yes</td>
<td>2500</td>
<td>bladder</td>
<td>percreta</td>
</tr>
<tr>
<td>10</td>
<td>8+5</td>
<td>37</td>
<td>no</td>
<td>1500</td>
<td>no</td>
<td>none</td>
</tr>
</tbody>
</table>

*Ultrasound Obstet Gynecol* 2015; 46: 367–375

Natural history of early first-trimester pregnancies implanted in Cesarean scars

Case 2: ultrasound images obtained at 5 (a), 6 (b), 8 (c,d) and 18 (e) weeks' gestation, showing gestational sac within gap of scar defect (a), growth of gestational sac into endometrial cavity (b), empty upper endometrial cavity and thin myometrium between gestational sac and bladder (c), high cord insertion (d), and loss of interface between myometrium and placenta with increased blood flow behind the placenta and placental lakes (e).
Natural history of early first-trimester pregnancies implanted in Cesarean scars

Case 5: ultrasound images obtained at 5 (a), 8 (b) and 9 (c) weeks' gestation, showing placental lakes and bulging of gestational sac outside uterine contour (b,c), and at 26 weeks (d,e), showing large placental lacunae and velamentous cord insertion (arrow). Hysterectomy revealed area of placenta percreta and velamentous cord insertion (arrows) (f,g).

Ultrasound in Obstetrics & Gynecology
Volume 46, Issue 3, pages 367-375, 6 AUG 2015 DOI: 10.1002/uog.14775

Natural History?

Case reports of the natural history of ongoing scar implantation prospectively diagnosed in the first trimester.

- Implantation of a pregnancy over or into a Caesarean section scar is a precursor of MAP
- The degree of morbidity is variable and difficult to predict based on first trimester ultrasound findings.
- Assessment of ongoing pregnancies probably best performed between 7-9 weeks gestation
- Findings that may predict a severe placenta accreta or percreta:
  - complete implantation within the myometrial defect
  - bulging of the trophoblast out of the uterine contour
  - large placental lakes
Management of CS pregnancies

- Expectant:
  - suitable for small, failed pregnancies
  - inaccessible failed pregnancies
  - women who decline intervention

Medical treatment

- Case series - over 150 cases reported in the literature
- Non surgical Rx:
  - methotrexate local / systemic
  - + / - uterine artery embolisation
- Complication rates vary (18-60%)
- Success rates 85-100%

*Timor Tritsch 2012*
Medical treatment

The efficacy of the systemic methotrexate treatment in caesarean scar ectopic pregnancy: A quantitative review of English literature
S. Bodur¹, Ö. Özdamar², S. Kılıç³ & İ. Gün⁴

- Advantages
  - Preservation of fertility
  - Reduce risk of intraoperative haemorrhage
- Disadvantages
  - Up to 12 months to resolve
  - Prolonged bleeding
  - Risk of sudden haemorrhage during follow up
  - Success rates somewhere between 50-100%

Litwicka 2011
Surgical treatment: techniques

- Abdominal approach
  - excision, laparoscopic or open
  - hysterectomy

- Transcervical approach
  - Hysteroscopic resection
  - USS guided evacuation + tamponade

- Transvaginal approach

- Adjuvant treatments
  - methotrexate
  - uterine artery embolisation

Ideal surgical treatment

- Fertility sparing
- Minimal complications
- Technically simple
- Reduce risk of recurrence
- Reduce morbidity in future pregnancies
### Open resection

<table>
<thead>
<tr>
<th>Reference</th>
<th>Time period</th>
<th>No cases</th>
<th>Primary treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larsen 1978</td>
<td>1978</td>
<td>1</td>
<td>resection</td>
</tr>
<tr>
<td>Rempen 1990</td>
<td>1990</td>
<td>1</td>
<td>resection</td>
</tr>
<tr>
<td>Valley et al 1998</td>
<td>1998</td>
<td>1</td>
<td>resection</td>
</tr>
<tr>
<td>Vial et al 2000</td>
<td>2000</td>
<td>1</td>
<td>resection</td>
</tr>
<tr>
<td>Fylstra 2002</td>
<td>2001</td>
<td>1</td>
<td>resection</td>
</tr>
<tr>
<td>Yang et al 2003</td>
<td>Not spec</td>
<td>3</td>
<td>resection (+UAE)</td>
</tr>
<tr>
<td>Shih 2004</td>
<td>2004</td>
<td>1</td>
<td>resection</td>
</tr>
<tr>
<td>Seow et al 2004</td>
<td>1995-2000</td>
<td>1</td>
<td>resection</td>
</tr>
<tr>
<td>Maymon et al 2004</td>
<td>1995-2002</td>
<td>1</td>
<td>resection</td>
</tr>
<tr>
<td>Coniglio 2004</td>
<td>2002</td>
<td>1</td>
<td>resection (ruptured)</td>
</tr>
<tr>
<td>Holland et al 2008</td>
<td>2005</td>
<td>1</td>
<td>resection</td>
</tr>
<tr>
<td>Halperin 2009</td>
<td>2002-2007</td>
<td>6</td>
<td>resection +/- IAL</td>
</tr>
<tr>
<td>Al-Nazer et al 2009</td>
<td>2009</td>
<td>1</td>
<td>resection</td>
</tr>
<tr>
<td>Ficioglu et al 2010</td>
<td>2008</td>
<td>1</td>
<td>resection</td>
</tr>
</tbody>
</table>

n = 24

### Laparoscopic surgical excision

<table>
<thead>
<tr>
<th>Reference</th>
<th>Time period</th>
<th>No cases</th>
<th>Primary treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee CL 1999</td>
<td>1999</td>
<td>1</td>
<td>resection</td>
</tr>
<tr>
<td>Wang YL et al 2006</td>
<td>2003-2005</td>
<td>8</td>
<td>resection</td>
</tr>
<tr>
<td>Lee JH et al 2008</td>
<td>2003-2007</td>
<td>7</td>
<td>resection</td>
</tr>
<tr>
<td>Demirel LC et al 2009</td>
<td>200x</td>
<td>1</td>
<td>resection (heterotopic)</td>
</tr>
<tr>
<td>Fuchs N et al 2015</td>
<td>2009-2014</td>
<td>4</td>
<td>resection</td>
</tr>
</tbody>
</table>

n = 25 + 32 combined
Laparoscopic excision: technique

- Incise serosa & reflect bladder down
- Inject vasopressin (1 unit/ml)
- Transverse incision using monopolar over bulge of sac
- Remove trophoblast with suction irrigation and grasper
- Trim myometrial edges
- Repair defect with continuous suture

Laparoscopic excision

- Operating time 45-210 minutes
- EBL minimal – 300ml with vasopressin
Laparoscopic excision

- Four pregnancies reported post excision as primary Rx
- 3 implanted normally and reached term.
- 1 recurrent scar pregnancy: delivery at 30 weeks, hysterectomy extensive placenta accreta (initial LSCS for term IUD and breech, second elective)

Hysteroscopic resection

<table>
<thead>
<tr>
<th>Reference</th>
<th>Time period</th>
<th>Success rate</th>
<th>Primary treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wang CJ 2006</td>
<td>1999-2004</td>
<td>6/6</td>
<td>Coag,ercp,coag</td>
</tr>
<tr>
<td>Yang Q 2009</td>
<td>2006-2008</td>
<td>37/39</td>
<td>Pretreat with mife 36 pts/UAE 3</td>
</tr>
<tr>
<td>Deans 2009</td>
<td>2004-2007</td>
<td>6/6</td>
<td>Cold loop</td>
</tr>
<tr>
<td>Li et al 2011</td>
<td>2004-2010</td>
<td>18/20</td>
<td>MTX / UAE / nil, then Bipolar resection under USS guidance +/- Foley</td>
</tr>
<tr>
<td>Wang G 2014</td>
<td>2009-2011</td>
<td>29/39</td>
<td>2 converted to open resection, 8 additional procedures (MTX/UAE/lap excision)</td>
</tr>
</tbody>
</table>

Success = 96/110 (87%)
Hysteroscopic resection

- Max blood loss reported as 140 ml mean (max 300ml)
- Operative time 45 mins mean (max 85 mins)

Transvaginal resection

Wang et al
http://dx.doi.org/10.1016/j.fertnstert.2013.10.024
## Transvaginal resection

<table>
<thead>
<tr>
<th>Reference</th>
<th>Time period</th>
<th>Success rate</th>
<th>Additional treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>He 2011</td>
<td>2009-2010</td>
<td>6/6</td>
<td></td>
</tr>
<tr>
<td>Wang 2012</td>
<td>2011-2012</td>
<td>12/12</td>
<td>local MTX</td>
</tr>
<tr>
<td>Le 2013</td>
<td>2011-2012</td>
<td>15/15</td>
<td>suction via incision &amp; cervix</td>
</tr>
<tr>
<td>Wang 2013</td>
<td>2008-2012</td>
<td>22/23</td>
<td>Suction via cervix</td>
</tr>
</tbody>
</table>

Success rate 55/56 (98%)

### Transvaginal resection

- n= 56
- Blood loss reported as 75-100 ml mean (max 1000 ml)
- operative time 21-53 mins mean
- five intrauterine pregnancies on follow up
Suction evacuation

- 9/108 cases required hysterectomy
- Usually those undiagnosed prior to haemorrhage
- 58/108 required additional procedures

Suction evacuation: technique

- Misoprostol PR
- Infiltrate with bupivocaine 0.5% & adrenaline
- Insert modified Shirodkar suture without tying tape
- Continuous USS guidance
- Suction to remove decidua in cavity as per routine ERPC
- Gentle rotation of suction curette at level of scar
- Check with TVS / PRS for RPOC
- Tie suture if heavy bleeding, remove if not
- Remove suture in 3-7 days
- Prophylactic antibiotics
Suction evacuation

Suction evacuation
King’s & UCH patients

- 232 women with scar pregnancies
- gestation by dates (wks) = 7+4 (4+1-14+4)
- 191/232 (82.3%) of women were treated surgically

King’s & UCH patients: extended case series

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n=232</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing pregnancy</td>
<td>123 (53%)</td>
</tr>
<tr>
<td>Heterotopic</td>
<td>9/232 (3.9%)</td>
</tr>
<tr>
<td>GSD (mm)* n=209</td>
<td>17.3 (3.0-74.0)</td>
</tr>
<tr>
<td>size of POC (mm) n=23</td>
<td>36.0 (15.0-58.0)</td>
</tr>
<tr>
<td>CRL (mm)* n=151</td>
<td>6.7 (1.3-72.0)</td>
</tr>
<tr>
<td>Surgical management</td>
<td>191 (82.3%)</td>
</tr>
</tbody>
</table>

* median, range
1997 – 2013
King’s & UCH patients: outcome

<table>
<thead>
<tr>
<th>Outcome</th>
<th>n=191</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>190 (99.5%)</td>
</tr>
<tr>
<td>Suture tied</td>
<td>82 (42.9%)</td>
</tr>
<tr>
<td>Foley catheter</td>
<td>3 (1.6%)</td>
</tr>
<tr>
<td>EBL (ml)*</td>
<td>100 (10-3000)</td>
</tr>
<tr>
<td>EBL &gt; 1000 ml</td>
<td>20/191 (10.5%)</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>9/191 (4.7%)</td>
</tr>
<tr>
<td>Hysterectomy</td>
<td>1/191 (0.5%)</td>
</tr>
<tr>
<td>RPOC</td>
<td>18/191 (9.5%)</td>
</tr>
<tr>
<td>ERPC/rpt procedure</td>
<td>7/191 (3.7%)</td>
</tr>
</tbody>
</table>

* median, IQR

King’s & UCH patients: predictors of morbidity

- Advancing gestational age
- Increasing gestational sac diameter
- Increasing CRL
- High vascularity
- Only GSD & vascularity remained significant at LR
Suction evacuation: future pregnancies

- Data available for 96 women
- 79 tried to conceive again
- 6 women had recurrent scar pregnancies (7.6%, 95% CI 0.9-11.7)
- 60/79 women conceived again with intrauterine pregnancies (75.9%)
- All but one had rpt CS, no cases of uterine rupture

Suction evacuation +/- cerclage

- Fertility sparing ✔
- Minimal complications ✔
- Technically simple ✔
- Reduce risk of recurrence ✗
- Reduce morbidity in future pregnancies ✗
Summary

- Scant data regarding natural history
- Complications tend to occur in undiagnosed / misdiagnosed cases
- The earlier the diagnosis of CSP the less complicated the treatment & more time for decision making
- Prophylactic cerclage simple technique – safe and effective
- Less invasive & fewer potential complications than excision or hysteroscopic resection
- MTX pre treatment unlikely to be of benefit
- Scar revision of uncertain benefit