Can we predict the behavior of a desired CSP?
Over the Scar? Into the Scar/niche?
Can we link US features to prognosis yet?

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Cesarean Scar Pregnancy: Update 2017

I have no conflicts of interest

CSP is a man made disease
True incidence is not known
$\approx$1 in 2000-2500 cesarean deliveries
Rate closely related C/D rates
52% of CSPs had only one prior C/D
The more previous C/D, the more CSP, the more placenta previa and accreta

Let us examine the faulty implantation in a more detailed fashion
What is the trophoblast and what does it accomplish?
Trophoblasts (from Greek trephain: to feed, and blastos: germinator) are cells forming the outer layer of a blastocyst, which provide nutrients to the embryo develop into a large part of the placenta. They are formed during the first stage of pregnancy and are the first cells to differentiate from the fertilized egg.

The Extravillous Trophoblasts appear, differentiate and start invading the decidua

- Normal implantation involves invasion of the uterine wall by two subgroups of extravillous trophoblast:
  - the interstitial trophoblast invades through the endometrium and the superficial one-third of the myometrium.
  - the endovascular trophoblast invades and remodels the maternal spiral arterioles.

*Tantbirojn et al, Placenta 2008; 29:639
Propose that the extent of uterine wall "invasion" by placental villi (and resulting accreta vs. increta and percreta) may be dependent on the depth of the scar. And that "placenta increta and percreta are not due to a further invasion of extravillous trophoblast in the uterine wall, rather they likely arise secondary to dehiscence of a scar, leading to the presence of chorionic villi deep within the uterine wall, and thus give extravillous trophoblast greater access to the deep myometrium".

Is there an entity, such as placenta accreta/percreta in the 1st Δ of the pregnancy?

In the 1st trimester placental invasion can be identified if the sac is implanted in the anterior lower uterine segment* and suggests the possibility of placenta accreta.


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

Image at 14 weeks.
Ruptured several weeks later.
Histology: Percreta


In the second trimester there is high risk for complications
Therefore the answer to the two questions is: **YES!** Placenta accreta and percreta can occur in the 1st and early 2nd trimester.

These observations are based upon:

- Reports of massive hemorrhage during D&C
- Histology of MAP in the involved uteri*
- Reports of proven 1st Δ US and subsequent histology of MAP in the near term placenta

- Comstock Ch et al. JUM 2003
- Ballas J et al. JUM 2012
- Timor-Trinch IE, Monteagudo A, Santos R, Tymbal T, Pineda G, Arslan AA. The diagnosis, treatment and follow-up of cesarean scar pregnancy. AJO G 2012;207:44.

The conclusion in the literature is that:

- CSP is a precursor of MAP,
- There is now ample evidence that can be used to counsel patients with CSP to enable them to make an informed choice between a 1st Δ TOP and continuation of the pregnancy, with its risk of premature delivery and loss of uterus and fertility.
- The question is: how accurate can we be?

**Additional literature support for the fact that CSP is one of the precursors of placenta accreta**

Cesarean scar pregnancy is a precursor of morbidity adherent placenta

- Ten patients with CSP progressed to attempt delivery of a live neonate
- 9 succeeded
- All then had hysterectomies
- All ten had AIP
Over the last several years it became obvious, that not all CSPs resulted in MAP.

Ten patients diagnosed with CSP
- All ten delivered live neonates
- Only 5 resulted in MAP leading to hysterectomy

The next question is: can we predict which CSPs will become MAP and which will not.

And if we can predict MAP, at what point (GA) can we diagnose a placenta that will be pathologically adherent?

First: the correct diagnosis has to be established
- Use mainly high frequency TVS!
- Transabdominal US may help
- Contrary to all the publications of using MRI, please disregard them and trust your transvaginal US!

Step 1A: For the correct diagnosis apply the sono definition of scar pregnancy
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. Rarely: A-V malformation at the site of a CS
**Step 1B.** For the correct diagnosis determine the location of the gestational sac in the uterus

On a panoramic, longitudinal, sagittal scan determine the location of the gestational sac. Divide the uterus in half by an imaginary line.

- **If the gestational sac is below it:** suspect a CSP or a cervical pregnancy. Counsel accordingly.
- **If the gestational sac is above it:** it is mostly a normal implantation.

Sensitivity = 93.0%, Specificity = 98.9%, PPV = 96.4%, NPV = 97.9%.

If you combine the two methods to diagnose CSP......

- **Antero-Inferior Uterine ‘CSP risk’ Triangle**
  - ‘Timor line’
  - ‘Call line’
- Not published!

**Measure bladder-to-sac distance**

- The literature is not only confusing as to the sac location, but.....
- Rarely is there information about bladder-to-sac distance or overlying myometrial thickness
- Furthermore, usually there is no distinction between “gestational sac” and “placenta”
- Lastly, there is rarely any mention about location of placental vascularization
To correctly measure the sac-to-bladder distance, we need a precise definition of implantation, since it may determine outcome.

Sporadically, but increasingly, we hear and read that there may be a distinction between implantation “on the scar tissue” and “in the niche (dehiscence)”.

On the scar or in the “niche”....??

- The literature is confusing as to location of the sac:
  - **ON the scar** with a chance to proceed to 3rd trimester (so called “low lying sacs”)
  - **IN the niche**, SURROUNDED by myometrium, **seldom** proceeds to term (so called “true” CSPs)
- Confusing?? TRUE: Differentiation at time is very hard

- Recent reviews of ‘scar pregnancies’ include both types because both were managed by injection & D&C.


It is clear that there is no uniform and agreed upon definition of the type and depth of implantation placental and its correlation to outcome.

Here is my understanding of the issue of implantation after years of observations of adherence disorders and cesarean scar pregnancies:

- **Comstock**: “Low lying: versus—surrounded by myometrium”
- **Twicker**: < 1mm predicted MAP
- **Naji**: away from scar, close to scar, crossing the scar, **inside the scar (CSP)**
- **Rac**: smallest anterior myometrial thickness on 1st trimester sonography significantly improved detection of morbidly adherent placenta.

**Hard to detect any organization**

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**My definition of EARLY sonographic appearance:**

Placenta implanted ...”**on the scar”**...

The relevant thickness has yet to be determined.
ALWAYS stay focused upon the proximity of the placenta to the anterior uterine surface or the bladder.

Have you ever looked at the location of the SAC in CSPs mainly after 7-8 weeks being half-way in the uterine cavity?

It is still a scar pregnancy!! Rely on the patient’s Hx, location of the placenta and its vascular supply!!

At times (mostly after 7 weeks) the location of the sac may be misleading.

Pregnancy growing fully into uterine cavity. Placenta with vessels stays anchored within the niche.

Prognostic signs based upon the depth of implantation

We tried to learn if there is a difference in pregnancy outcome as a function of the distance between the gestational sac and the anterior uterine surface/bladder.

Original Research

Chestnetics

The clinical outcome of cesarean scar pregnancies implanted “on the scar” versus “in the niche"

Andrea Kaell Ayers, MD; Giuseppe Cali, MD; Ana Montenegro, MD; Johana Oviedo, MD; Jose Reinos, MD; and Melanie F. White, MD

It is suspected that CSPs implanted within a dehiscent scar (“niche”) behave differently compared to CSPs implanted on top of a thick fibrous scar.

No such studies are available

We assessed the natural development and pregnancy outcomes of CSP implanted either “on the scar” or “in the niche”.

Retrospective, multi-center study of 17 CSP patients between 5-9 wks

- Group A: “on the scar” = 6 patients
- Group B: “in the niche” = 11 patients
- Measured: Myometrial thickness overlying the placenta
- Compared: gestational age and mode of delivery, blood loss at delivery, neonate weight and placental histopathology.
Cesarean scar pregnancy implanted “on the scar”

Example of a patient with CSP implanted “on the scar” with a normal placenta at delivery.

Example of a patient with CSP implanted “in the niche” with placenta percreta at delivery.

<table>
<thead>
<tr>
<th>Results</th>
<th>Group A ‘On scar’</th>
<th>Group B ‘In niche’</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>6</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>GA @ delivery (wks)</td>
<td>38</td>
<td>34</td>
<td>0.001</td>
</tr>
<tr>
<td>Mode of delivery</td>
<td>6 CD 1 with MAP</td>
<td>10 CD all with MAP</td>
<td></td>
</tr>
<tr>
<td>Cesarean hysterectomy</td>
<td>1 C-Hyst for Morbidly Adherent Plac</td>
<td>10 C-Hyst MAP 1 gravid hyst @ 20 weeks for bleeding</td>
<td></td>
</tr>
<tr>
<td>Est blood loss (ML)</td>
<td>700</td>
<td>1200</td>
<td>0.001</td>
</tr>
<tr>
<td>Myometrial thickness @ the scar</td>
<td>5mm (range 4-9)</td>
<td>1mm (0-2)</td>
<td></td>
</tr>
</tbody>
</table>

What did we learn?

- Patients with CSP implanted “on the scar” had a substantial better outcome compared to patients with CSP “in the niche”.
- Myometrial thickness below 2mm in the 1st trimester US was associated with Morbidly Adherent Placenta at delivery.
We tried to learn if there is a difference in pregnancy outcome as a function of presence or absence detecting known and “classical” sonographic characteristics of AIP. Are there classical US signs of AIP present already in the 1st trimester? • First-- What are the “classical” signs of MAP/AIP in the 2nd and 3rd trimesters?:  
- Low* anterior** implantation  
- Lacunae  
- No clear anechoic space  
- Increased vascularity  
- Altered bladder line  

*Timor-Trisch IE, Monteagudo A, Calì G, Di Belley H, Kaelin Agten A, Arslan AA.  
**Calì G, Forlani F, Timor-Trisch IE, Palacios-Jaraquemada J, Minneci G, D'Antonio F.  

Are the classical US signs of AIP present already in the 1st trimester?  
**Answer**: Yes they are:  
10 weeks 1 day  
Large number of Lacunae  
Unusually increased vascularity at the placental insertion

First trimester diagnosis of abnormally invasive placenta: a systematic review and meta-analysis  
- **Objectives**: to ascertain whether US signs suggestive of MAP are present in the 1st Δ and they predict MAP  
- **Results**: Nine studies (578 pregnancies at risk for MAP)  
- At least one US sign suggestive of MAP was detected in 83.7% (95% CI 61.3-97.5) of cases with confirmed MAP  
- **Conclusions**: US signs of MAP are already present during the 1st Δ, especially before 11 weeks of gestation and are those typical of a caesarean scar pregnancy (CPS).  
- Low implantation of the sac was the most common US sign associated with MAP in the 1st Δ of pregnancy  

Disappearance of the clear myometrial line  
Seen in 75-85% at 11-14w:
Gray scale and color Doppler. Evolution of the placenta from CSP to MAP

Lacunae 10w 1d Vascularity

10w 3d 16w 5d

23w 5d

24w 5d

36w 3d

Conclusion

Over the last several years an increasing number of authors gathered significant experience that allows to provide evidence based counseling to patients presenting with a CSP.

We are not yet at a point where we can translate the gained experience into reliable risk assessment. More research & clinical observations are needed in the form of an international CSP registry.

We need to introduce routine US scanning at 6-8 weeks for all patients with a history of previous CS.

Suggested management of CSP

FH +

CSP

Available evidence based counseling

CSP

Patient requests TDP

No FH

Recheck q 3 days

Patient interested in continuing pregnancy

No FH after 3 scans or at 7 wks by reliable dating

Follow by US and by hCG until zero!

Select appropriate Rx

Stop heart without delay: Inject;

Double balloon:

Hysterotomy or

Gravid hysterectomy?

Monitor hCG & US weekly. Watch for possible EMV

Determine if placenta/sac is on the scar or in the niche. MEASURE MYOMETRIAL THICKNESS

“in the niche” or ≤ 5mm: high risk for MAP (increte, percreta) and cesarean hysterectomy

“on the scar” or ≥ 5mm: low risk for MAP (accreta) and cesarean hysterectomy

Last Suggestion:

Early recognition of CSP starts with Patient and Physician education:

When discharging patients from the hospital after a C/D make sure to tell her to present to the Ob/Gyn the day after the first positive pregnancy test for an US scan between 6-7 weeks.

If I have time I would like to show you our new, minimally invasive treatment method of CSP

The use of a double, cervical ripening balloon catheter as a single, minimally invasive treatment of CSP and CxP

OBSTETRICS

A new minimally invasive treatment for cesarean scar pregnancy and cervical pregnancy

Ilan E. Timor-Tritsch, MD; Ana Monteagudo, MD; Tom-Ann Bennett, MD; Christine Foley, MD; Joanna Nance, FDOMS, Andrea Kaelin Agten, MD


Recap—Minimally invasive treatment for cesarean scar pregnancy using a double-balloon catheter: additional suggestions to the technique

Ilan E. Timor-Tritsch, Ana Monteagudo, Tom-Ann Bennett, Christine Foley, Joanna Nance, Andrea Kaelin Agten.

Am J Obstet Gynecol March 2016
Reasons for its use:

- Simultaneously terminates pregnancy and prevents bleeding
- Simplify treatment; Minimize patient discomfort
- Adapt a catheter familiar to Ob in the L&D to treat CSP
- Also effective for cervical pregnancies

The double balloon catheter

Lately: New, minimally invasive treatment: Placing a double cervical ripening balloon

Timor-Tritsch, Monteagudo, Bennett, Foley, Kaelin Agten. A new minimally invasive treatment for cesarean scar and cervical pregnancy. Article accepted for publication by AJOG

The NEW experience: 5 centers*

- 32 CSPs & 3 CxPs 35 patients were treated (6-8wks)
- Catheter placement & balloon inflation tolerated well.
- Oral pain medication and antibiotics. IM MTX were given
- Last 12 patients received paracervical block (1% Lidocaine)
- Balloons deflated, catheter removed 1-3 days
- Minimal, "old", dark blood was seen after removal of the catheters from intra-cavitary accumulation of blood
- In all cases almost total resolution of the hCG, the sac site & its vascularity was seen within 20-60 days

* New York/Bellevue Medical centers: 21cases
* Carnegie Imaging (Dr. Rebarber and Monteagudo): 4 cases
* Lenox Hill, MPH (Dr. Bornstein): 3 case
* Einstein Medical college 3 cases
* Michigan State university: 3 cases
* Texas Medical center 1 case
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Timor-Tritsch, Montesagudo, Bennett, Foley, Kaelin Ageten. A new minimally invasive treatment for cesarean scar and cervical pregnancy. Article accepted for publication by AJOG
Results

- Pts discharged home within 2 hours
- Balloons remained in place mean 2 days
- hCG dropped in a mean 49 days
- No significant bleeding
- No further Rx needed

Cervical ripening double balloon treatment

Timor-Tritsch IE, MD
Kaelin Agten A. MD

The New York experience: 6 centers*

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- In the last 21 cases we used adjuvant systemic MTX
  - *Nyu/Bellevue Medical centers: 25 cases
  - *Carnegie Imaging (Dr. Rebarber and Monteagudo): 5 cases
  - *Lenox Hill, MNF (Dr. Bornstein) 1 case
  - * Dr. M. (Michigan) 2 cases
  - * Einstein Dr. P. Dar 2 cases

*NYU School of Medicine
NYU Langone Medical Center

Timor-Tritsch et al AJOG 2016