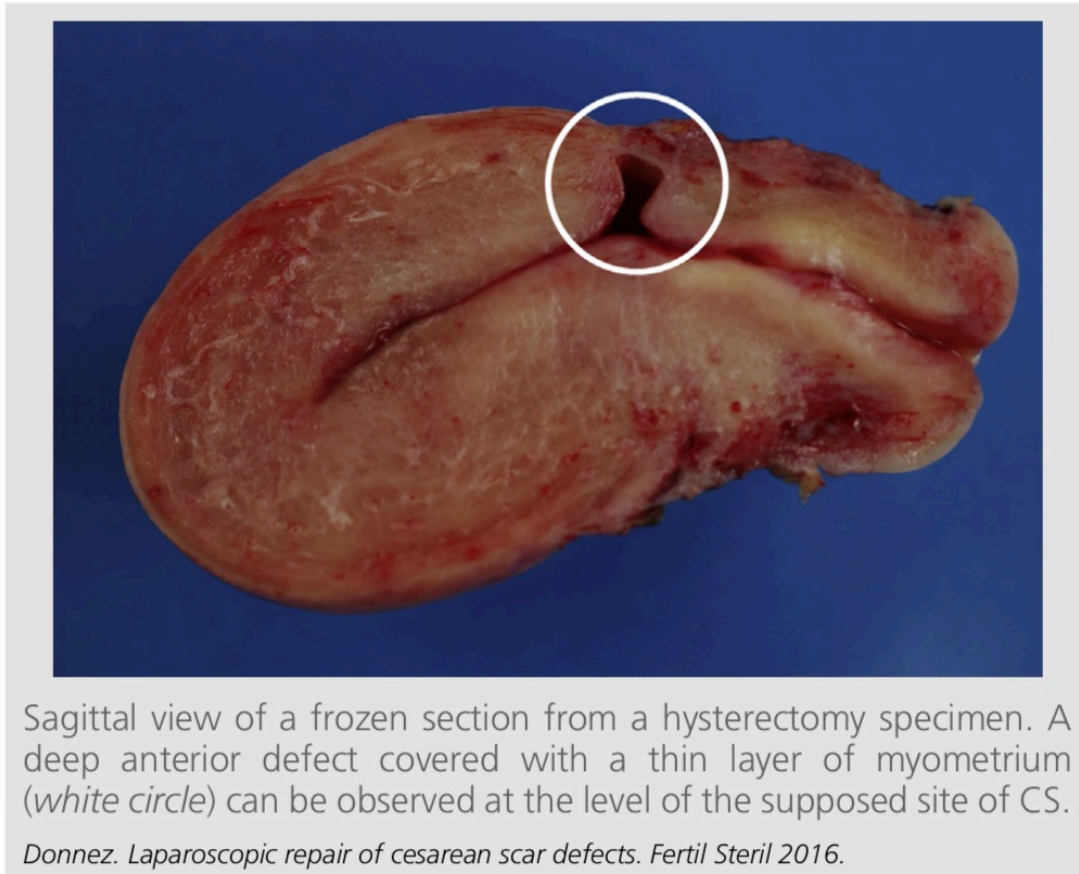


Isthmococele / Uterine Niche

Tim Chang September 2020

Intro

There is increasing incidence of CS in modern times which has led to a new condition of isthmococele (uterine niche) first reported by Morris 1995 (pathologist from RSA)



Incidence /Prevalence

- US 24-70% post CS
- SSG 56-84%
- MRI

Prevalence higher in those with symptoms.

Definition and classification (variable)

A defect / diverticulum in the anterior uterine wall representing myometrial discontinuity from previous CS of >2mm represented on US as an hypoechoic area in the myometrium

Classification:

Size:

- Large >50% reduction myometrial thickness or RM <2-3mm
- Small RM ≥ 3mm or <50% myometrial thickness

Anatomy

- Simple 1 defect only
- Simple with 1 branch
- Complex (multiple branches)

Symptoms

- Absent / present

Location

- Upper 2/3 cervix and isthmus 85% : CS done electively or early labour
- Lower 1/3 cervix : CS done at advanced dilatation with short cervix

Aetiology / pathogenesis

Risk factors

- Retroverted / retroflexed uterus
- Multiple CSs (reported 100% niches after 3 CSs)
- Lower scar position esp at ≥ 5 cm dilatation with lower presenting part
- Surgeon technique eg Incomplete closure (omitting endometrium) , 1 layer closure and locking sutures(leads to tissue hypoxia)?
- Early adhesions / poor wound healing , genetics etc

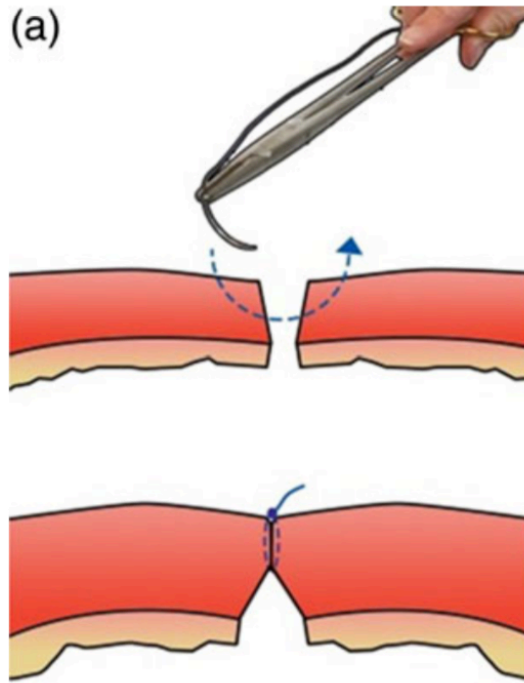
Table 4

Predisposing factors for cesarean scar defect					
Authors	Study type	No. patients	Population	Outcome	Results
Vikhareva Osser et al. 2010 [21]	Prospective cohort	108	Previous cesarean	Factors increasing the risk of large niche	Cervical dilatation ≥ 5 cm and station of the presenting part at caesarean increased the risk. Retroflexed uterus and duration of active labour ≥ 5 hours associated with a large niche.
Vikhareva Osser et al. 2009 [23]	Case-control	287	Women who delivered vaginally (n = 125); Women with at least one previous cesarean (n = 162).	Prevalence	Scar defects in 61% (66/108), 81% (35/43) and 100% (11/11) after one, two and at least three caesareans.
Yazicioglu et al. 2006 [30]	Randomized controlled trial	137	Previous caesarean	Evaluation of two different suturing techniques.	Full thickness suturing including the endometrium reduced the rates of uterine niche. Less cervical dilatation was associated with niche formation.
Hayakawa et al. 2006 [27]	Prospective cohort	137	Previous caesarean	Evaluation of single or double layer closure and other perioperative parameters.	Double layer closure decreased the risk. Other factors included increased gestational age at delivery, twin pregnancies, premature rupture of membranes and pre-eclampsia.
Yasmin et al. 2012 [13]	Randomized double blind	90	Previous caesarean	Evaluation of different suturing techniques on scar thickness and dehiscence at subsequent caesarean.	Locking of the first layer in single or double layer closure was associated with lower myometrial thickness compared with non-locked double layer closure.
Ceci et al. 2012 [10]	Prospective cohort	60	Pregnant women who underwent their first cesarean.	Single-layer continuous locked closure vs. single layer interrupted sutures.	No difference in the rate of scar defects (87%). Single-layer continuous locked closure was associated with larger defects.
Ofili-Yebovi et al. 2008 [26]	Prospective cohort	324	Previous cesarean and TVS for various gynecological indications.	Risk factors	A history of multiple cesareans, retroflexed uterus and the inability to visualize all cesarean scars in women with previous multiple cesareans were associated with a niche.
Wang et al. 2009 [17]	Cross-sectional	207	Previous cesarean	Association between the size of a niche and uterine position and number of previous cesarean.	Defect size was significantly greater in women with history of multiple cesareans and retroflexed uteri.
Monteagudo et al. 2001 [29]	Prospective cohort	44	Previous cesarean and SHG for various gynecologic indications	Association between the number of previous cesarean surgeries and the size of the niche and thickness of the residual myometrium.	No correlation between the number of cesareans and the size of the niche or the mean thickness of the residual myometrium.

Tulandi 2016

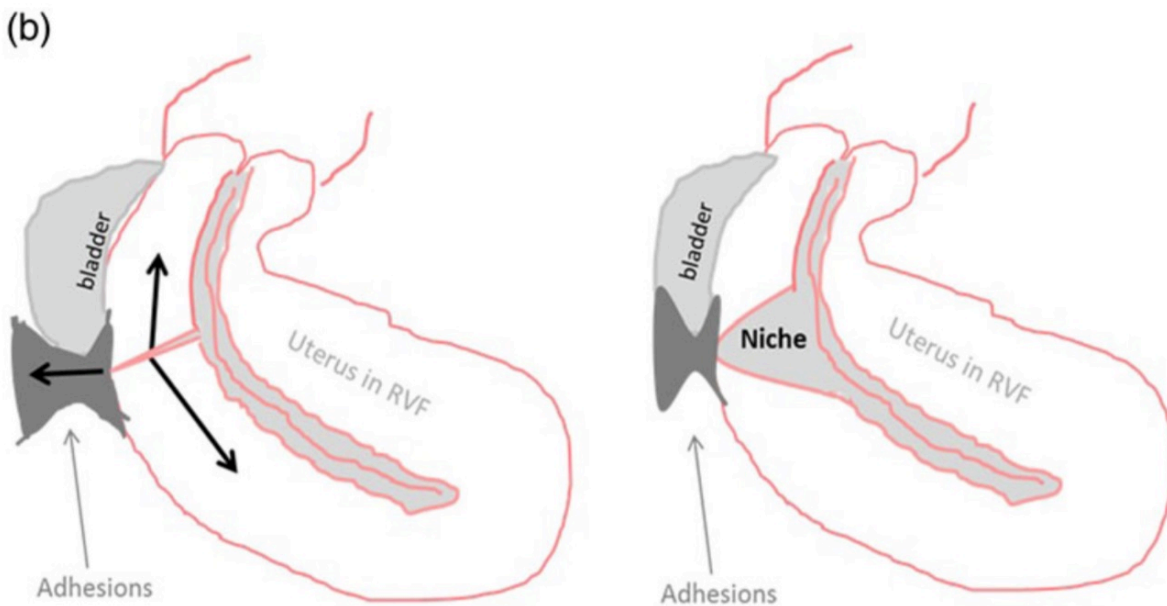
Theories of isthmocoele formation

- Incision through cervical tissue (thru mucous glands with defective healing) eg avoid bladder flap
- Incomplete closure of the CS wound (esp single layer and shallow bites suture not incorporating whole myometrium)



Vervoort 2015

- Early adhesion formation from scar pulling to the abdominal wall leads to pulling forces on the uterine scar esp with retroflexed uterus. Meticulous haemostasis, avoiding infection, avoiding devascularisation important.



Vervoort 2015

- Impaired wound healing / genetic factors

Presentation

Asymptomatic (2/3)

Symptoms more common if Residual Myometrial Thickness (RMT) <50% of adjacent myometrium

AUB (30-80% with niche may have AUB)

- Often Postmenstrual spotting or IMB
- Collection blood from menses unable to be expelled due to fibrosis
- secreting blood / mucous from niche which is hypervascular or has endometriosis within the scar
- correlation with size of defect and AUB
 - RMT <50% adjacent myometrium more likely AUB RR 6.13

Pelvic pain / dysmenorrhoea (34-68% of patients with niche have pain)

- inflammatory infiltration of the scar
- increased contraction

Infertility (4-19% reduction in fertility after CS. Most studies did not look at rates reduced fertility after niche per se)

Pathogenesis

Chronic inflammation / blood deposits affect:

- Cervical mucus
- Sperm transport
- Embryo implantation

Women with previous CS had 10% lower birth rate than those who had VD

Obstetric

- Placenta accreta
- CS scar EP
- Uterine dehiscence

Some data suggests size of uterine niche found on US non pregnant state with large D/RMT ratio increased risk of dehiscence / rupture

Investigations / Diagnosis

US

- 24-70% post CS
- ideally performed follicle phase cycle D7-14 (often fluid present in the cavity)
- lack studies measuring accuracy and validity of niche measurements but the essential measurements especially for the planning or surgery:
 - sagittal
 - height
 - depth
 - distance from external os
 - bladder fold (vesicovaginal fold) to apex niche
 - RM and adjacent myometrial thickness (AMT)
 - transverse width niche

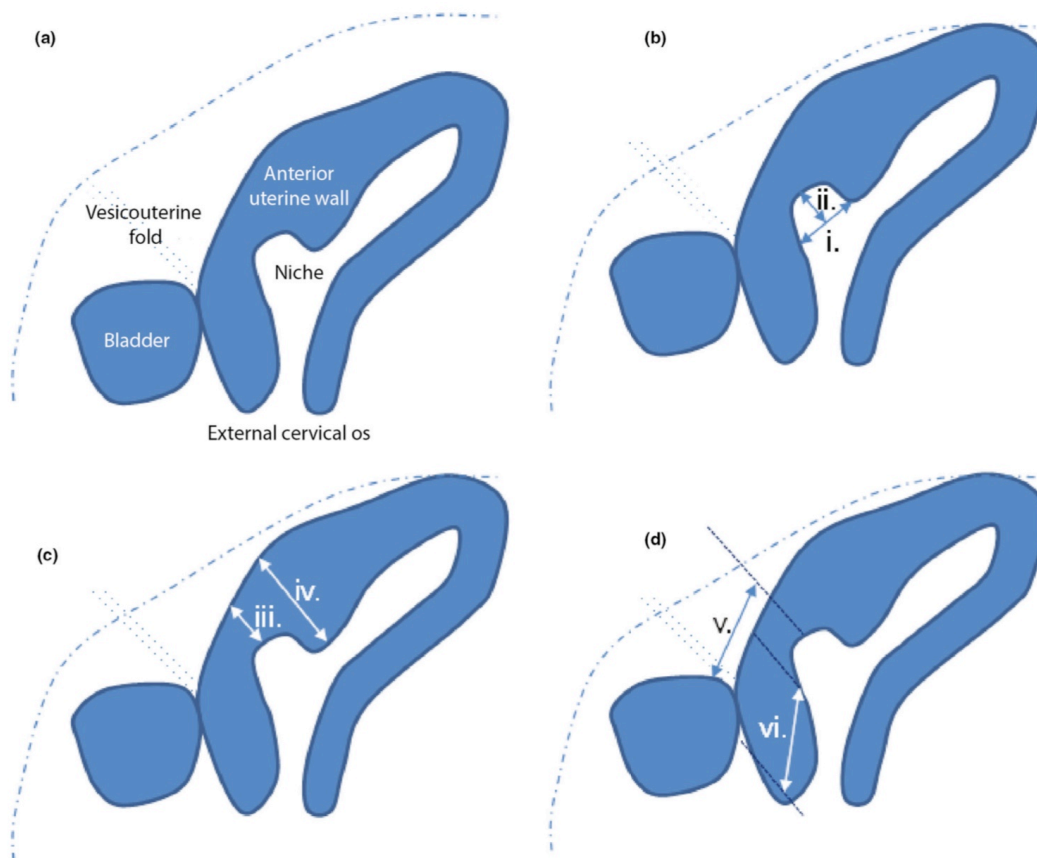
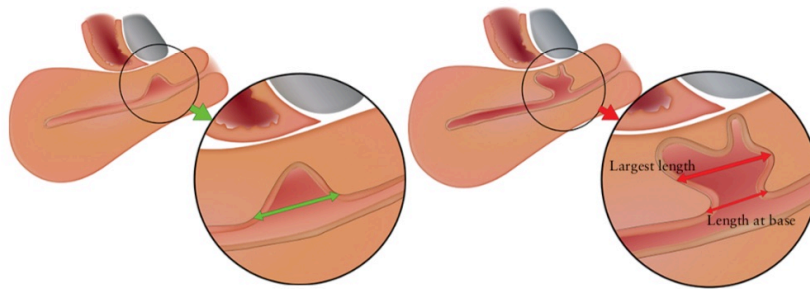
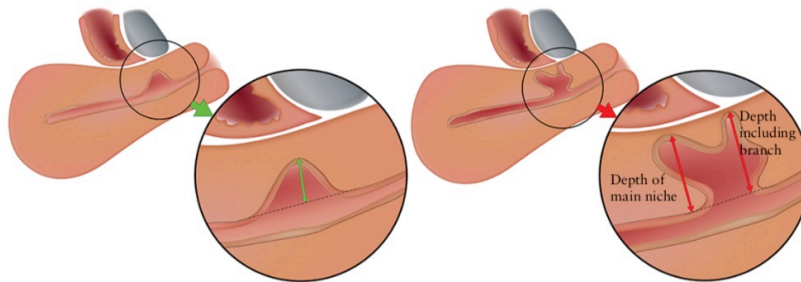


Figure 2. Schematic demonstrating the appearance of the caesarean niche. (a) In sagittal view, a sonographic defect of at least 2 mm associated with a residual myometrial thickness of <5 mm defines the presence of a niche on transvaginal ultrasonography. (b–d) Essential sonographic measurements including length (i.), depth (ii.), RMT (iii.), adjacent myometrial thickness (iv.), niche to vesicouterine fold (v.) and niche to level of external cervical os (vi.) are depicted. If present, branches are treated separately with regard to depth and RMT measurements. RMT = residual myometrial thickness.

from Brook et 2020

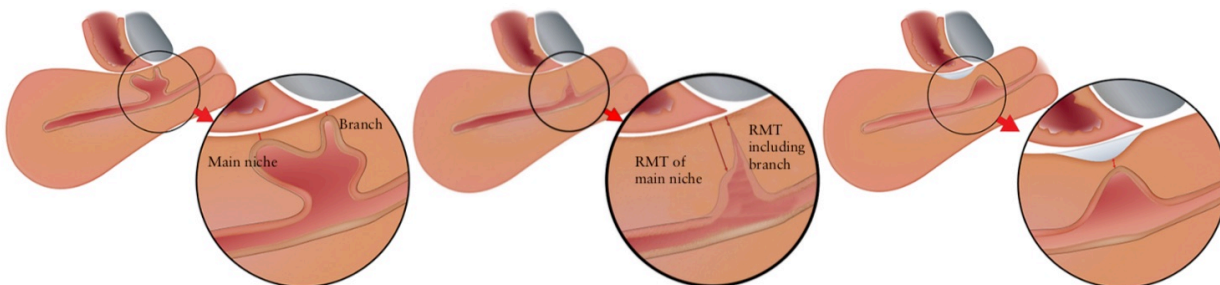


(a) Niche length. Both largest length and length at niche base should be measured.



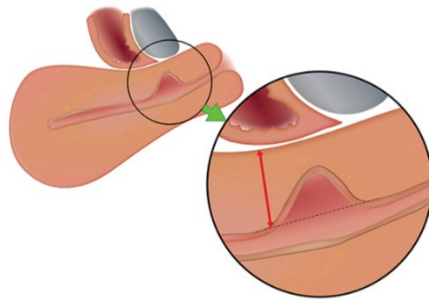
(b) Niche depth. Largest depth should be measured, both of main niche and including deepest branch if branches are present.

Jordans 2019

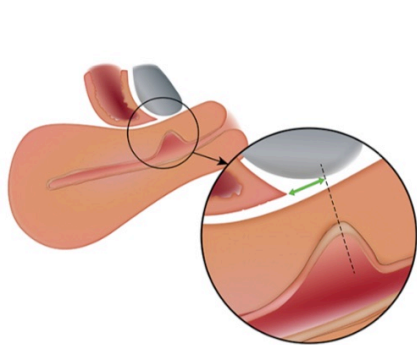


(c) Residual myometrial thickness (RMT). Thinnest point of RMT should be measured, regardless of direction (measured perpendicular to serosa but not necessarily to uterine cavity), both from main niche and, if there are any branches, from branch with thinnest RMT. Fibrosis is not included in RMT measurement.

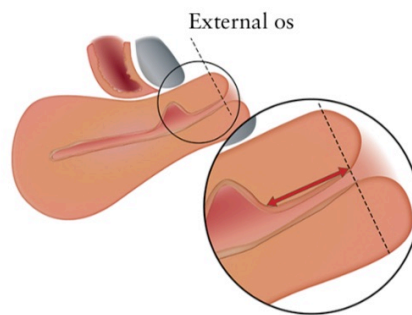
Residual myometrial thickness Jordans 2019



(e) Adjacent myometrial thickness (AMT).
AMT should be measured close to niche, where myometrium is thickest.



(f) Distance between niche and vesicovaginal (VV) fold. Niche–VV fold distance should be measured from level of top of main niche (where residual myometrial thickness is smallest (dotted line)) to VV fold.



(g) Distance between niche and external os. Niche–external os distance should be measured parallel to cervical canal, from most distal point of niche to external os.

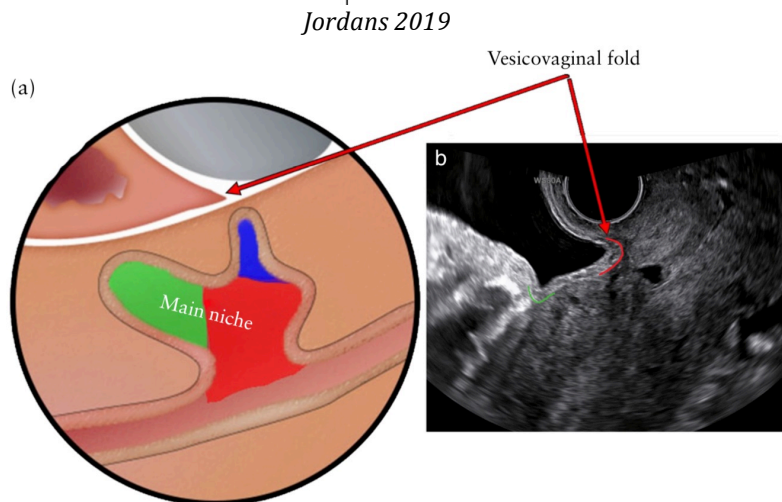


Figure 3 Main niche and vesicovaginal fold. (a) Red and green areas represent main niche and blue area represents branch. (b) Green line indicates plica vesicouterina or uterovesical fold, while red line indicates vesicovaginal fold.

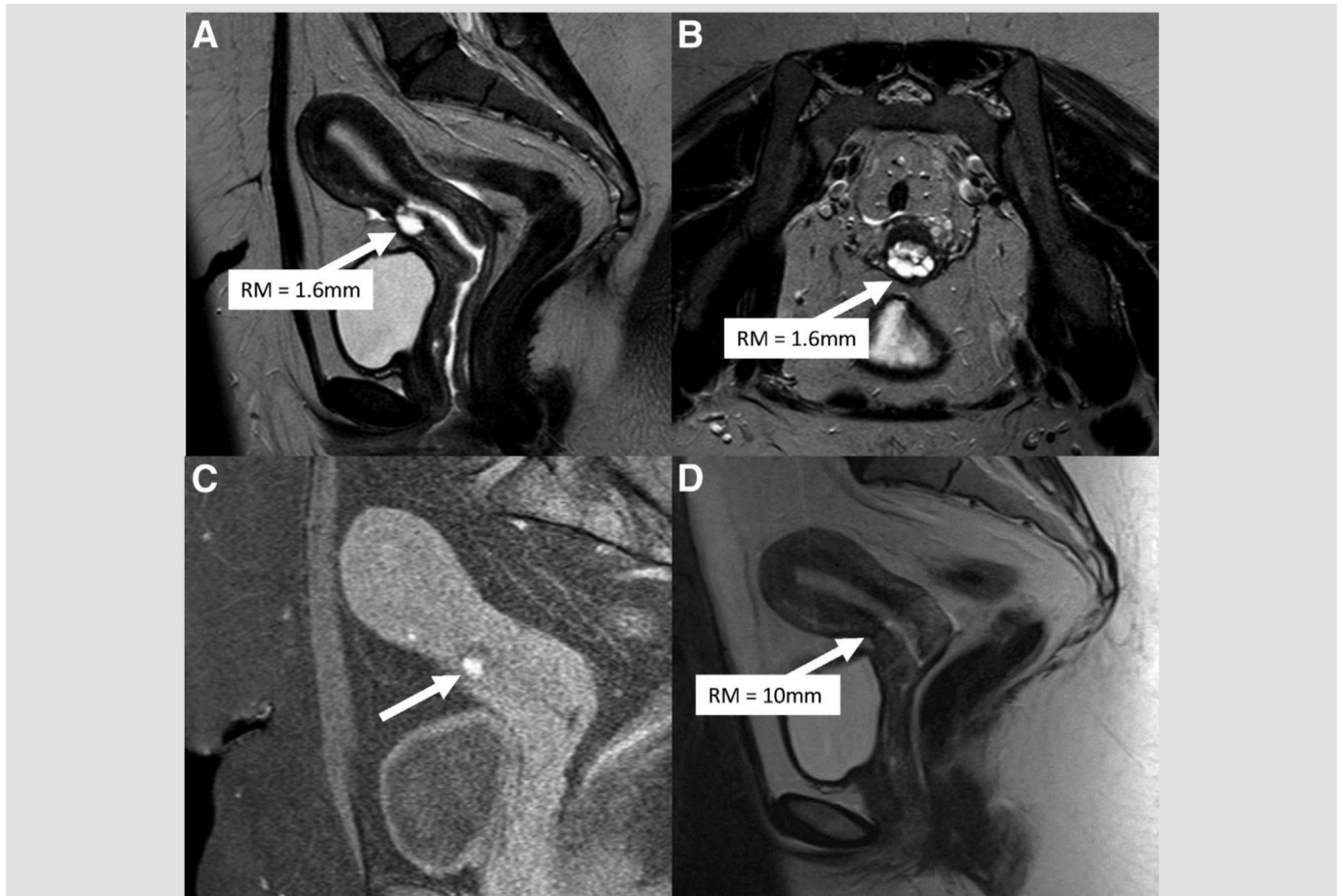
Jordans 2019

distance niche to VV fold important in surgical planning

SSG

- 56-84% post CS
- more sensitive and specific than TVUS
- planning for surgical treatment
- potentially niche may appear bigger due to fluid distension

MRI



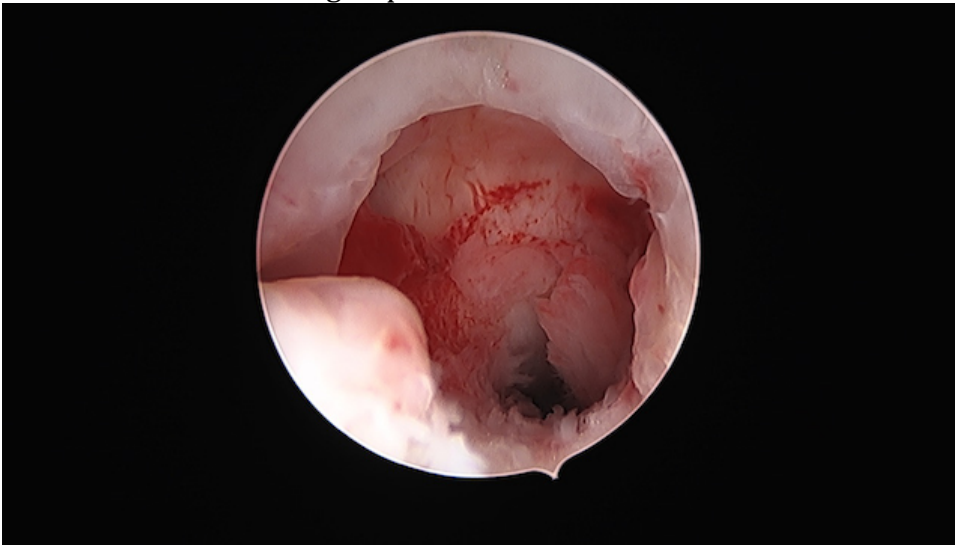
(A) Preoperative sagittal view of a T2-weighted image shows the residual myometrium (RM; *white arrow*) measuring 1.6 mm, covering a deep cesarean scar defect. (B) Preoperative transversal view of a T2-weighted image from the same patient. The RM covering the scar (*white arrow*) is very thin. (C) Sagittal view of a T1-weighted image with saturation of fatty tissue showing hypersignals (*white arrows*) inside the cesarean scar defect, suggestive of blood retention. (D) Sagittal view of a T2-weighted image after laparoscopic repair. The defect is no longer visible, and the RM at the level of the isthmus (*white arrow*) measures 10 mm.

Donnez. Laparoscopic repair of cesarean scar defects. Fertil Steril 2016.

good correlation MRI and US to histology

Hysteroscopy

- defect seen upper cervix cavity like
- vessels branching or punctation



Management

Depends on

- Symptoms
 - Bleeding
 - Pain
 - infertility
- Size
- Future pregnancy desires

Medical management

OCP

High dose OCP can improve AUB symptoms short term

Tahara et al N= 11

10/11 resolution in symptoms after 3- 6 cycles OCP (EE50mcg + 500mcg norgestrol) then stopped

FU around 6 months

Maybe useful short term treatment

Mirena

No trials but good idea

GnRHa

For short term treatment

Surgical Approaches

Hysteroscopic

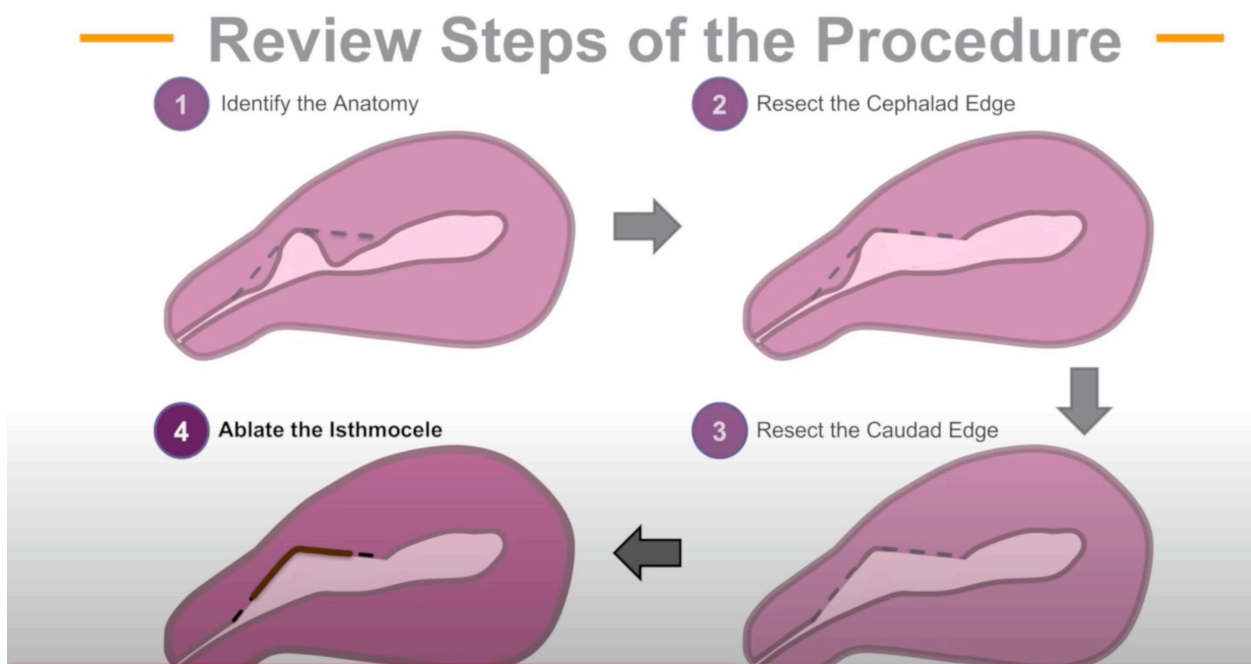
Criteria

- Symptomatic
- RM >3mm
- ? not desiring pregnancy? Some studies suggest RM >4mm with <50% D/RMT ratio maybe suitable
- anteflexed / anteverted uterus better outcome retroflexed

Technique

- Use of US guidance good idea but no evidence of lower morbidity
- Instillation blue dye in the bladder assists ID perforation
- Resect lower edge (distal)
- Resect upper edge (proximal) omitted in some studies concern weakening cervix and cervical IC
- Ablate base

Aim even out the lower and upper edges of the niche so the blood / fluid is not trapped with



ablation of the base.

Anna Abacjew-Chmylko et

metaanalysis n=448 non RCT

Success 85% with complete resolution 70% AUB

No real data on pain or fertility outcome

Duration of surgery 15-50 minutes average 30min Dependent on size of the niche (measure width x depth mm²)

Risks

- perforation uterus
- bladder injury

some studies looked at pregnancy after hysteroscopic repair

Table 6

Outcome of surgical repair of cesarean scar defect in women with infertility

Author	Study type	Total No. patients	Procedure	No. pregnancy
Fabres et al. 2005 [31]	Retrospective cohort	11	Hysteroscopy	9 (81.8%) wall thickness cut-off values not reported)
Gubbini et al. 2008 [25]	Prospective cohort	9	Hysteroscopy	7 (77.8%) wall thickness cut-off values not reported)
Gubbini et al. 2011 [16]	Prospective cohort	41	Hysteroscopy	41 (100%) 24 months after surgery wall thickness cut-off values not reported)
Tanimura et al. 2015 [6]	Prospective cohort	4 18	Hysteroscopy Laparoscopy	4 (100%) 10 (55.6%), wall thickness cut-off values ≥ 2.5 mm for hysteroscopy

pregnancy rates 80-100% in selected cases (Tulandi 2016)

HystNiche trial RCT (registered 2015) comparing hysteroscopic resection vs control looking at AUB improvement. Awaiting results

Laparoscopic repair

Criteria

- RM <3mm
- Symptoms
- Wants to preserve fertility

Layers 1-3

Technique

- Combined laparoscopic / hysteroscopic
- ID the niche from below (typically hysteroscope which can transilluminate the defect and delineate the borders of the niche)
- Dissect the bladder off lower segment
- Excised scar tissue with scissors / laser
- Hysteroscope / Dilator in the cervical canal to ID defect
- Repair in 1 or 2 layers \pm peritoneum ((0) or 2(0) vicryl / PDS with (0) V lock)
- (interrupted 1st layer followed by continuous 2nd layer)
- adhesion barrier (? Necessary?)
- Shorten round ligaments (esp retroverted uterus)
- Hysteroscope to ensure uterine integrity

FU SIS /MRI 3/12

Attempt conception 3-6/12

Outcome measures

Vervoort 2018

N= 101 FU 6 month with US

- Symptomatic with RM <3mm
- Increased myometrial thickness (1.43mm-9.62mm on MRI)
- Bleeding 90% improvement
- Pain 90% improvement
- Fertility 45% pregnant after hx of infertility

Donnez 2016

N=38 case series followed up to 6 years

RM <3mm by MRI

All symptomatic

Surgical repair 3 layers

- Improved RM 1.4mm to 9.6mm
- 91% improved symptoms
- 44% become became pregnant and delivered
- 79% fibrotic tissue with 21% endometriosis and sig reduced muscular density

Vaginal

Similar improvement symptoms 90% AUB and better than hysteroscopic approach

More cost effective vs laparoscopy

More blood loss than hysteroscopic approach

Maybe challenging IDed scar defect vaginally with transillumination

Unable to visualise other pathology

Needs experienced vaginal surgeon

Steps

- Vaginal incision
- Dissect bladder off the cervix/ lower segment
- Incised bladder peritoneum
- ID niche and excision (aided palpation + hysteroscope)
- Repair in 2 layers

Hysterectomy

Ultimately treatment in those not desiring fertility

Bladder adhesions maybe issue

Pregnancy related issues

Should asymptomatic patients with large defect have surgical repair to prevent dehiscence?

What is the risk uterine rupture with uterine niche?

- Without repair
- After repair

What is the optimal time to measure niche after CS? Ideally >3 months

How Should women after repair of Niche be delivered ?

Can Antenatal assessment LUS predicting uterine dehiscence / rupture?

Kok et al

Metaanalysis 21 studies N= 2776

Antenatal US of LUS 34-39 weeks

75% non blinded

TA + TV

Full uterine thickness defect 3.1-5.1 mm and myometrial thickness 2.1-4mm are strong negative predictor uterine defect (dehiscence or rupture) during TOL

Myometrial thickness <2.0mm strong positive predictor uterine defect during TOL

Can measurement niche non pregnant state predict Risk of dehiscence

Pormoski et al

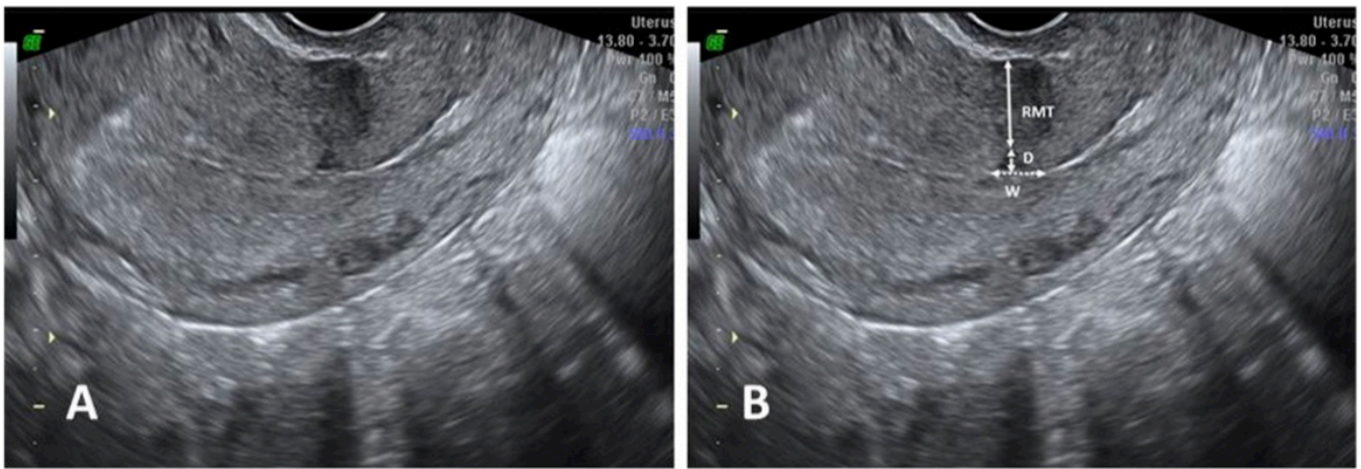
308 women with previous CS had measurement Niche TV US at 6 weeks Post Partum
exclusion:

- Double layer closure
- Puerperal infection
- Non LUS CS
- CS <37 weeks
- Uterine malformation

N= 41 followed up 8 years after first CS had repeat CS

Assessed risk of dehiscence at the 2nd CS (NO VBAC)

Of all parameters measured D/RMT ratio most predictive dehiscence



(D= depth hypoechoic area; RMT = residual myometrial thickness)

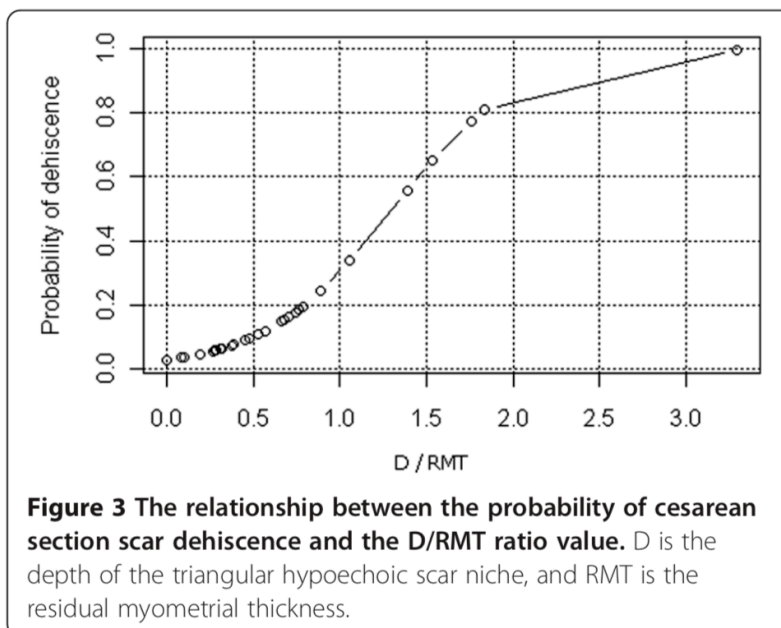


Figure 3 The relationship between the probability of cesarean section scar dehiscence and the D/RMT ratio value. D is the depth of the triangular hypoechoic scar niche, and RMT is the residual myometrial thickness.

threshold for dehiscence = 0.785; (<44% of RMT) below which no dehiscence (sensitivity 71% specificity 94%)

D/RMT =1.3035 (>57% RMT) risk dehiscence >50% (see graph)

Other questions regarding Niches for future research:

- Parameters eg size etc of niches to define clinical effects of niches?
- Do different parameters define different symptoms of niches?

CS scar EP

- Unknown what is the exact risk CSEP with niche
- Surgical treatment with preadjuvant UAE / MTX

Conclusions

There is an increasing rate of CS world wide, which will inevitably lead to increasing rise of Niche problems.

Need to look at ways to reduce Niche formation:

- Avoid CS (WHO recommends 15%)
- Surgical technique especially incision higher with non locking double layer closure

Early recognition symptoms and diagnosis of Niche

Understand treatment options and when to perform surgery

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