1. What is a cesarean scar pregnancy (CSP)

**Synonyms in the literature:** Scar pregnancy, Cesarean section scar ectopic, Section scar ectopic

- It is a iatrogenic entity
- A blastocyst implants in a microscopic or macroscopic tract on the uterine scar or in a “niche”, in the faulty anterior uterine wall
- Mechanism similar to implantations after uterine surgery (myomectomy, curettage, manual removal of placenta etc…. as in placenta accreta)

On US, most of the time it appears like this:
One previous CS = one niche

Two previous CS = two niches

What is a cesarean section scar pregnancy and how does it look?

How does a CSP appear on US?

Empty uterine cavity
cervix

How does it come about??
Endometrium of the niche is thin

How does it come about??
Fertilized egg travels to the scar of previous incision of the section

Placenta accreta or C/S scar pregnancy

Color Doppler of the vessels at the scar implantation site

Vessels invade implantation site all the way to the bladder
**Cesarean Rates (per 1,000 births), Industrialized Countries, 1990-2004**

- **Italy**
- **U.S.**
- **Germany**
- **Netherlands**
- **Denmark**
- **UK**

Source: OECD Health Data 2006

**EARLY sonographic appearance:**

Placenta …“on the scar”…

Is it important??

Differentiation at time hard!

In either case, the clinical management is probably the same

Is it really……..?

**Theories of pathogenesis.**

- The Nitabuch fibrinoid layer is thinned or missing, and the placenta will attach itself too deeply into the uterine wall.


**Theories of pathogenesis: Low O₂**

- • Rosen* invokes theories** about the role of a low oxygen tension stimulating the cytotrophoblast to deeply invade the scarred area

- • Kleiman*** believes that trophoblasts have a strong propensity for attaching to exposed extracellular matrix at the scar tissue

- • Other, less proven theories were also published


*** Kleiman HJ et al, Placenta 1990; 11:349-367
3. Incidence

C/S Scar Pregnancies

- True incidence is not known
- \( \approx 1 \) in 2000-2500 cesarean deliveries
- Rate increasing due to rising C/S rates
- 52% of CSSP had only one prior C/S
- The more previous C/S, the more CSP, the more placenta previa and accreta

Miller DA et al, Am J Obstet gynecol 1997; 177:210

USA: Cesarean delivery rate
- 1970: 5.5%
- 1988: 24.7%
- 1996: 20.7%
- 2002-2006: 30.5%
- 2007: C/S rate is 32.8%

- 4,247,694 deliveries

Overall C/S rate increased 40% since 1996 due to increase of the primary rate (12.6 to 20.6%) & a steep decrease of VBAC (28 to 9.2%)
C-Section Rates Steady For First Time In Decades

A new report by the Centers for Disease Control and Prevention reveals that the overall rate of Cesarean section (C-section) births has stopped increasing and has been steady from 2009 to 2011.

Morbidly adherent placenta (“accreta”) and CSP rates parallel the increasing CD rates

Cesarean Rates (per 1,000 births), Industrialized Countries, 1990-2004

Source: OECD Health Data 2006

4. Diagnosis and differential diagnosis

The sonographic diagnosis

As per some reviews the Dx by TVUS: sensitivity 84.6%
This depends on the expertise

The first line imaging to diagnose or to confirm a CSP is TVS!!!

Should you order MRI to diagnose or to confirm a sono diagnosis?

The answer is: Not necessary!! TVS is diagnostic!!
Sono criteria of CSP

1. No fetal parts in the uterine cavity or cervix
2. Thin myometrial layer between the bladder and gestational sac
3. "Triangular" shaped gestational sac
4. Gestational sac close to the bladder and anterior uterine wall

5. A-V malformation at the site of a CS

Twin CSP

Heterotopic: Scar and IUP

Twin pregnancy: CSP and IUP

Triplet pregnancy: CSP and twin IUP

The differential diagnosis

1. Cervical Pregnancy – however – remember: Cx pregnancy is EXTREMELY rare & occur in intact uterus
2. IUP in the process of abortion – however – they very rarely have a beating heart!

Therefore:
If the chorionic sac is low, close to the cervix and the patient had a previous cesarean delivery: IT IS A CSP!!!!
Placenta accreta and percreta can occur in the 1st trimester

- **Fact based upon:**
  - Reports of massive hemorrhage during D&C and histology of MAP in the involved uteri*
  - Reports of proven 1st Δ US and subsequent histology of MAP in the near term placenta
    - In all 6 of the cases of Comstock** and 10 cases of Ballas*** previous C/D was the risk factor

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5. What is the natural history of CSP?

b. Is CSP a precursor of Morbidly Adherent Placenta (accreta, percreta)?

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Is there accreta/percreta in the 1st Δ?

- In the **1st trimester** it can be identified if the sac is implanted in the anterior lower uterine segment*

In a patient with a previous cesarean delivery, a sac lying in the lower uterine segment on a scan at 10 weeks or earlier suggests the possibility of placenta accreta.

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Is there accreta/percreta in the 2nd Δ?

- In the **early 2nd trimester** findings may be seen as early as 13-18 weeks**

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An illustrative case that supports the causative connection between 1st Δ CSP and placenta accreta
Progression of vascularization of a CSP into EPA by Weeks of gestation

Cases of CSP diagnosed in the 1st trimester

Findings suggests that signs of placenta accreta are present in the first trimester

CSP: changing direction of patient counseling before and after 2012

Before treatment the patient should be counseled

CSP: changing direction of patient counseling before and after 2012

What prompted the change in counseling?

11/25/2014
What prompted the change in counseling?
• Third: New information based upon increasing number of cases and case series reporting on successful deliveries of live babies in the 3rd trimester

6. 1st trimester treatment choices, if continuing the pregnancy is NOT an option

The major treatment modalities
• Surgical requiring general anesthesia
  – Major: laparotomy
  – Minor: Laparoscopy, Hysteroscopy; D&C
• Minimally invasive: Local injection (MTX/KCl)
• Systemic
  – Major: UAE
  – Minor: IM Methotrexate (single/multiple)
• Different combinations of the above
  – Simultaneously
  – Sequentially

Primary treatment in 751 cases
1. Hysteroscopic excision
2. Hysteroscopy by TAS guidance
3. Hysteroscopy & Mefipristone
4. Laparotomy & excision
5. Laparotomy with elective TAH
6. Laparotomy & systemic MTX
7. Laparotomy & hysteroscopy
8. TAS guided local MTX injection
9. TAS guided local KCl injection
10. TAS guided local & systemic MTX
11. TVS guided local MTX injection
12. TVS guided local KCl injection
13. TVS guided local & systemic MTX
14. Local injection of Vasopressin
15. UA embolization alone
16. UA embolization & systemic MTX
17. UA embolization & local MTX
18. D&C alone
19. D&C & systemic MTX
20. D&C & Shirodkar cervical suture
21. Laparoscopic excision
22. Laparoscopy & hysteroscopy
23. Laparoscopy & systemic MTX
24. MTX systemic alone
25. MTX systemic & hysteroscopy
26. Expectant management
27. Trichostatin
28. Transrectal US guided aspiration
29. Hysteroscopy & Vasopressin
30. Hysterotomy by vaginal approach
31. Combination of ≥3 Rx. Modalities

Which treatment??
• Given the wide variety of primary treatment approaches, most seemed to be insufficient or ineffective, or fraught with complications.
• The sporadic, mostly individual cases and their results were insufficient to enable a clear conclusion as to which was the most effective management protocol leading to the least or no complications.

Are there guidelines??
• It is obvious that none of the countries, USA included, have a set of guidelines at hand when a patient with an early placenta accreta or a cesarean scar pregnancy presents.
7. Treatment complications

Before treating: know the complications!

Complication rate in the 751 cases
Overall: 331 (44.1%)

Analysis of the most frequently used treatments

Systemic MTX alone
- Methotrexate administered systemically without any other treatment in combination had a 64.6% complication rate.
- The only speculation we may offer to explain the failure of this primary noninvasive treatment approach is due to its slow action and its questionable ability to stop the cardiac activity and placental expansion.
- The expected result may take days.

Systemic MTX alone
- While waiting for the drug effect, the gestational sac, the embryo/fetus and its vascularity are growing.
- In this case, a secondary treatment has to deal with, a larger gestation with a rich vascularization, thus the risk of complications increases.
  - If only possible, do not use MTX as a single IM injection as the only treatment – don’t expect it to stop the heart beats, most of the time it does not.

Sequential, multidose systemic MTX
- If after reading the literature you are not convinced of the high failure rate of a single systemic MTX treatment, plan for a multidose (2-3 doses) protocol over one week. Be aware of its side effects. Even such treatment fails at times
  - However do use IM MTX as an adjuvant therapy with other treatments
Suction aspiration and/or D&C alone or in combination

About 305 cases reviewed in the literature with about 62% (29-86%) complications

If planning for it: have blood and a Foley balloon handy!!

UAE alone or in combination

About 64 cases reviewed in the literature with about 47% complications

Not the best “first line” treatment. Good adjuvant

UAE and D&C

• Uterine artery embolization or D&C alone, or in any “combination treatment,” had the largest complication rate (59.1% and 58.7% respectively).

• In the case of a D&C the multilayered myometrium in the uterine body, is able to contain bleeding at the placental site after its separation, in a CSP the exposed vessels in the cervical scar tissue bleed, since there is no muscle to contract and to contain the resulting profuse bleeding.

Laparotomy

14 cases reviewed in the literature with about 28% complications unless TAH

Laparoscopy alone or in combination

About 54 cases reviewed in the literature with about 20-30% complications
Operative hysteroscopy alone or in combination

About 119 cases reviewed in the literature with the second lowest (about 18%) complication rate

Timor-Tritsch 2013 AJOG

Transabdominal or transvaginal US guided local, intra-gestational sac injection of MTX/KCl

About 81 cases reviewed in the literature with about an average of 9.6% (0-15%) complications

(Only 9 of the 81 were transabdominal US guided transabdominal injections; the rest of 72 were TVS guided transvaginal injections)

Timor-Tritsch 2013 AJOG

Important adjuvant in managing bleeding after different procedures should bleeding occur.

Have available: 5, 10, 30 or 50 cc Foley-balloon catheters (possibly rubber NOT plastic) for emergency or elective use

Combination Management

Aspiration of the gestational sac (GA)
If bleeding occurs
10 cc Foley Balloon catheter inserted to tamponade

Pt stays over night but bleeding continues
Larger balloon Foley (50cc) inserted

Bleeding stops. Pt discharged home
• Insertion guided either by TA or TV US

The use of a Foley balloon catheter as an adjuvant therapy in preventing or managing bleeding during treatment for cesarean scar and cervical pregnancies

Accepted for publication 10/16/2014

- Insertion by transabdominal or transvaginal US guidance

- The same approach to insert and inflate balloon catheters can (and were reported to) be used after the following treatments, should bleeding occur:
  - Local intragestational sac injection
  - Aspiration or D&C
  - Hysteroscopic excision
  - Uterine Artery Embolization
  - Laparoscopic excision

Most and least complications by mode of treatment

<table>
<thead>
<tr>
<th>Treatment/Complications</th>
<th>Most frequently used single &amp; combination Rx</th>
<th># of cases</th>
<th># of complications</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTX alone</td>
<td>87</td>
<td>54</td>
<td>62.1</td>
<td></td>
</tr>
<tr>
<td>D&amp;C</td>
<td>305</td>
<td>189</td>
<td>61.9</td>
<td></td>
</tr>
<tr>
<td>UA embolization</td>
<td>64</td>
<td>30</td>
<td>46.9</td>
<td></td>
</tr>
<tr>
<td>Hysteroscopy</td>
<td>119</td>
<td>22</td>
<td>18.4</td>
<td></td>
</tr>
<tr>
<td>Local injection of MTX/KCl (TAS or TVS guidance)</td>
<td>81</td>
<td>8</td>
<td>9.6</td>
<td></td>
</tr>
</tbody>
</table>

Most and least complications by mode of treatment

Timor-Tritsch 2013 AJOG

• CSP is a dangerous pathology
• Even in the best of hands, using the managements with seemingly the most effective results, complications may occur.
• Management protocols combining different surgical, medical and radiological solutions may be the least risky

Treatment: Is there any single one?

Probably not!
7. Summary and conclusions

1. The diagnosis of early PA and/or CSP is difficult. They were often misdiagnosed as “low intrauterine pregnancies,” “cervical pregnancy,” or a “miscarriage in progress.” The best diagnostic tool was high frequency transvaginal ultrasound. MRI does NOT add to the Dx.

2. The earlier the diagnosis was established, the better the outcome seemed to be. This was true even if treatment modalities with slightly higher complication rates were used in very early gestation.

• Studying the literature of PAD & CSP,
  – their missed diagnoses,
  – lack of evidence based treatment approaches and
  – serious but mostly preventable complications,
  our review of the cases involving PAD and CSP resulted in the following observations:

[Diagram showing outcomes and complications related to CSP and PAD]
3. If possible, D&C should be avoided, since it can lead to profuse bleeding, additional secondary backup procedures, general anesthesia, blood transfusion, and in many instances, laparotomy & loss of the uterus

- It was reported to be successful AFTER a previously administered treatment such as UAE

3. D&C Continued
- If D&C is still the treatment of choice, blood products should be readily available at the site.
- As a palliative measure, a balloon catheter should be inserted in cervix (possibly under transabdominal ultrasound guidance), and inflated to minimize blood loss.

4. Systemic MTX as a single treatment of choice should be avoided.
   - Waiting days for its effect to stop the heartbeats only to realize that it failed, wastes precious time.
   - A subsequent, “second line” treatment approach with a possibly higher complication rate may endanger the patient.

5. Uterine artery embolization as a single treatment should be used sparingly or not at all. Waiting for its effect to stop or slow the bleeding could delay a more effective primary treatment that may save the uterus.
   Combining UAE with other treatments was reported as successful

   At the time of discharging women from the hospital after a CD, she should be advised that in case of a future pregnancy, an early visit (1-2 weeks after a missed period) at the obstetrician for a TVS is of paramount importance.

The “best treatment” (?)
This is what I do:
- Evidence based counseling!!
- If no heart beats: just watch (hCG, US)
- Heart beats: Individualize treatment
- If treatment needed: do it promptly! Stop the heart beats!
- I use TV US guided, TV local MTX intra-gestational sac injection + IM MTX
- Back-up Foley catheter
- F/U with hCG and US
- If pregnancy is desired: close US monitoring
It is all about clinical results!!

Means to reduce the risk & increase good outcome

- Forewarning: timely Dx, early counseling
- Preparation
- Timing strategies**** (Scheduled delivery at 34w)

*Al-Khan A et al. Maternal fetal outcomes in placenta accreta after institution of team management. Reprint, 2014 e-Publication
***Wright ID et al. Predictors of massive blood loss in women with placenta accreta. AOG 2013: 205 e1-6

Means to reduce the risk & increase good outcome

- Delivery at institution with:
  - Experience
  - Operative resources
  - Access to large amounts of blood & its products, since prediction of which women will lose the most is not possible

*Al-Khan A et al. Maternal fetal outcomes in placenta accreta after institution of team management. Reprint, 2014 e-Publication
***Wright ID et al. Predictors of massive blood loss in women with placenta accreta. AOG 2013: 205 e1-6

Thank you for listening!