

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

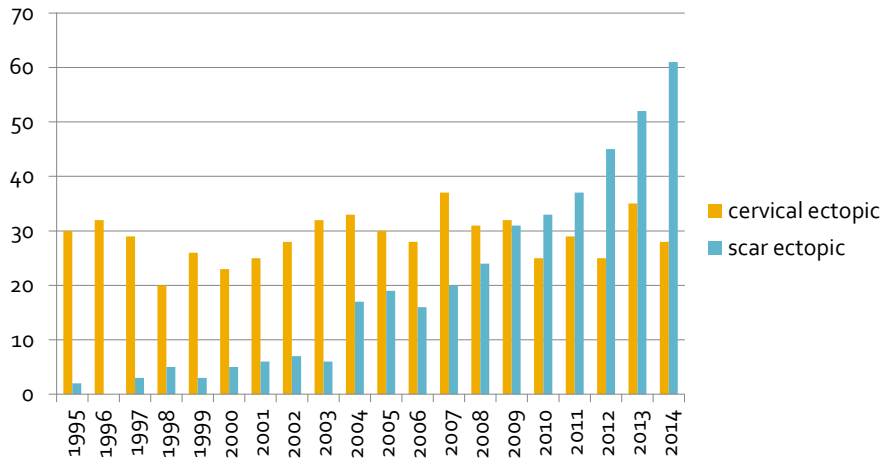
Diagnosis: cautionary tale

- 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

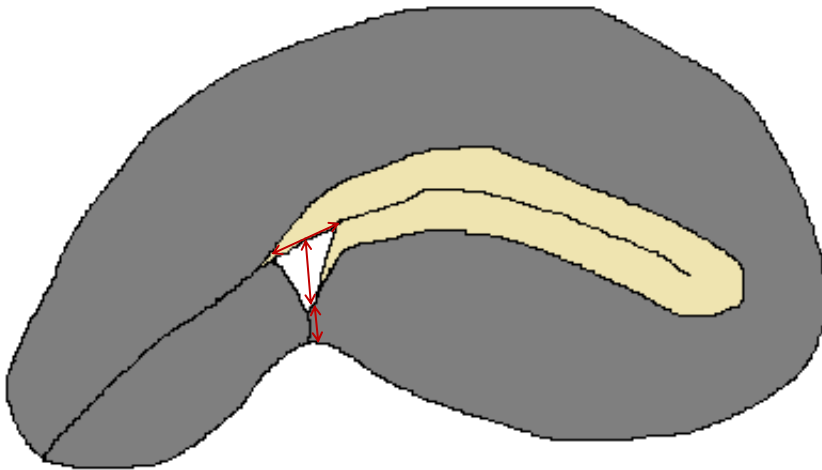
Diagnosis: cautionary tale



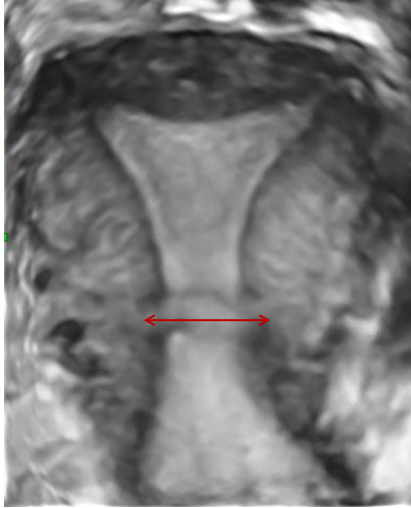
English Literature



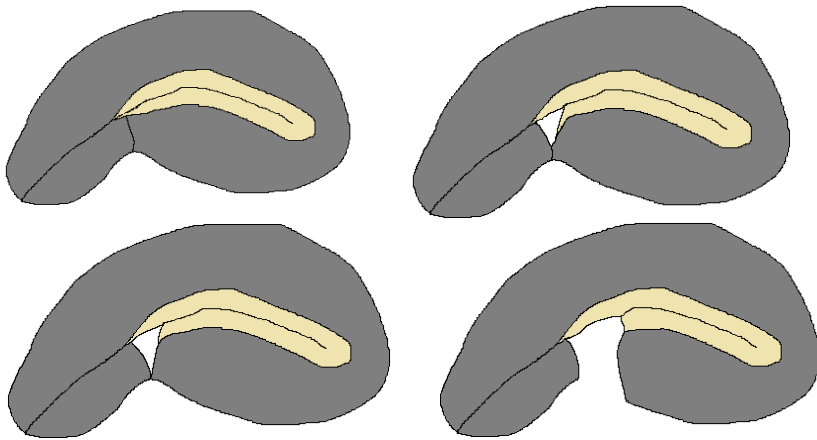
Diagnosis: scar implantation



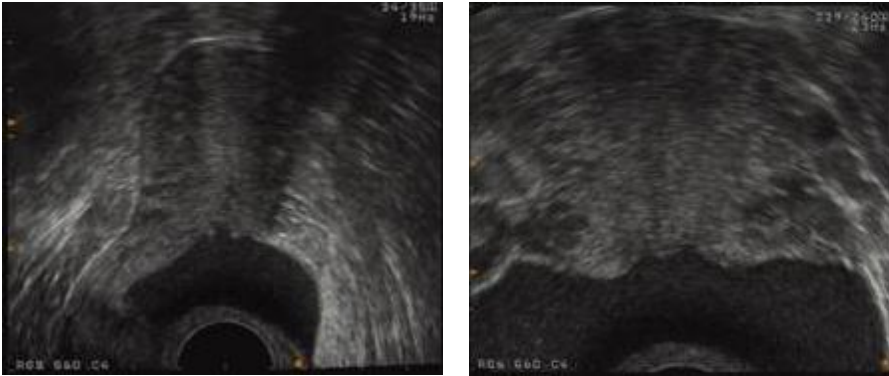
Diagnosis: scar implantation



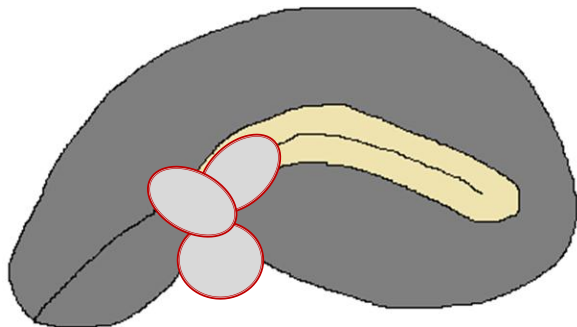
Diagnosis: scar implantation



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

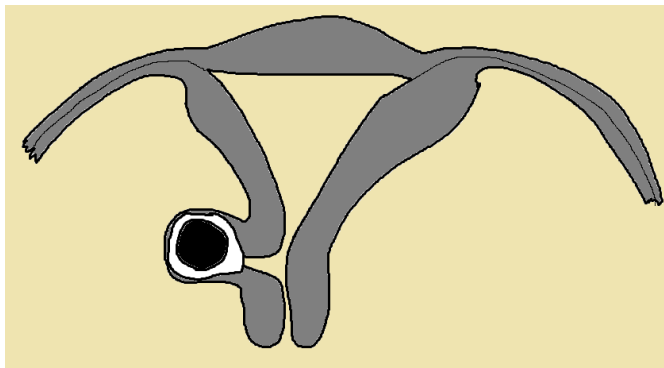
Diagnosis: scar implantation

- Additional features:
 - Placental lacunae
 - Wedge shaped gestational sac

Diagnosis: scar implantation



Diagnosis: scar implantation



Diagnosis: scar implantation



Diagnosis: scar implantation



First trimester caesarean scar ectopic pregnancy evaluation using MRI

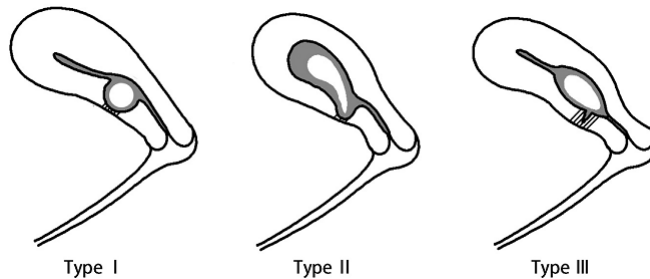
Categories of caesarean scar ectopic pregnancy based on magnetic resonance imaging (MRI).

Type	MRI findings
I	A thin-walled diverticulum is visible at the CSS defect. The GS is fully or mostly embedded in the diverticulum.
II	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.
III	A niche is visible in the CSS defect. The GS is mainly embedded in the isthmus.

CSS, caesarean section scar; GS, gestational sac.

Clin Radiol 2014 Feb;69(2):123-9.
doi: 10.1016/j.crad.2013.07.021.

First trimester caesarean scar ectopic pregnancy evaluation using MRI



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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.

Study	GA	N	outcome
Abraham 2012	7	1	SROM 24/40, APH 28/40, Emergency CS, haemorrhage, Emergency hysterectomy
Ben Nagi 2005	5	1	EI CS at 37/40, haemorrhage, Emergency hysterectomy
El-Matary 2007	6	1	SROM 31/40, APH 36/40, Emergency CS, haemorrhage, Emergency hysterectomy
Herman 1995	7	1	Acute abdominal pain 35/40, laparotomy, haemorrhage, hysterectomy, internal iliac ligation
Jurkovic 2003	6	1	haemorrhage 16/40, hysterectomy
Sinha 2012	6	1	Elective LSCS 37/40 haemorrhage, emergency hysterectomy, abdominal packing ITU
Timor- Tritsch 2012	9	1	haemorrhage 15/40, Emergency hysterectomy
Timor-Tritsch 2014	5-9	12	3 second trimester ruptures, 1 second trimester haemorrhage and hysterectomy, 8 third trimester hysterectomies
Wong 2005	6	1	37 weeks CS and hysterectomy

n = 20

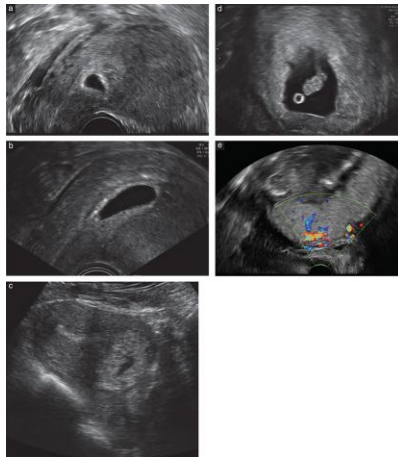
Natural History?

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

case	GA presentation	GA delivery	hysterectomy?	EBL (ml)	urinary tract injury?	histology
1	4+4	32	yes	3500	no	accreta
2	5+0	26	no	1400	no	none
3	8+0	37	yes	2500	bladder	accreta
4	9+1	37	no	3500	bladder	none
5	5+4	29	yes	13000	bladder & ureter	percreta
6	6+1	35	no	1000	no	accreta
7	7+5	35	yes	1500	bladder	increta
8	11+6	38	no	3000	no	none
9	8+4	29	yes	2500	bladder	percreta
10	8+5	37	no	1500	no	none

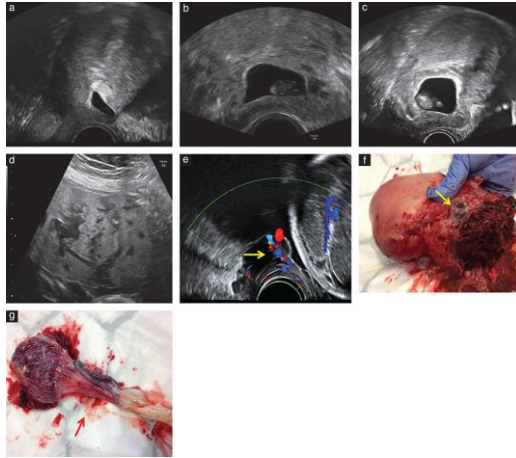
Ultrasound Obstet Gynecol 2015; 46: 367–375

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
<http://onlinelibrary.wiley.com/doi/10.1002/uog.14775>, pages 367-375, 6 AUG 2015 DOI: 10.1002/uog.14775
<http://onlinelibrary.wiley.com/doi/10.1002/uog.14775/fulltext/14775-isp-0002>

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

Clinical characteristics	Successful group (n = 22)		Unsuccessful group (n = 18)		p value
	Median	Range	Median	Range	
Age (years)	36.00	26–43	34.00	26–44	0.191*
Gravidity (n)	4.00	1–13	4.00	2–7	0.760*
Parity (n)	2.00	1–9	2.00	1–6	0.740*
Number of caesarean section (n)	1.00	1–4	1,00	1–3	0.603*
Gestational week (week)	6.00	5–8	6.00	5–11	0.095*
Embryonic cardiac activity status					
Negative (n, %)	12	70.6	5	33.3	0.028†
Positive (n, %)	6	29.4	12	66.7	
β-hCG level (mIU/l)	10,440.00	1,400–61,300	17,887.00	6,117–157,690	0.013*
Resolution time (day)	57.00	30–168	57.00	20–133	0.692*

Journal of Obstetrics and Gynaecology, 2014; Early Online: 1–7

Medical treatment

- 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

Reference	Time period	No cases	Primary treatment
Larsen 1978	1978	1	resection
Rempen 1990	1990	1	resection
Valley et al 1998	1998	1	resection
Vial et al 2000	2000	1	resection
Fylstra 2002	2001	1	resection
Yang et al 2003	Not spec	3	resection (+UAE)
Shih 2004	2004	1	resection
Seow et al 2004	1995-2000	1	resection
Maymon et al 2004	1995-2002	1	resection
Coniglio 20004	2002	1	resection (ruptured)
Holland et al 2008	2005	1	resection
Jiao et al 2008	1994-2007	3	resection
Halperin 2009	2002-2007	6	resection +/- IAL
Al-Nazer et al 2009	2009	1	resection
Ficioglu et al 2010	2008	1	resection

n=24

Laparoscopic surgical excision

Reference	Time period	No cases	Primary treatment
Lee CL 1999	1999	1	resection
Wang YL et al 2006	2003-2005	8	resection
Wang CJ et al 2006	1999-2004	4	resection
Lee JH et al 2008	2003-2007	7	resection
Demirel LC et al 2009	200x	1	resection (heterotopic)
Wang G et all 2014	2009-2011	32	TV aspiration & lap resection
Fuchs N et al 2015	2009-2014	4	resection

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 graspers
- 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

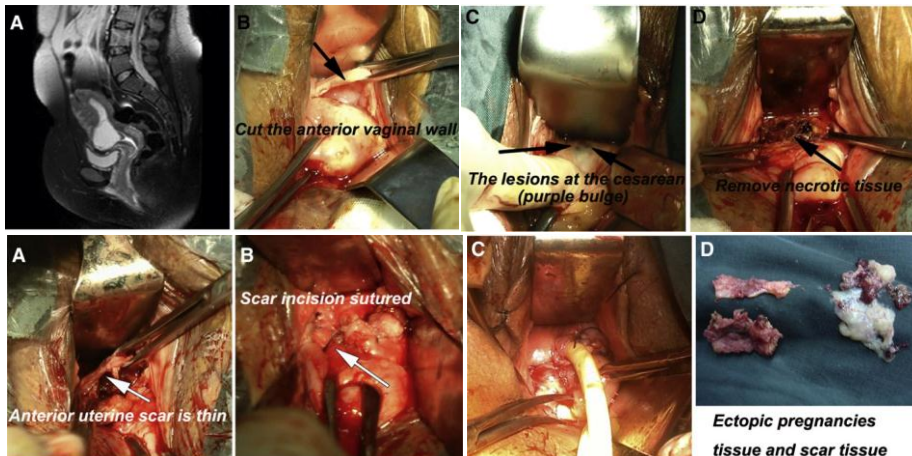
Reference	Time period	Success rate	Primary treatment
Wang CJ 2006	1999-2004	6/6	Coag, erpc, coag
Yang Q 2009	2006-2008	37/39	Pretreat with mife 36 pts/UAE 3
Deans 2009	2004-2007	6/6	Cold loop
Li et al 2011	2004-2010	18/20	MTX / UAE / nil, then Bipolar resection under USS guidance +/- Foley
Wang G 2014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

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

Reference	Time period	Success rate	Additional treatment
He 2011	2009-2010	6/6	
Wang 2012		12/12	local MTX
Le 2013	2011-2012	15/15	suction via incision & cervix
Wang 2013	2008-2012	22/23	Suction via cervix

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

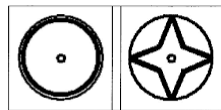
	D&C		
Moschos et al. J Clin Ultrasound. 2008	2004-2008	2	D&C
Nazi et al. Ultrasound Obstet Gynecol. 2008	2008	2	D&C

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

Jiao et al. Chin Med Sci J. 2006	1994-2007	2	USG to UAE
Reyffmann et al. Int J Gynaecol Obstet. 2005	2005	1	D&C to UAE
Yang et al. J Reprod Med. 2003	2003	1	D&C to laparotomy to UAE
Yang et al. J Reprod Med. 2003	2003	1	D&C to D&C to UAE to laparotomy
Wang et al. Fertil Steril. 2006	1999-2004	2	D&C to hysteroscopy + D&C
Lee et al. Hum Reprod. 1999	1999	1	D&C to hysteroscopy to laparoscopy
Li et al. Chin Med J. 2004	2004	1	D&C to UAE to D&C to laparotomy (hysterectomy)
Moschos et al. J Clin Ultrasound. 2008	2004-2008	1	D&C to laparotomy to hysterectomy
Norkka et al. Int J Gynaecol Obstet. 2008	2008	1	D&C to laparotomy to hysterectomy
Erenikel et al. Arch Gynecol Obstet. 2005	2005	1	D&C to laparotomy to hysterectomy
Huang et al. Chengde Yi Xue Za Zhi. 1999	1999	1	D&C to laparotomy to hysterectomy
Kucera et al. Ceska Gynekol. 2007	2006	1	D&C to hysterectomy
Seov et al. Ultrasound Obstet Gynecol. 2004	1995-2000	1	D&C to hysterectomy
Jiao et al. Chin Med Sci J. 2008	1994-2007	1	D&C to hysterectomy
Our case	2007-2008	1	D&C to laparotomy

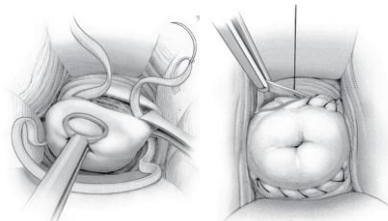
Suction evacuation: technique

- Misoprostol PR
- Infiltrate with bupivacaine 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



"Shirodkar"

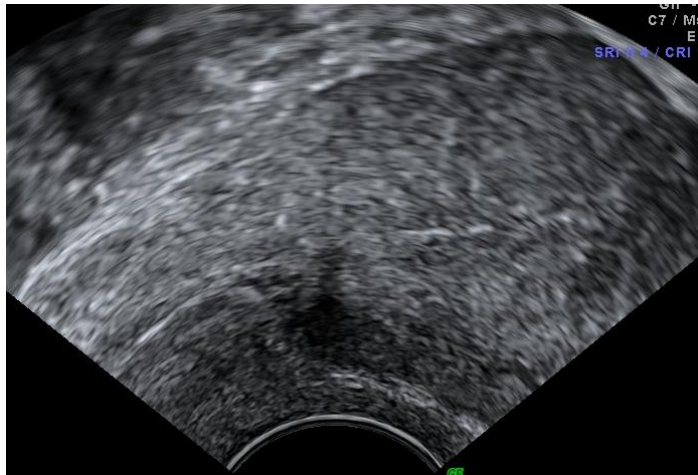
"4-steps"



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

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

* median, range
1997 – 2013

King's & UCH patients: outcome

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

* 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