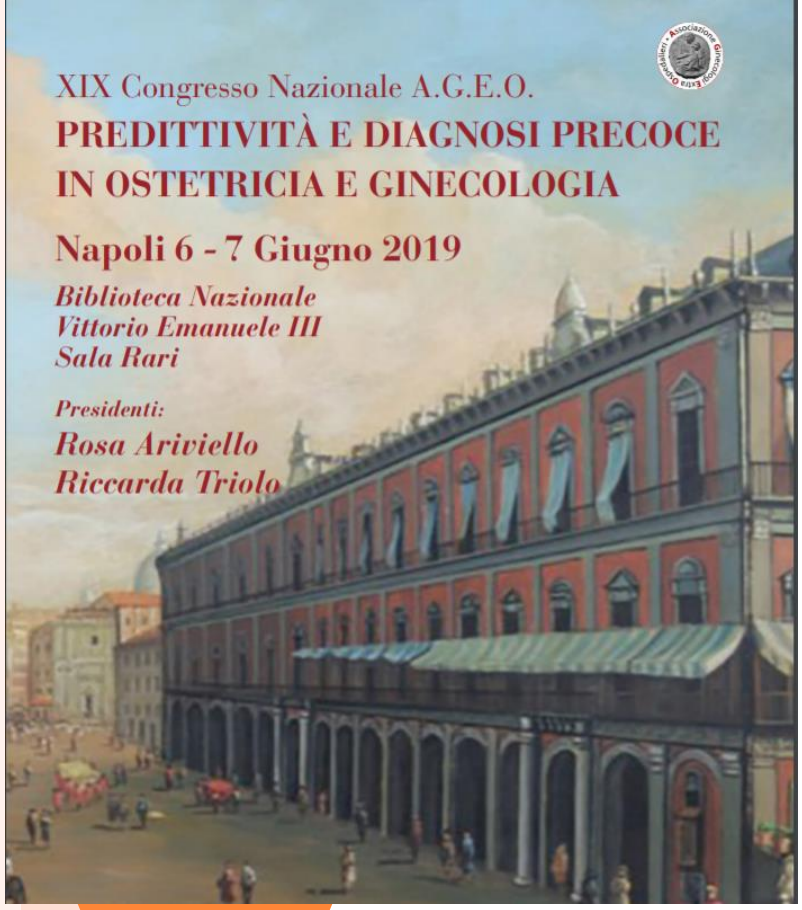
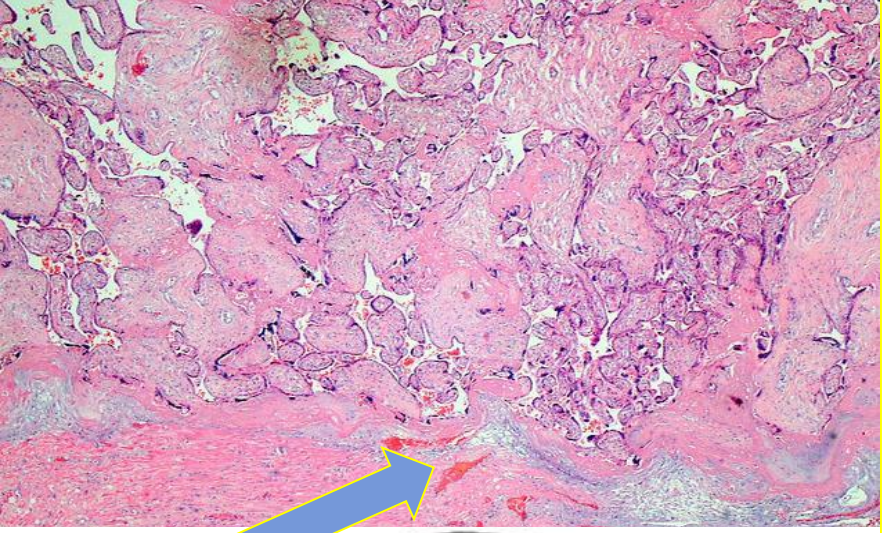


Predittività e diagnosi precoce dell'accretismo placentare

Dott.ssa *Laura Letizia Mazzarelli*

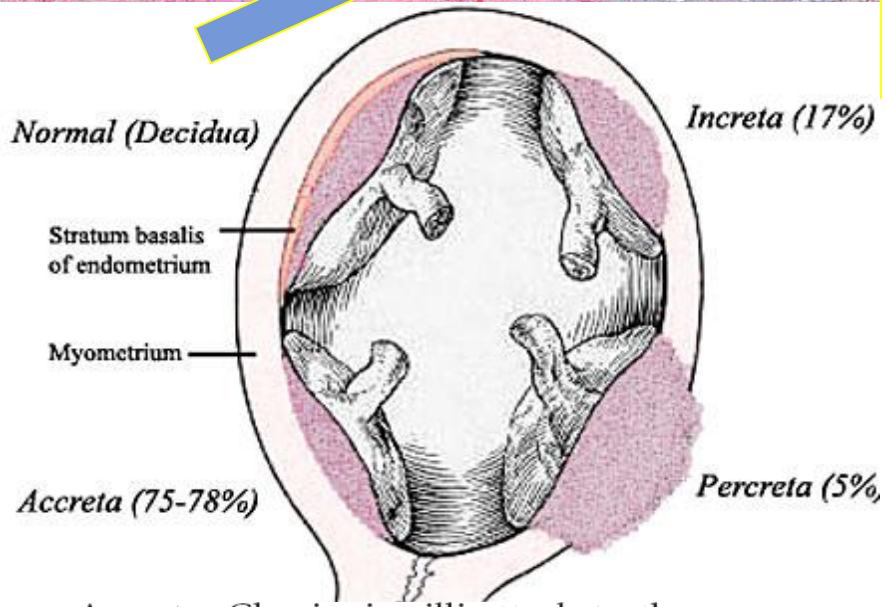
DIAGNOSTICA ECOGRAFICA E PRENATALE ANIELLO DI MEGLIO
AOU FEDERICO II



PLACENTA

ACCRETA

Differenti gradi di anomala aderenza parziale o totale della placenta alla parete uterina
(assenza/inadeguatezza della decidua basale)
caratterizzati da invasione del trofoblasto nel miometrio



Accreta. Chorionic villi attach to the myometrium, rather than being restricted within the decidua basalis.

Increta. Chorionic villi invade into the myometrium.

Percreta. Chorionic villi invade through the myometrium.

- **Deficit primario funzione/sviluppo trofoblasto**
- **Danno secondario basale: fallimento normale decidualizzazione (assenza focale /parziale/tot)**
- **Anomala vascolarizzazione e ossigenazione tissutale dell'area della cicatrice**

Oyelese Y,Ob Gyn 2006

Jauniaux Placenta 2011

PLACENTA ACCRETA: INCIDENZA

- 0.2% delle gravidanze
- 3-5% Placente Previe
- 1/30000 parti (anni 60)
- 1/2500 parti (1985-1994)
- 1/500 (2002)
- **1/333 !!!! (2000-2010)**
- 1/22000 PS
- Studiata da meno di 1 secolo
- Principale fattore rischio pregresse isterotomie
- Presenza P previa e precedenti TC amplificano il rischio di accretismo



Silver RM Obstet Gynecol 2006

Belfort M Am J Obstet Gynecol 2006

Fattori di rischio

- Pregresso taglio cesareo
- Pregressa chirurgia uterina
- Placenta previa
- Parità
- Età materna avanzata

TABLE 1

Frequency of placenta accreta according to number of cesarean deliveries and presence or absence of placenta previa[11]

Cesarean delivery	Placenta previa	No placenta previa
First (primary)	3.3	0.03
Second	11	0.2
Third	40	0.1
Fourth	61	0.8
Fifth	67	0.8
≥Sixth	67	4.7

SMFM. Placenta accreta. Am J Obstet Gynecol 2010.

Maternal Morbidity Associated With Multiple Repeat Cesarean Deliveries

Silver et al. – Obstet Gynecol 2006

30,132 TC elettivi

1) Stabilire se la morbilità materna aumenta all'aumentare del n° di TC

2) Stimare il rischio di placenta previa e accreta associato all'aumento dei TC

Table 4. Placenta Previa and Placenta Accreta by Number of Cesarean Deliveries

Cesarean Delivery	Previa	Previa*:Accreta† [n (%)]	No Previa‡:Accreta† [n (%)]
First§	398	13 (3.3)	2 (0.03)
Second	211	23 (11)	26 (0.2)
Third	72	29 (40)	7 (0.1)
Fourth	33	20 (61)	11 (0.8)
Fifth	6	4 (67)	2 (0.8)
≥ 6	3	2 (67)	4 (4.7)

2013

AOGS
ACTA Obstetricia et Gynecologica Scandinavica

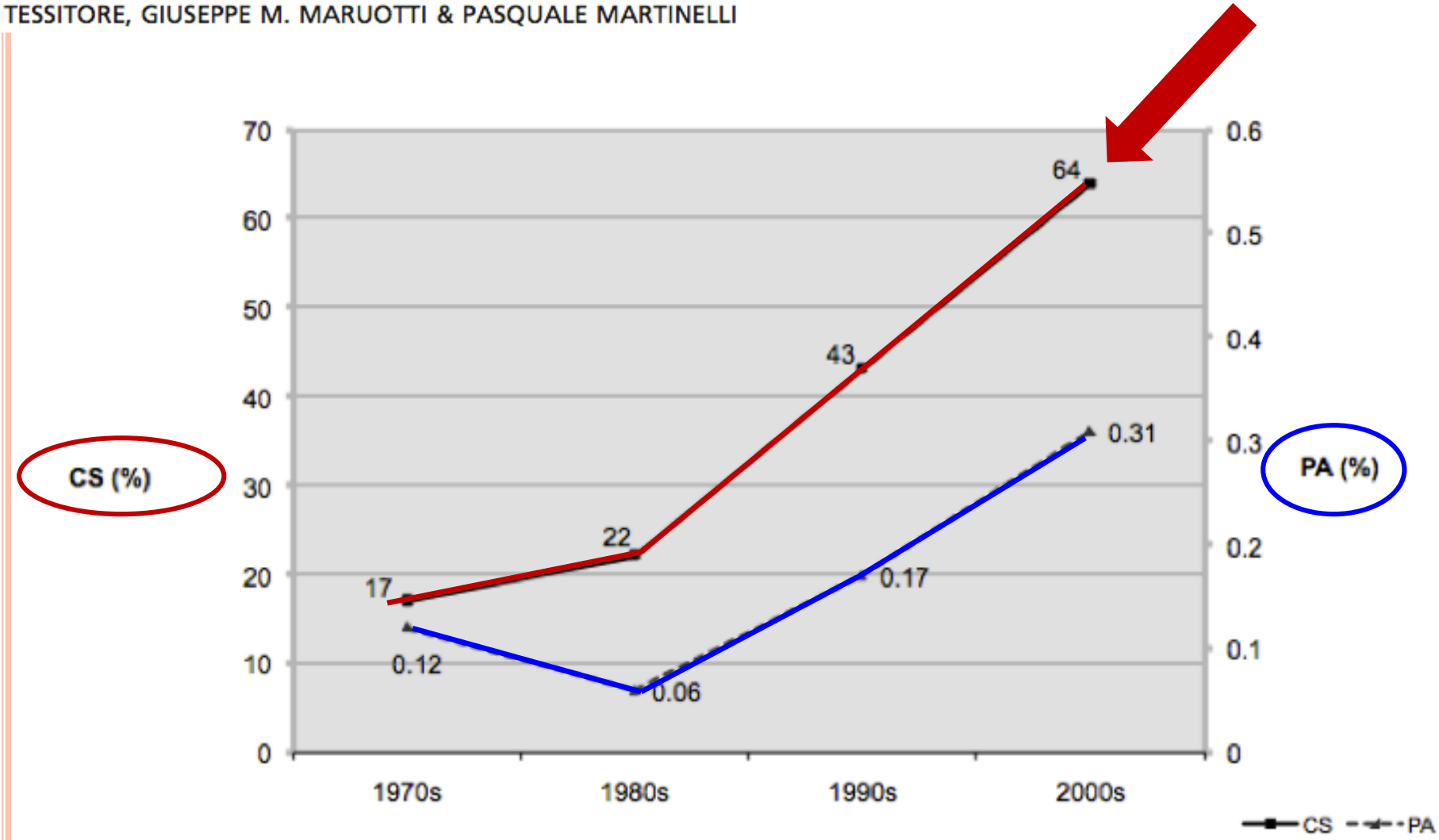
Placenta accreta: incidence and risk factors in an area with a particularly high rate of cesarean section

MADDALENA MORLANDO, LAURA SARNO, RAFFAELE NAPOLITANO, ANGELA CAPONE, GIOVANNI TESSITORE, GIUSEPPE M. MARUOTTI & PASQUALE MARTINELLI

	1970s		1980s		1990s		2000s		Total	
	n	%	n	%	n	%	n	%	n	%
PA cases	11	0.12	4	0.06	15	0.17	20	0.31	50	
Prior cesarean section*	4	36	2	50	3	20	14	70	23	46
1	2	18	0		0		5	25	7 14	
≥2	2	18	2	50	3	20	9	45	16 32	
Age ≥ 35 years	5	45	2	50	3	20	7	35	17 34	
Placenta previa	5	45	2	50	3	20	12	60	22 44	
Parity ≥ 2	7	64	3	75	3	20	10	50	23 46	
Prior curettage	4	36	0		9	60	8	40	21 42	
Other prior uterine surgery	2 (18)		0		0		0		2	4
IVF	0		0		0		1	5	1	2
Prior uterine embolization	0		0		0		1	5	1	2
Uterine malformation	1	9	0		0		0		1	2
Female sex of newborn	9	82	2	50	6	40	11	55	28	56
Prior cesarean section*, mean ± sd	0.6 ± 1		1.2 ± 1.5		0.4 ± 0.8		1.3 ± 1		0.9 ± 1	
Maternal age, mean ± sd	32 ± 5.5		32.7 ± 6.8		32.8 ± 5		33.5 ± 5		32.9 ± 5.1	

Placenta accreta: incidence and risk factors in an area with a particularly high rate of cesarean section

MADDALENA MORLANDO, LAURA SARNO, RAFFAELE NAPOLITANO, ANGELA CAPONE, GIOVANNI TESSITORE, GIUSEPPE M. MARUOTTI & PASQUALE MARTINELLI



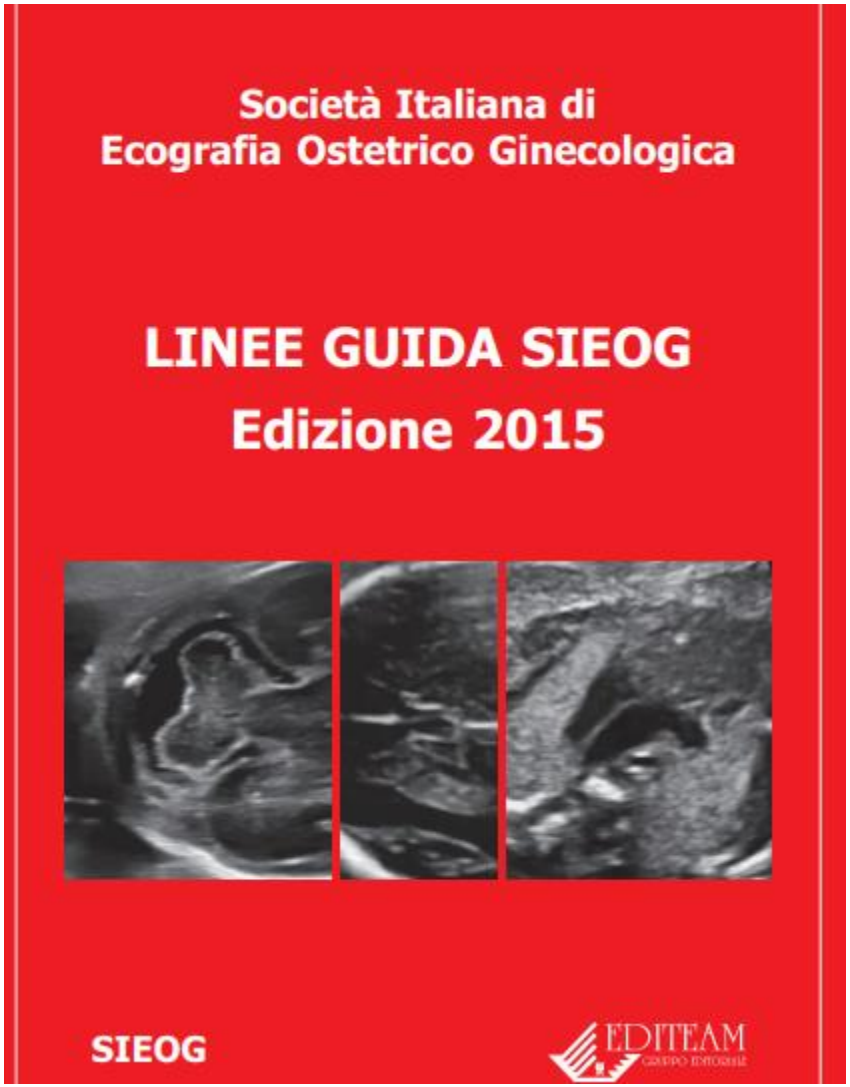
BJOG An International Journal of Obstetrics and Gynaecology

Royal College of Obstetricians & Gynaecologists

Placenta Praevia and Placenta Accreta: Diagnosis and Management

Green-top Guideline No. 27a

September 2018



LINEE GUIDA

ECOGRAFIA OSTETRICA
NEL SECONDO TRIMESTRE

Placenta
Localizzazione.

LINEE GUIDA

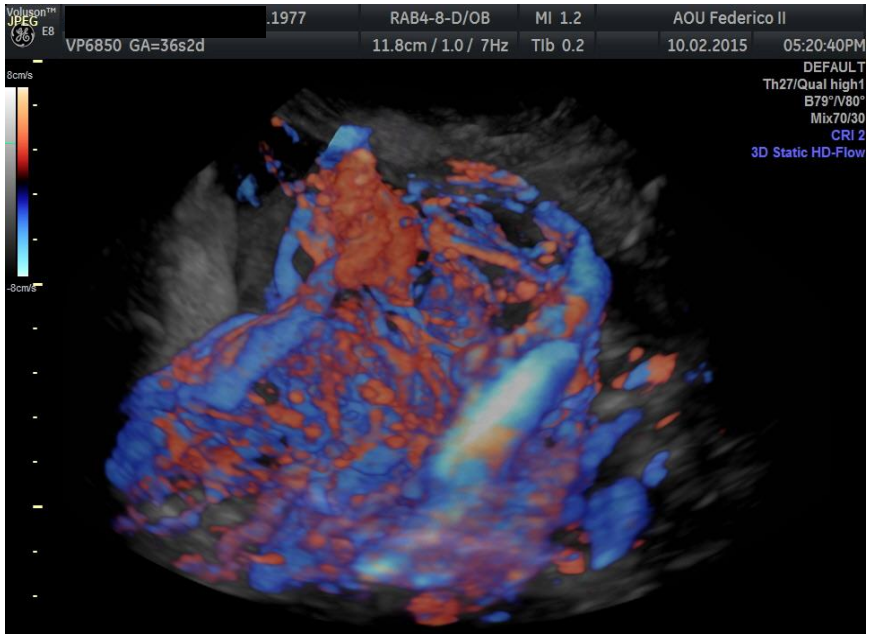
ECOGRAFIA OSTETRICA
NEL TERZO TRIMESTRE

1.2 Valutazione della quantità di liquido amniotico e dell'inserzione placentare.

APPROCCIO DIAGNOSTICO

- E’ importante effettuare la diagnosi prenatale di PA perché questo permette di pianificarne il management e di ridurre la morbilità Eller et al., BJOG 2009

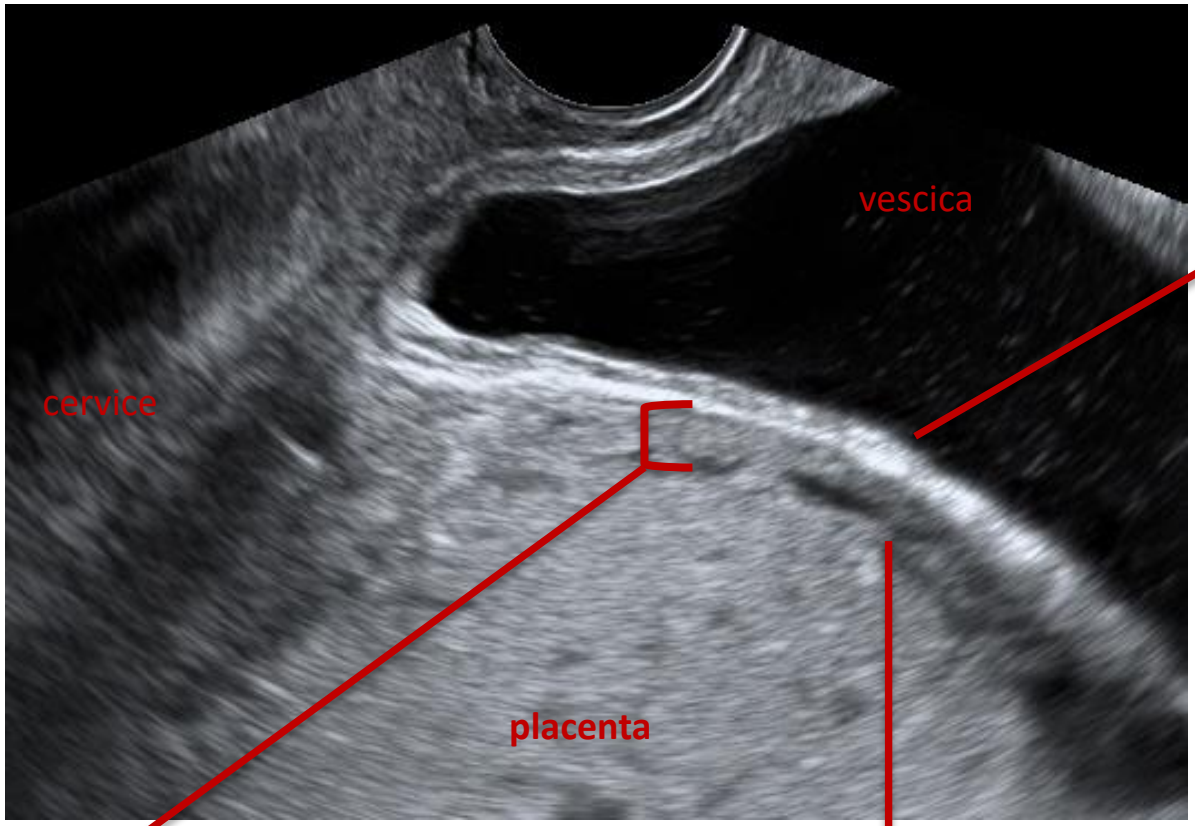
- La diagnosi può essere fatta con l’ultrasonografia (USG) o con la risonanza magnetica (RMN)





Placenta previa non accreta

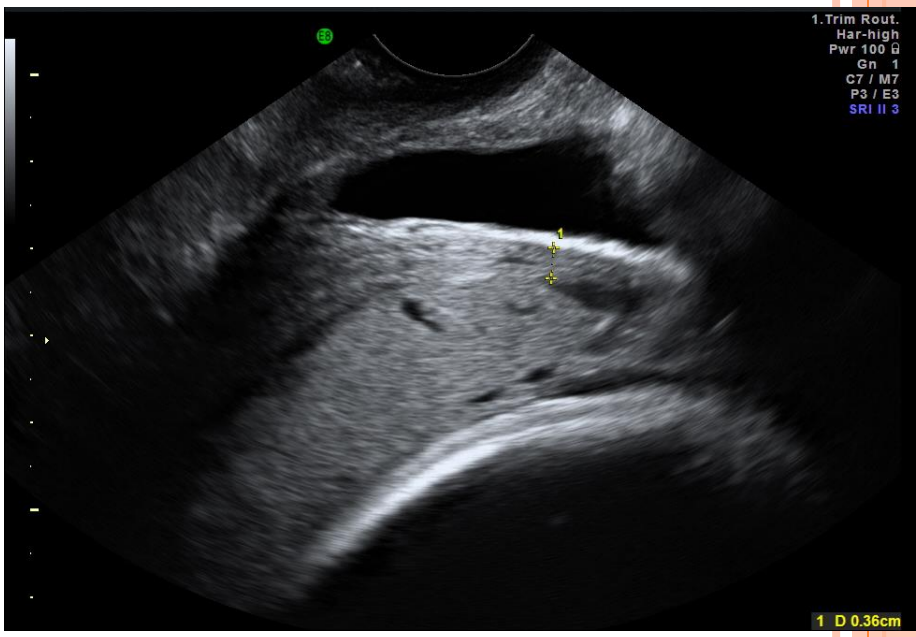
La parete uterina all'interfaccia utero-vescicale



Interfaccia utero-vescicale (bladder border)

Spessore miometriale

Spazio chiaro ipoecogeno retroplacentare (clear space)



- Over diagnosi di PA
- **65% casi sospettati USG poi confermati chirurgia/istologia**
- **Lacune placentari e perdita della zona chiara sono osservati anche in caso di placenta previa senza che vi sia aderenza della placenta**

Hamada S Prenatal Diagnosis 2011

Editorial

Proposal for standardized ultrasound descriptors of abnormally invasive placenta (AIP)

- The various wordings were unified into **a set of 11 descriptors**, 6 for 2D grayscale ultrasound, 4 for 2D color Doppler and 1 for 3D power Doppler

- Based on these new descriptors we are collecting evidence and expert opinions regarding the predictive value of these signs, aiming to develop guidelines for the diagnosis and management of AIP

Collins et al. UOG 2016

Members of the European Working Group on Abnormally Invasive Placenta

Thorsten Braun, *Charitè University, Berlin, Germany*;
Pavel Calda, *Department of Obstetrics and Gynecology, General Faculty Hospital, Charles University, Prague, Czech Republic*;
Kinga Chalubinski, *University of Vienna, Vienna, Austria*;
Frederic Chantraine, *Université de Liège, Liège, Belgium*;
Sally Collins, *John Radcliffe Hospital, Oxford, UK*;
Johannes Duvekot, *Erasmus MC-University Medical Centre, Rotterdam, The Netherlands*;
Jean-Michel Foidart, *Université de Liège, Liège, Belgium*;
Reynir Tómas Geirsson, *University of Iceland, Reykjavik, Iceland*:
Gilles Kayem, *Louis-Mourier, Columbes, France*;
Charlotte Krebs-Albrechtsen, *Rigshospitalet, Copenhagen University Hospital, Copenhagen, Denmark*;
Jens Langhoff-Roos, *Rigshospitalet, Copenhagen University Hospital, Copenhagen, Denmark*;
Louis Marcellin, *Groupe Hospitalier Cochin-Broca-Hôtel Dieu, Université Paris Descartes, Assistance Publique-Hôpitaux de Paris, Paris, France*;
Pasquale Martinelli, *University of Naples Federico II, Naples, Italy*;
Olivier Morel, *Maternité Régionale Universitaire de Nancy, Nancy, France*;
Maddalena Morlando, *University of Naples Federico II, Naples, Italy*;
Athanasios Mousiolis, *Alexandra University Hospital, Athens, Greece*:

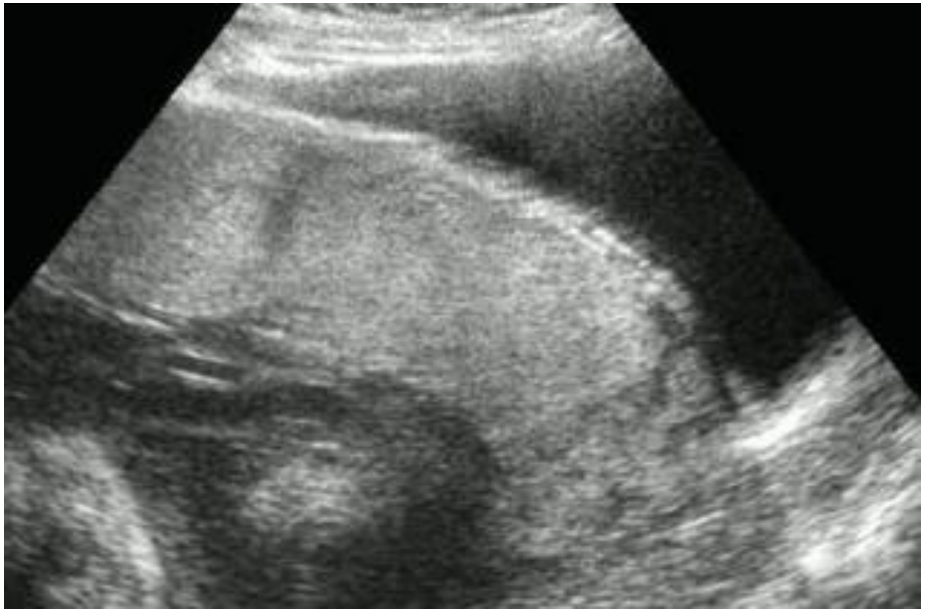
CRITERI DIAGNOSTICI

1. **Assottigliamento/assenza dello spazio ipoecogeno retroplacentare (CLEAR SPACE)**
2. **Assottigliamento/irregolarità/interruzione focale dell'interfaccia ipercogena tra sierosa uterina e vescica (BLADDER LINE)**
3. **Masse esofitiche attraverso la sierosa**
4. **Lacune placentari**
5. **Flusso lacunare**
6. **Spessore miometriale < 1 mm**
7. **Ipervascolarità dell'interfaccia tra sierosa uterina e vescica**
8. **Ipervascolarità tra placenta e margine uterino**

Clear space

- Linea ipoecogena di demarcazione tra miometrio e placenta rappresentante la decidua basale
- Manca in caso di accretismo in quanto vi è danno della decidua
- Spesso manca anche nelle gravidanze normali con placenta ad inserzione anteriore, mentre è quasi sempre presente in caso di inserzione posteriore

AUTORE	Sensibilità (%)	Specificità (%)	VPP	VPN
Comstock et al. 2004	73		14	
Wong et al. 2008	100	35	20	100
Calì et al. 2013	90.2	80.8	57	96.7

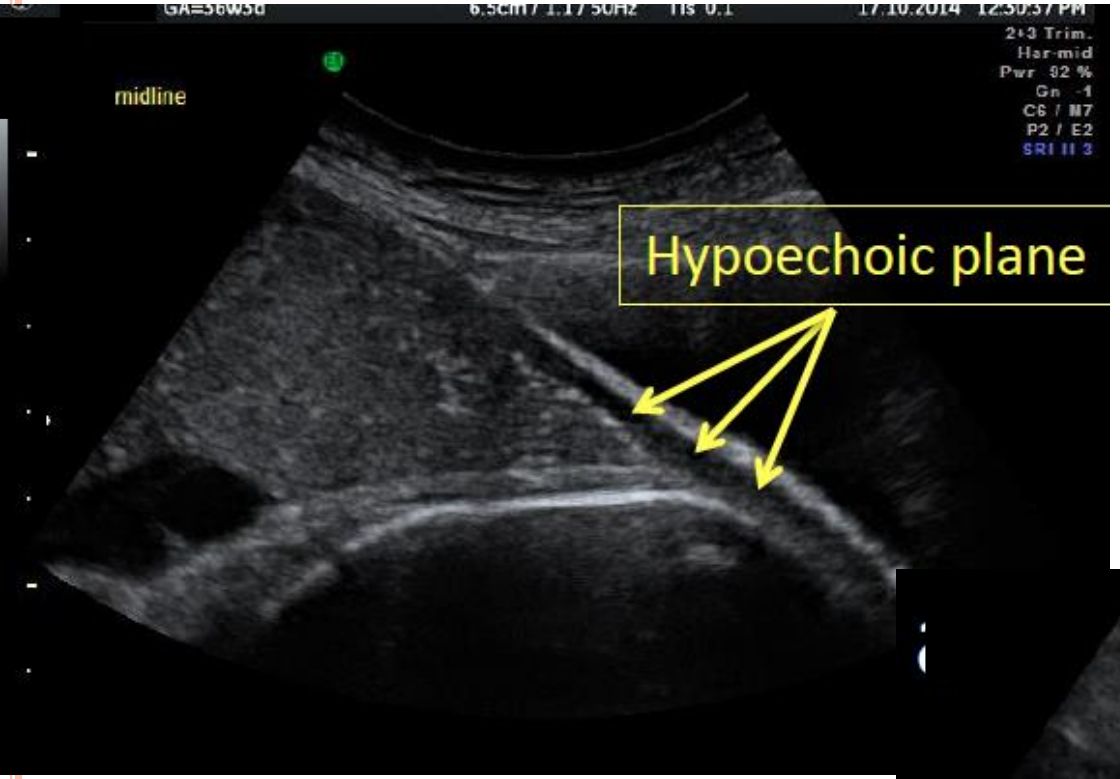


- Da non utilizzare da solo per la diagnosi dato l'elevato n° di falsi positivi
- L'assenza del segno permette di escludere la diagnosi

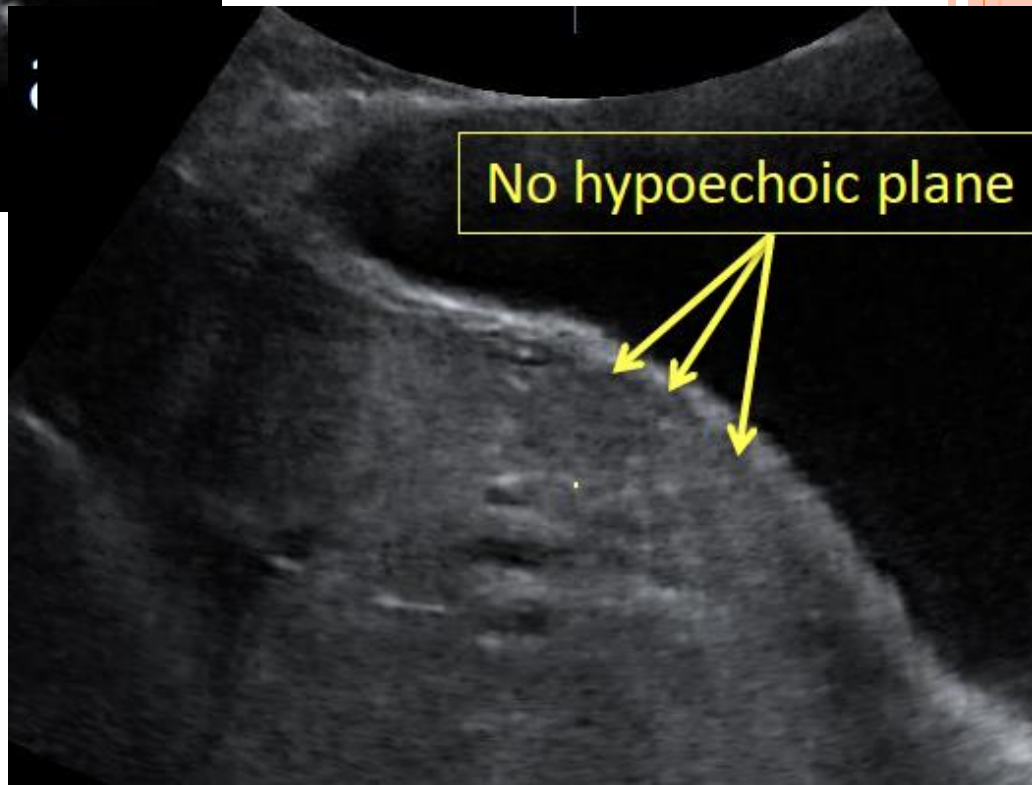
Comstock, Bronsteen 2013

Calì G et al. 2012

PERDITA DELLO SPAZIO IPOECOGENO

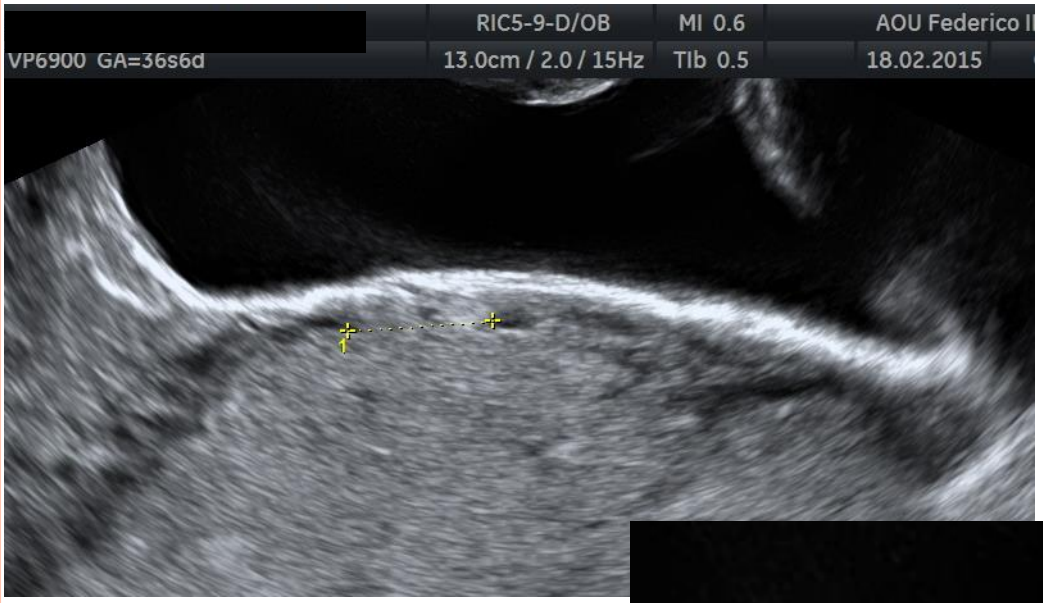


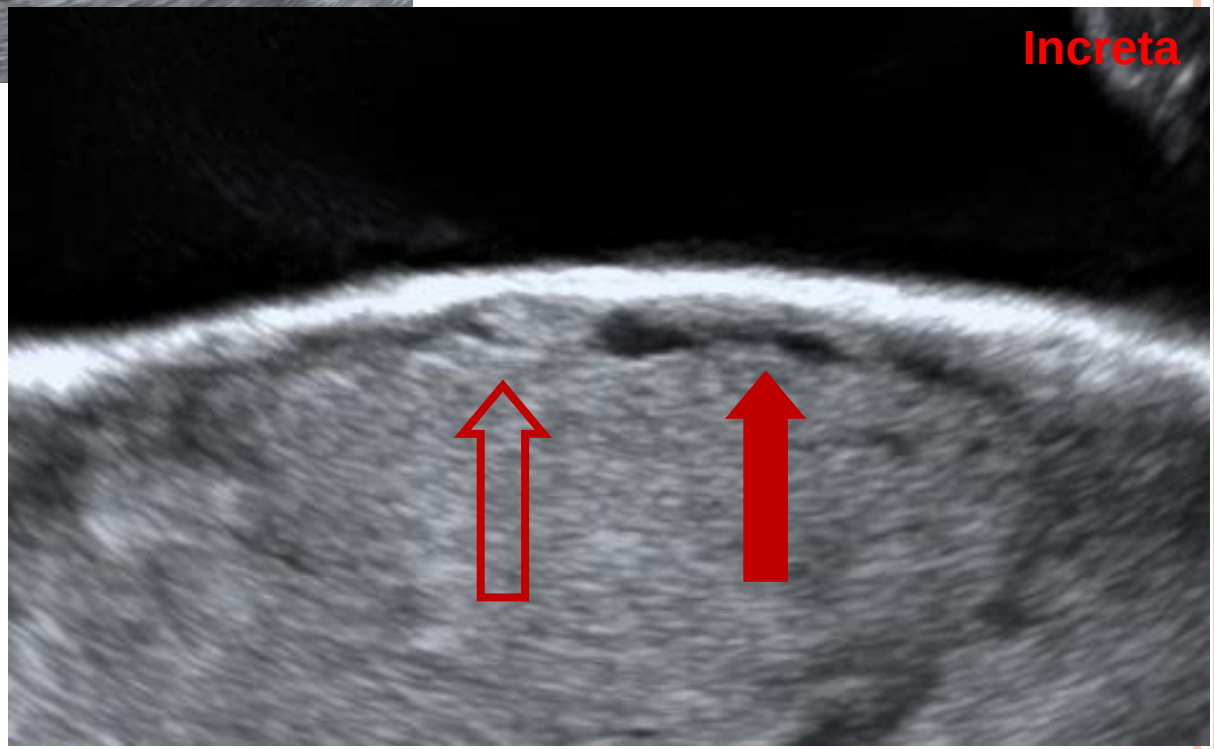
Perdita o irregolarità del piano miometriale ipoecogeno sottostante il letto placentare (il *clear space*)



Berkley et al., 2013

PERDITA DELLO SPAZIO IPOECOGENO



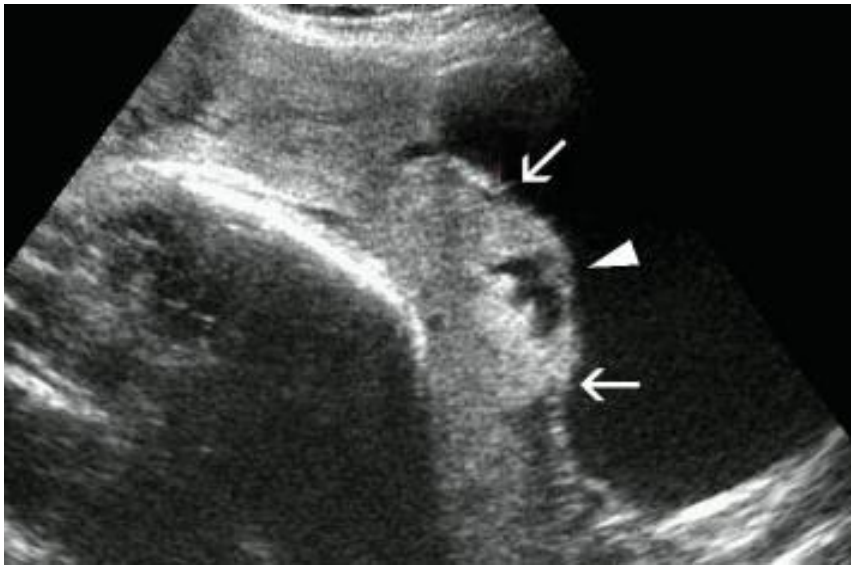


Bladder line

- L'interfaccia tra utero e vescica appare all'USG come una linea iperecogena continua
- Irregolarità/interruzione di tale linea in caso di accretismo conseguente all'aumentata vascolarizzazione presente in tale area
- Un'aumentata vascolarizzazione può essere dovuta anche alla presenza di varici formatesi in seguito ai pregressi tagli cesarei

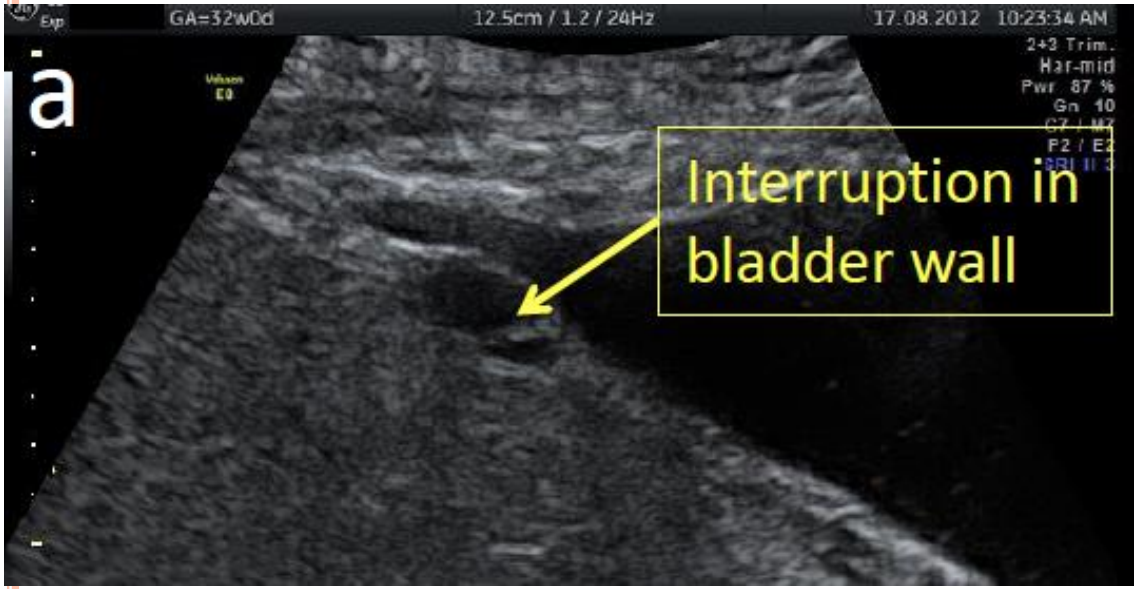
NB: L'interruzione della *bladder line* non è indicativa di percretismo!

AUTORE	Sensibilità (%)	Specificità (%)	VPP	VPN
Comstock et al. 2004	20		75	
Calì et al. 2005	70	99	96	92
Wong et al. 2008	11	100	100	88

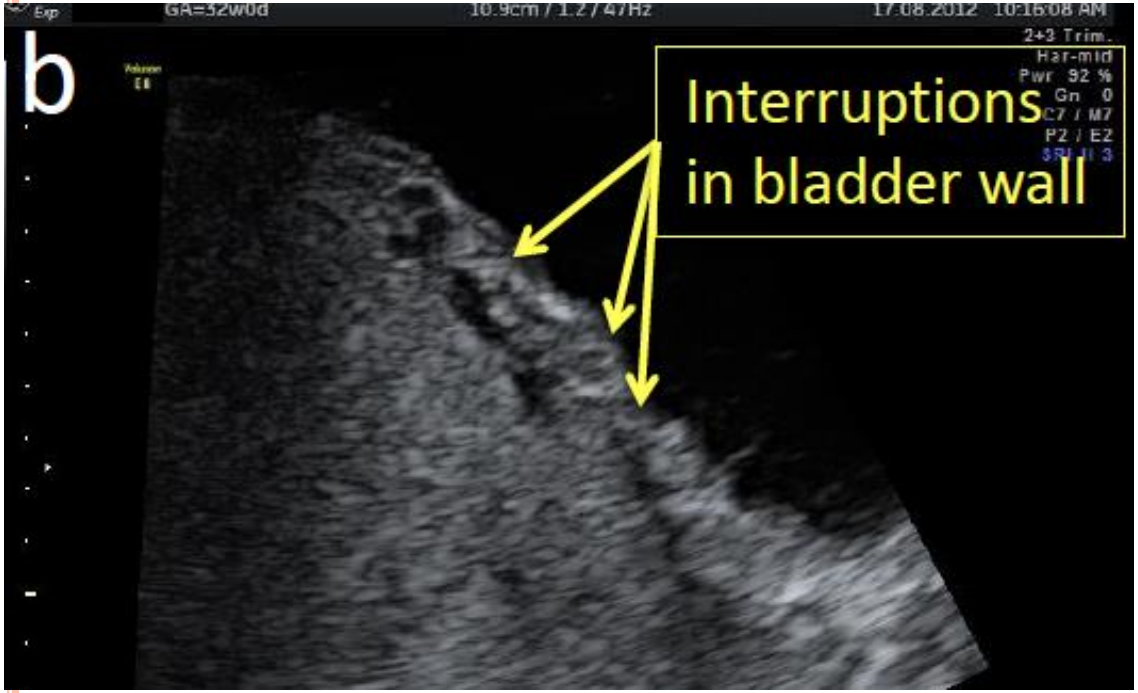


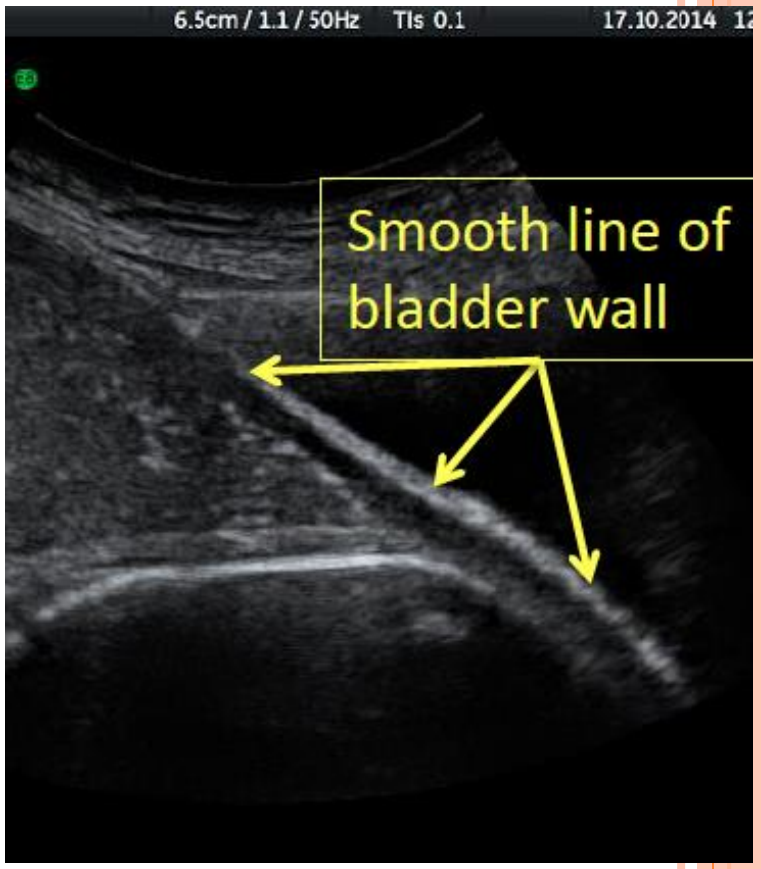
Comstock, Bronsteen 2013

ANOMALIE DEL MARGINE VESCICALE

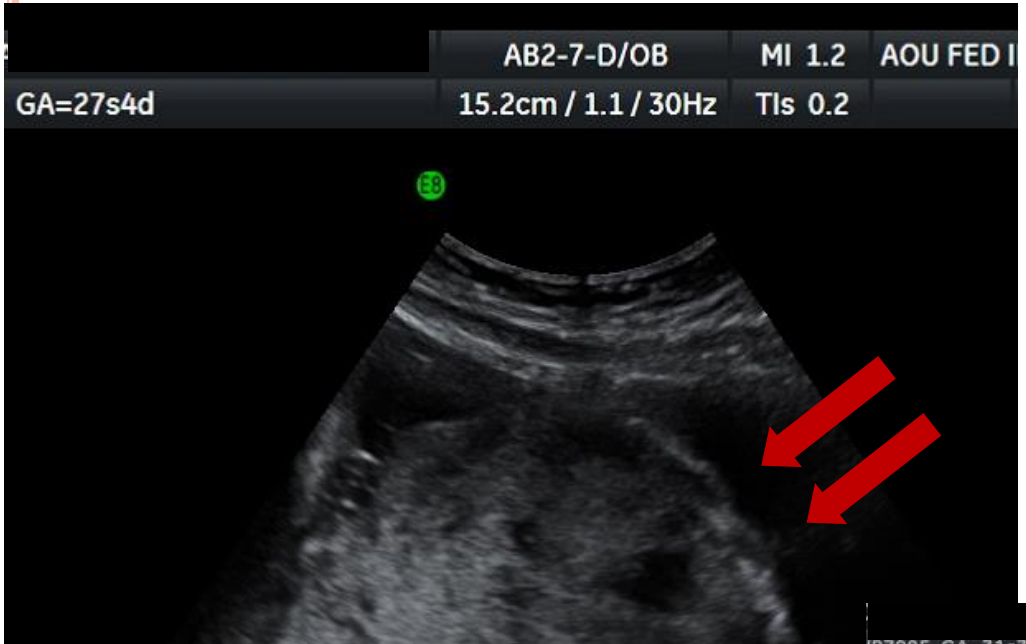


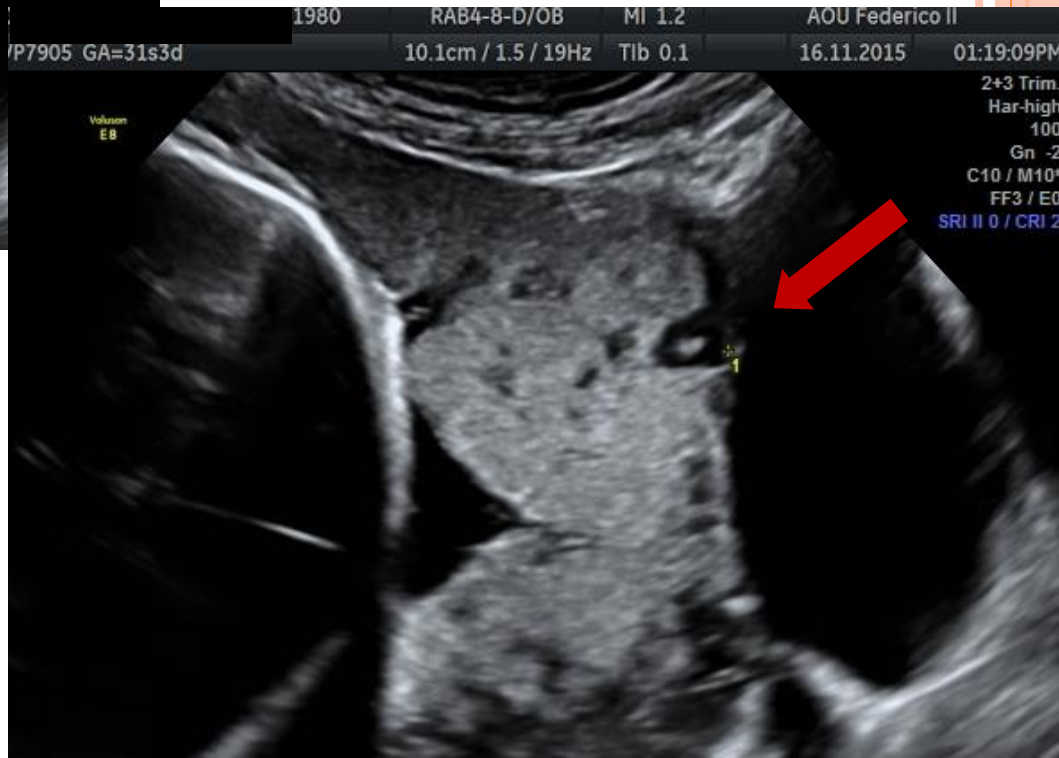
Perdita o interruzione della parete vescicale iperecogena





ANOMALIE DEL MARGINE VESCICALE





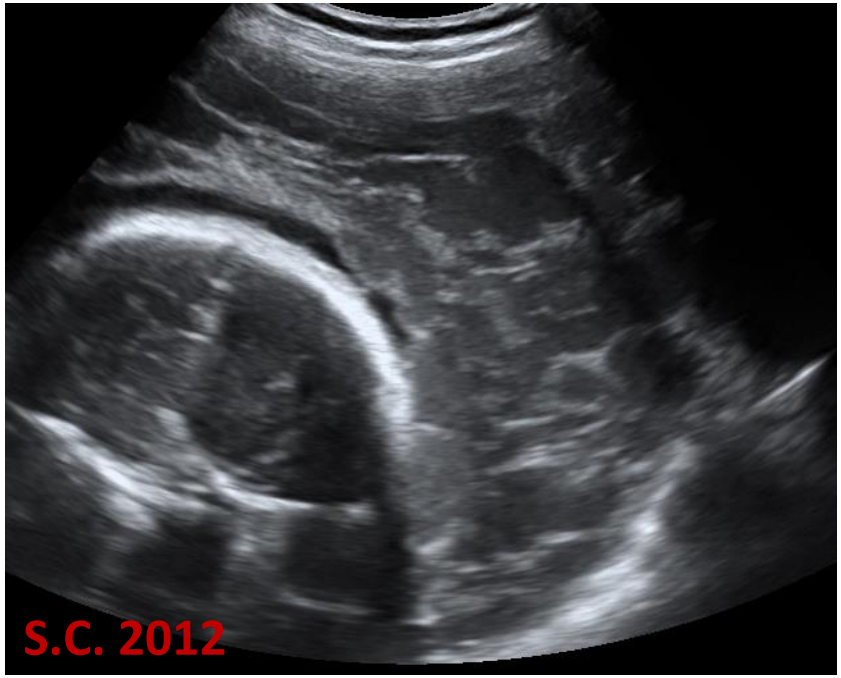
Lacune placentari

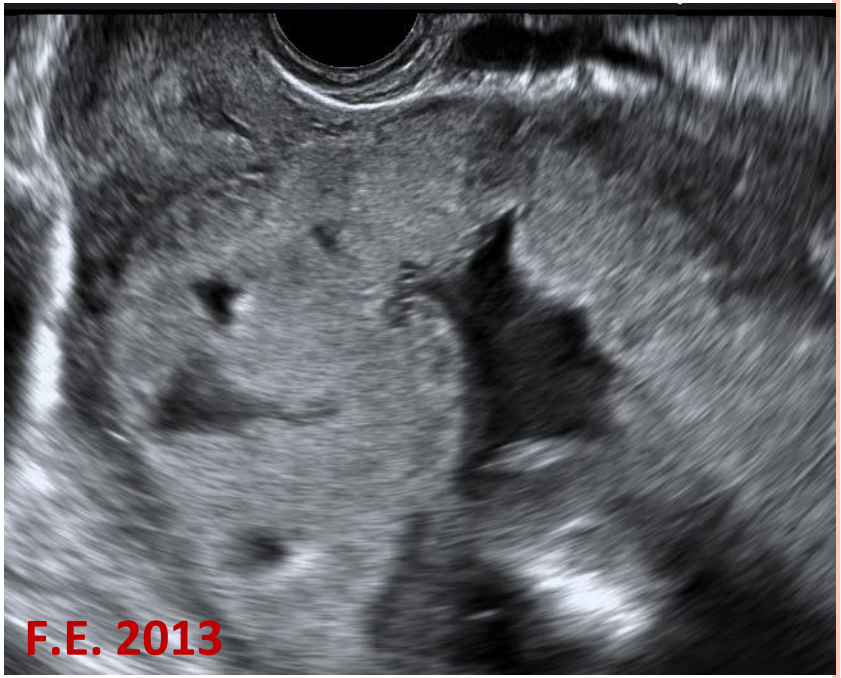
- Seni vascolari di forma irregolare ed oblunga e margini netti localizzati profondamente nello spessore placentare
- Presenza di flusso turbolento al Color Doppler
- Visibili precocemente nel corso della gravidanza
- Correlano col grado di infiltrazione placentare e con il ricorso all'isterectomia

AUTORE	Sensibilità (%)	Specificità (%)	VPP	VPN
Calì et al. 2013	73	86	60	90
Comstock et al. 2004	93		93	
Wong et al. 2008	100	28	21	100
Yang et al. Gr.≥1 2006	86.9	78.2	76.8	88
Yang et al. Gr.≥2 2006	100	97.2	93.8	100

Comstock, Bronsteen 201

LACUNE PLACENTARI



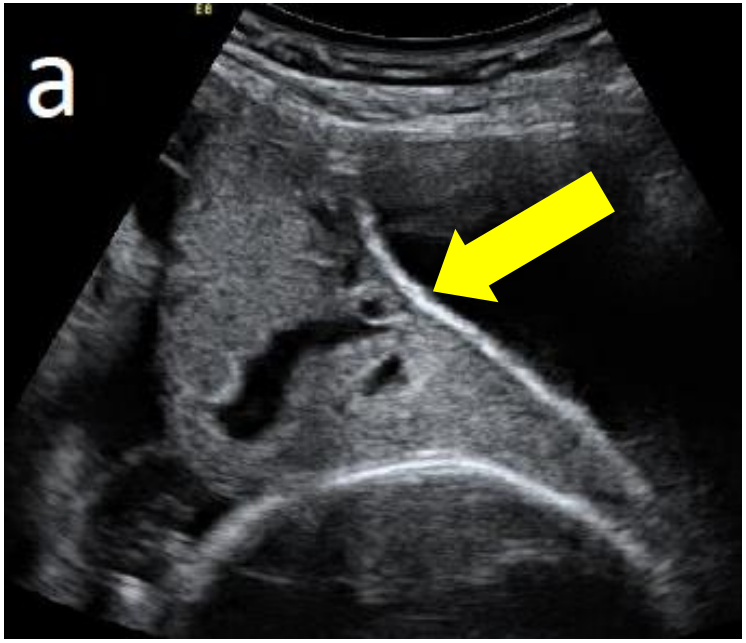


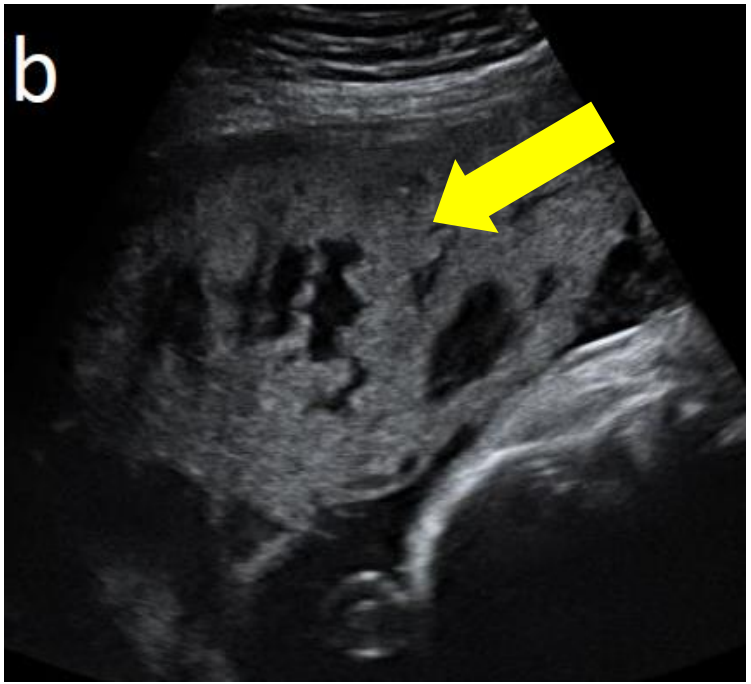
- > è il n° di lacune > la probabilità di accretismo
- Possono osservarsi in assenza di accretismo
- Nella placenta accreta hanno aspetto lineare e bordi irregolari, invece di essere rotondeggianti e lisce

Wong HS et al. 2008

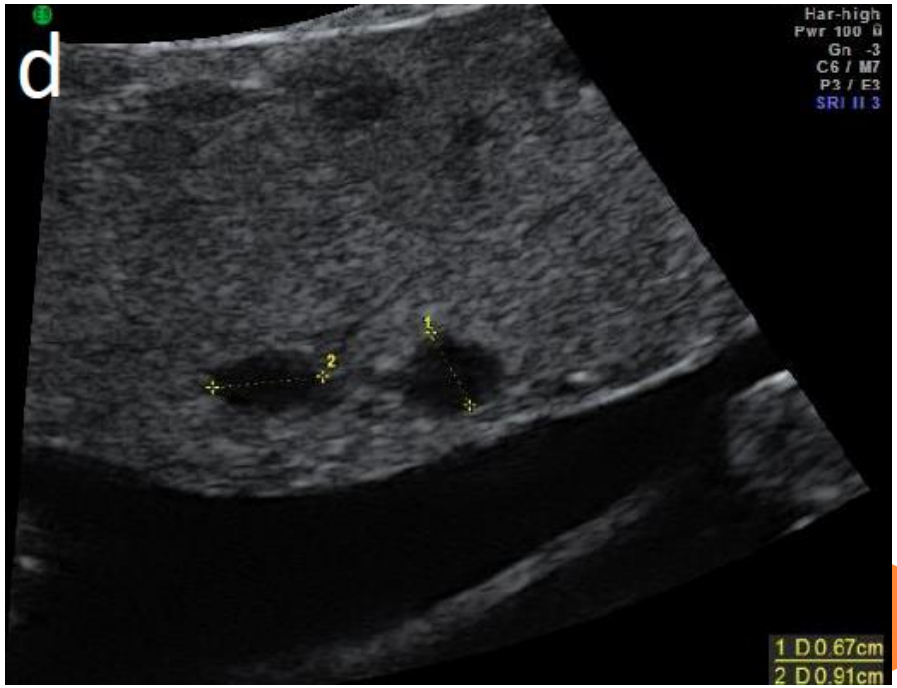
Comstock CH, 2005

LACUNE PLACENTARI ANOMALE



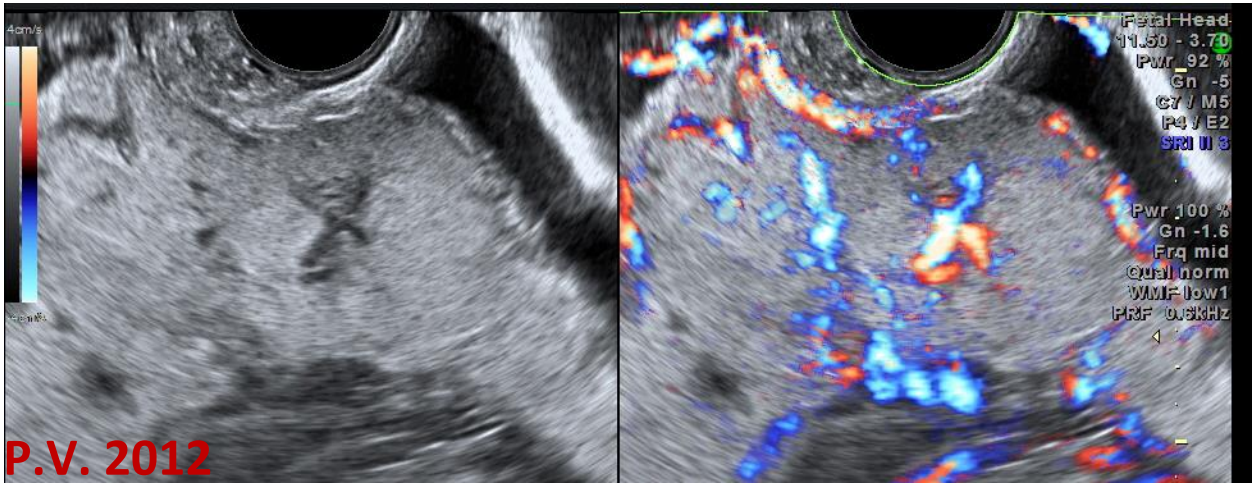


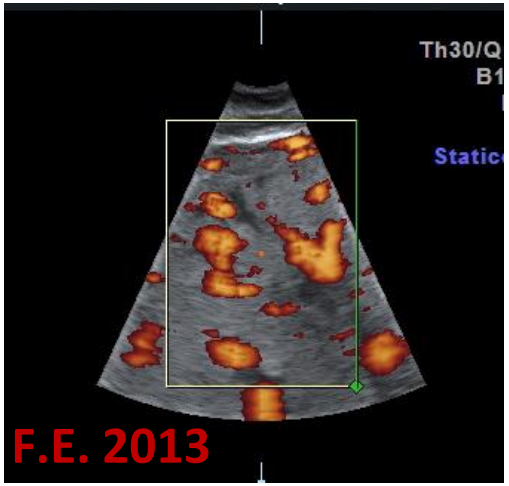
Presenza di numerose lacune, grandi e ad aspetto irregolare, che spesso presentano flusso turbolento visibile in gray-scale

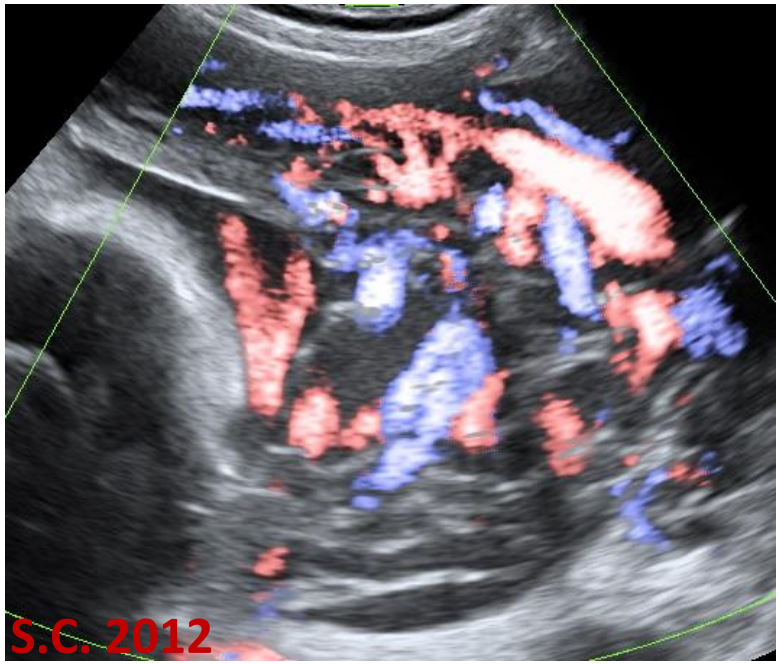


FLUSSO LACUNARE

SENS: 73% **SPEC:** 86% **VPP:** 60% **VPN:** 90%





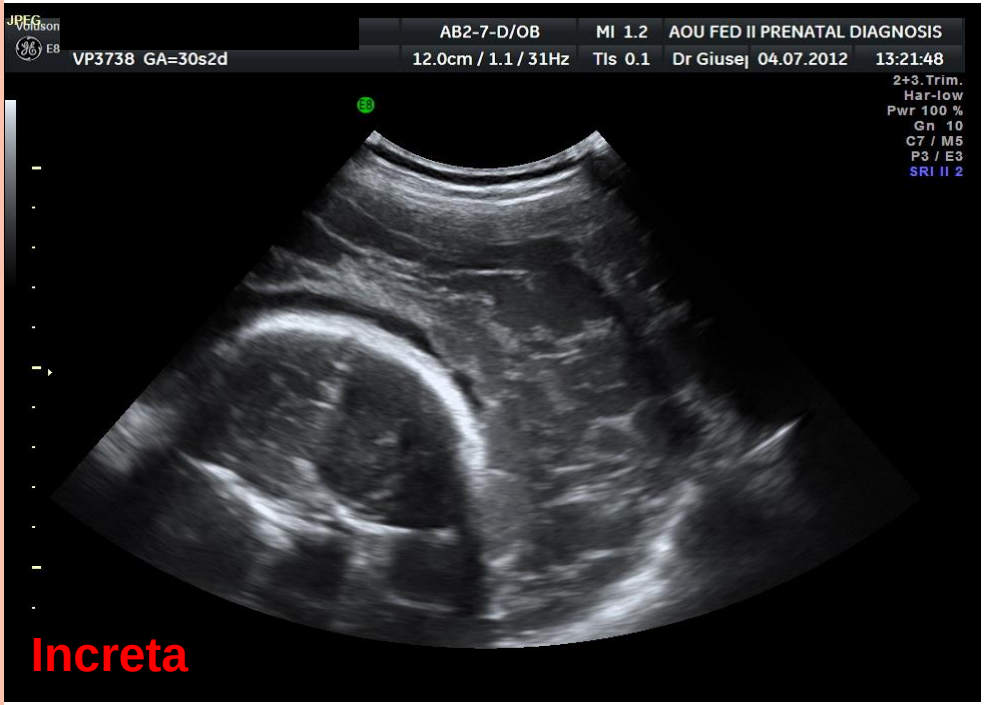


- > 6 lacune con flusso turbolento si associa a placenta PERCRETA

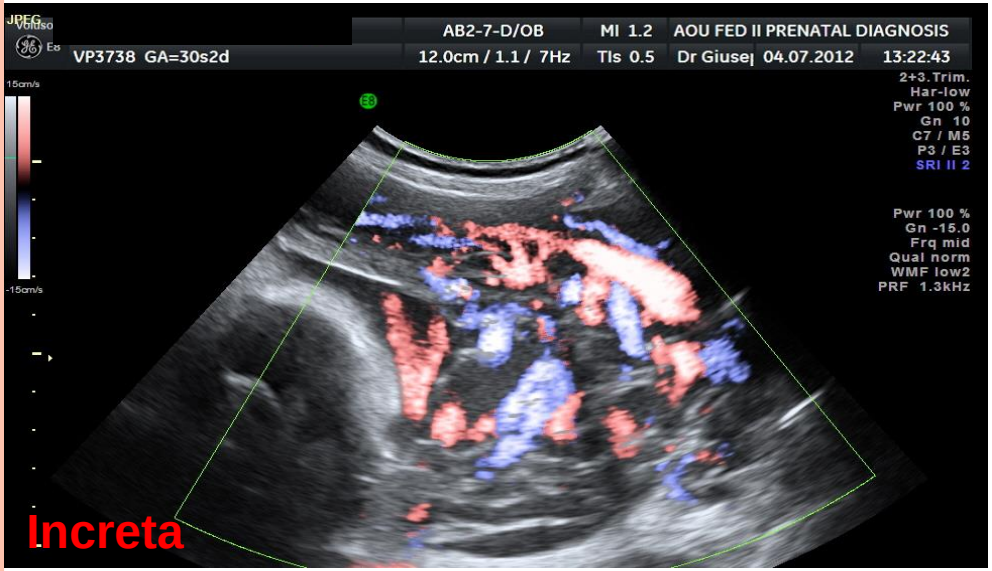
Calì G et al. 2012

Comstock CH, 2005

LACUNE PLACENTARI

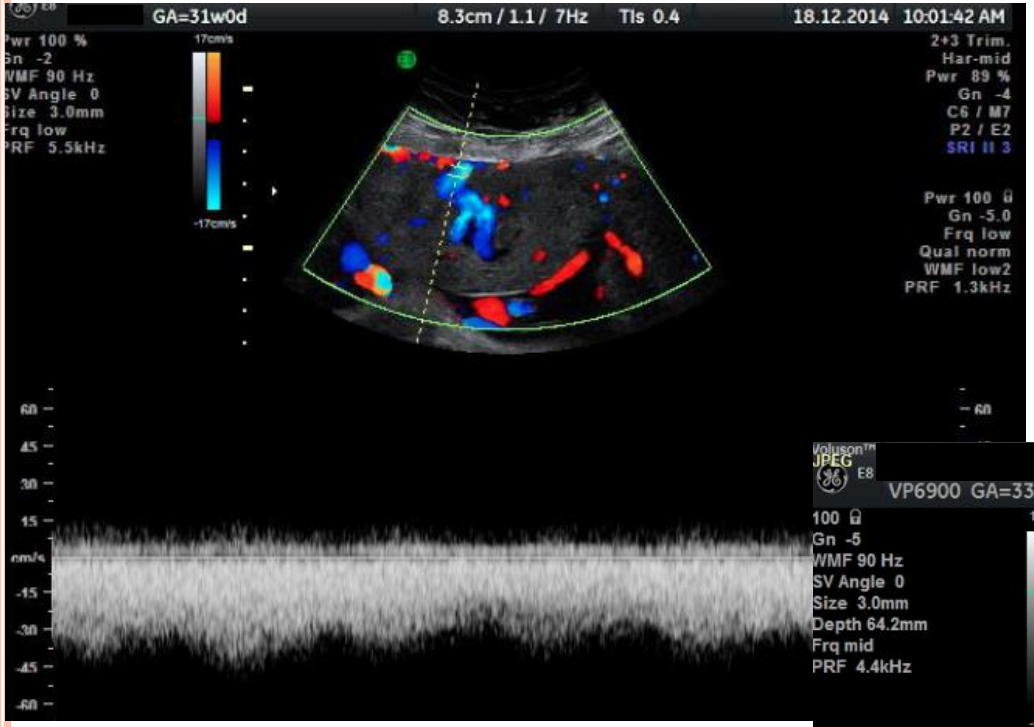




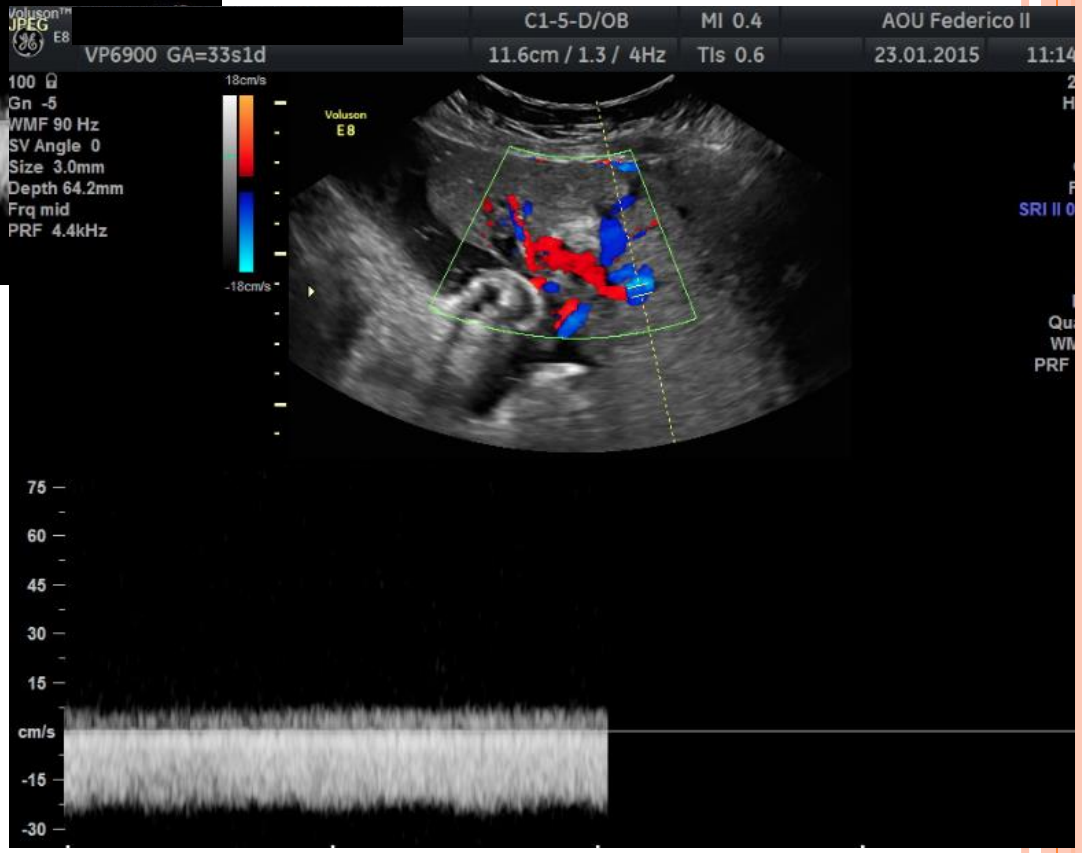




FEEDING VESSELS in lacune placentari



Vasi ad alta velocità che dal miometrio si gettano all'interno di lacune placentari, causando turbolenza in ingresso



Spessore miometriale

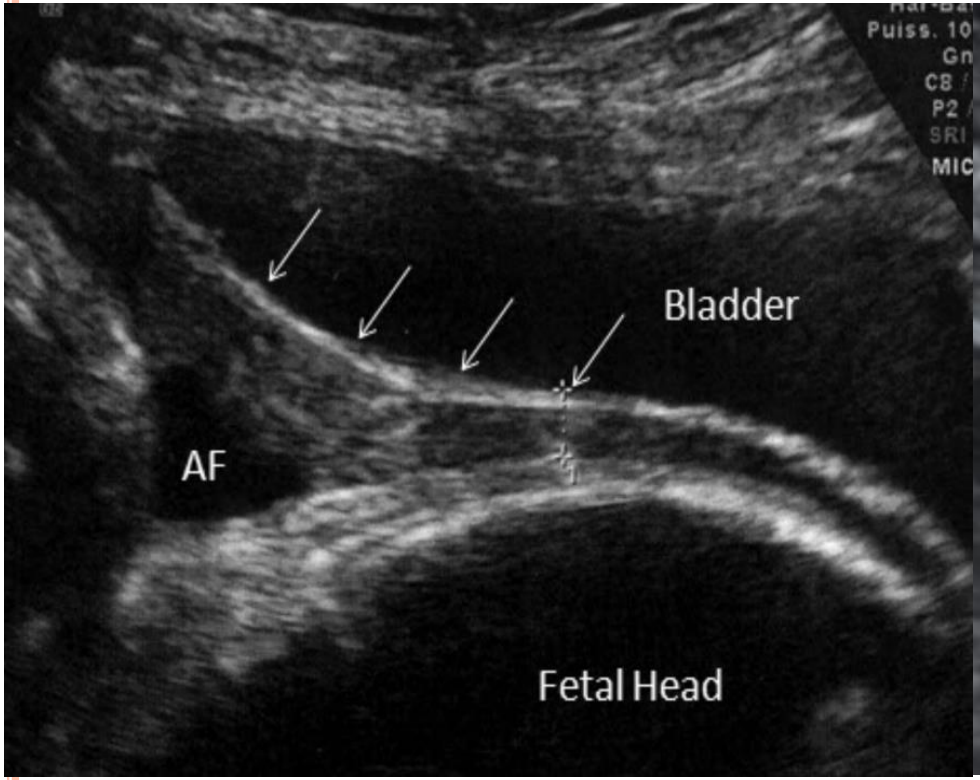
- Molti autori hanno osservato che uno spessore miometriale < 1 mm si associa a placenta accreta

  NB: Il segmento uterino inferiore si assottiglia naturalmente verso il termine di gravidanza!

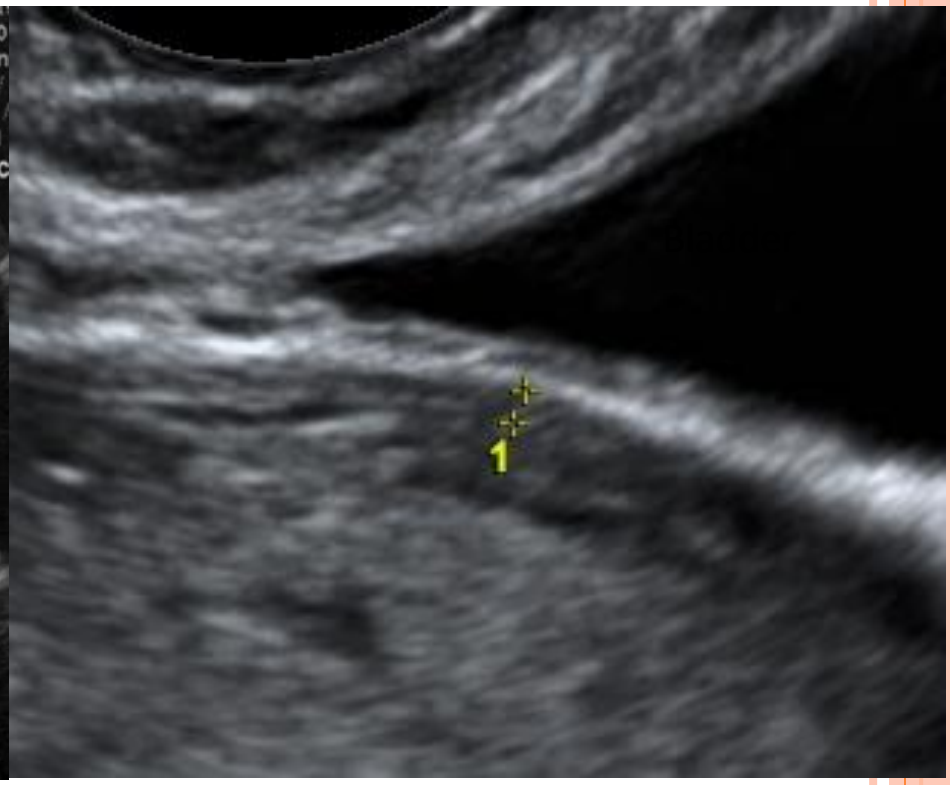
AUTORE	Sensibilità (%)	Specificità (%)	VPP	VPN
Wong et al. 2007	22	100	100	89
Twickler et al. 2000	100	72	72	100

Comstock, Bronsteen 2013

Spessore miometriale < 1mm



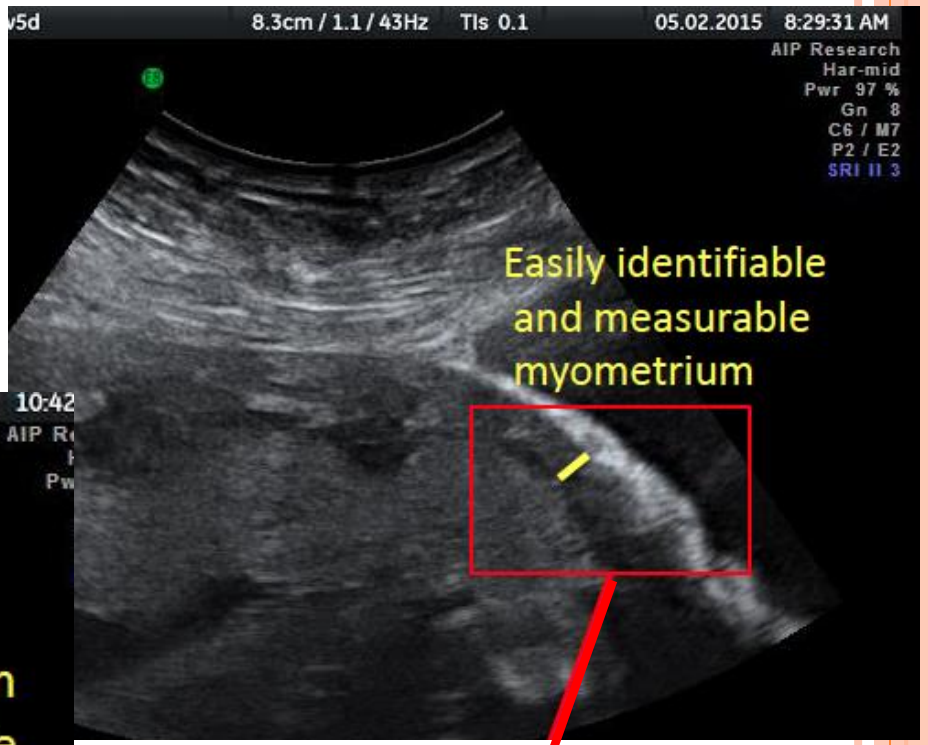
Spessore miometriale conservato



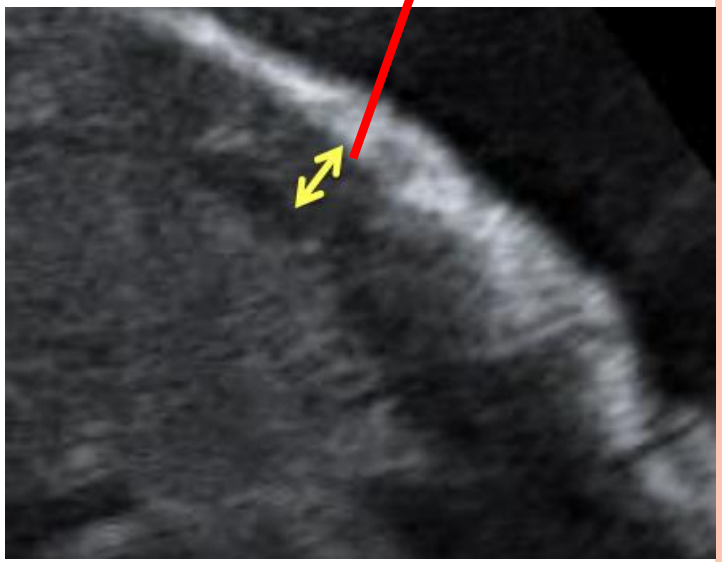
Assottigliamento del miometrio

ASSOTTIGLIAMENTO MIOMETRIALE

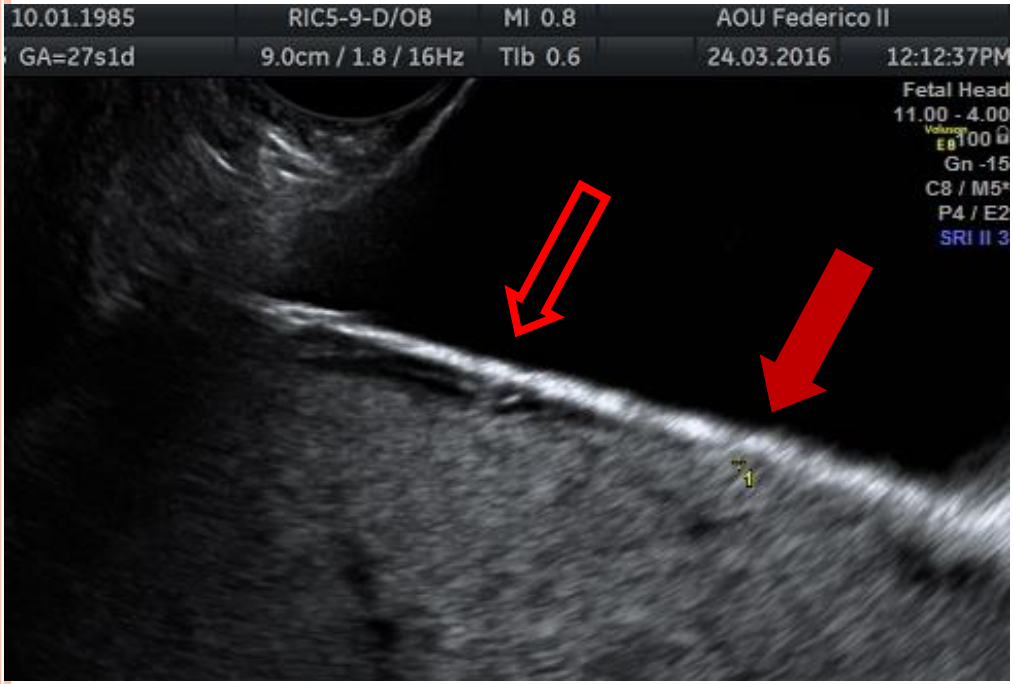
Assottigliamento del miometrio sovrastante la placenta (<1 mm o indistinguibile)

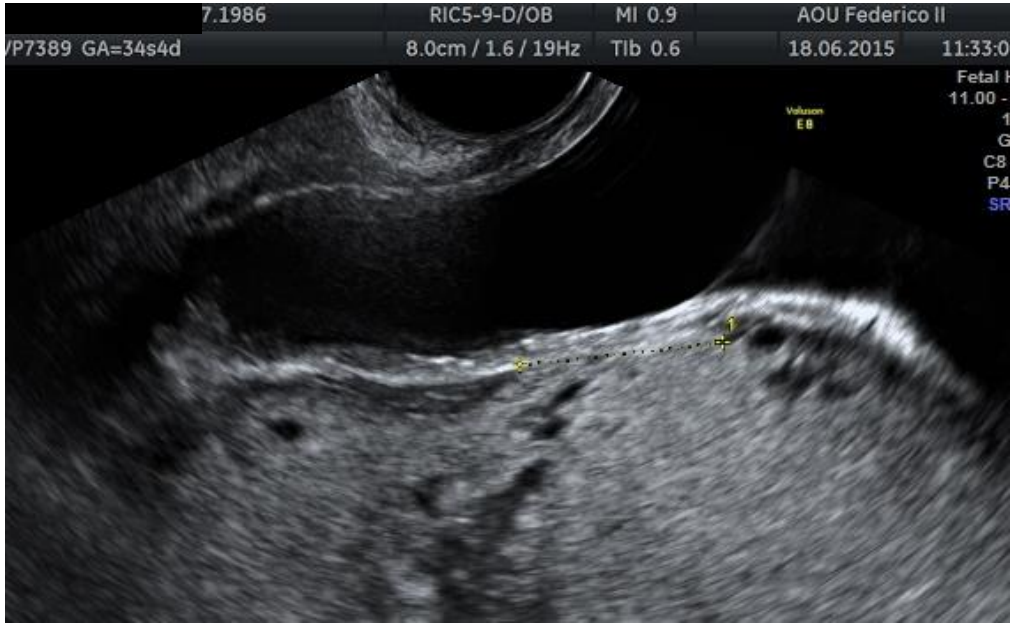






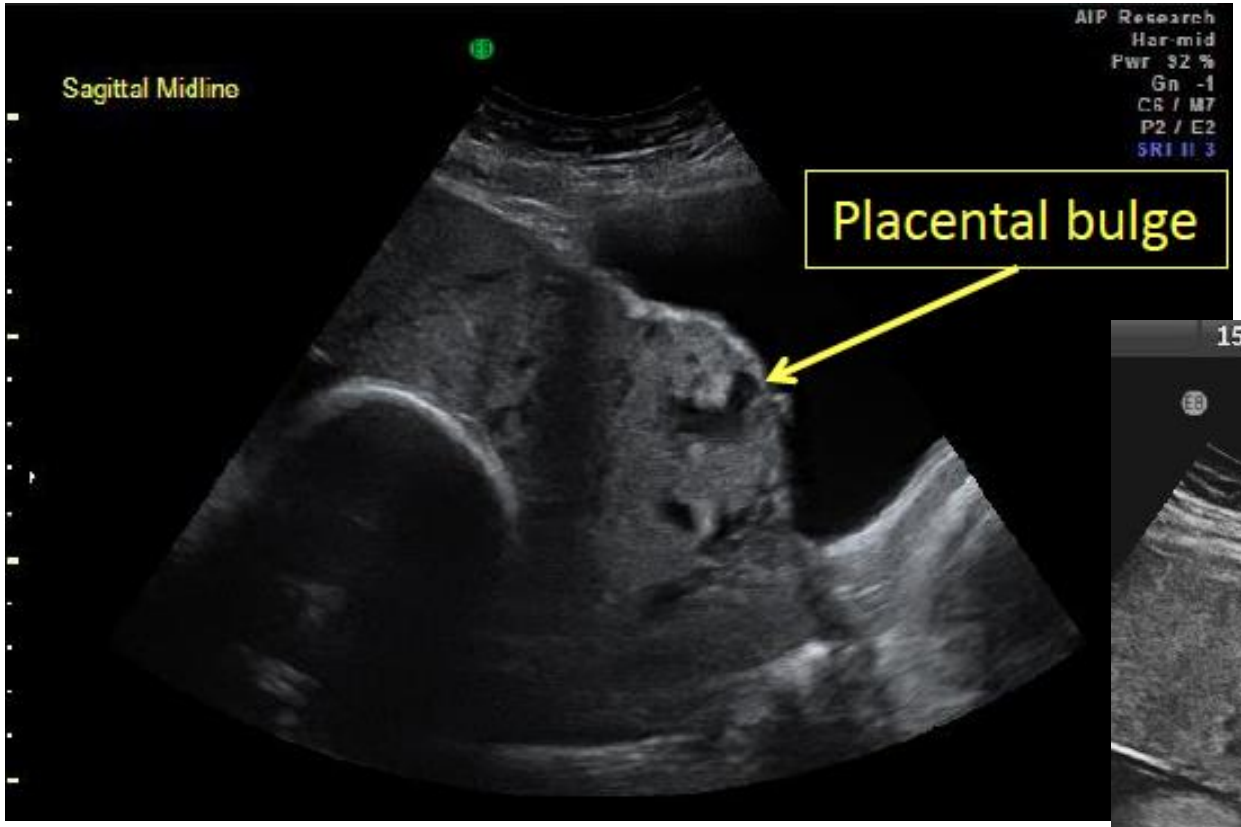
ASSOTTIGLIAMENTO MIOMETRIALE







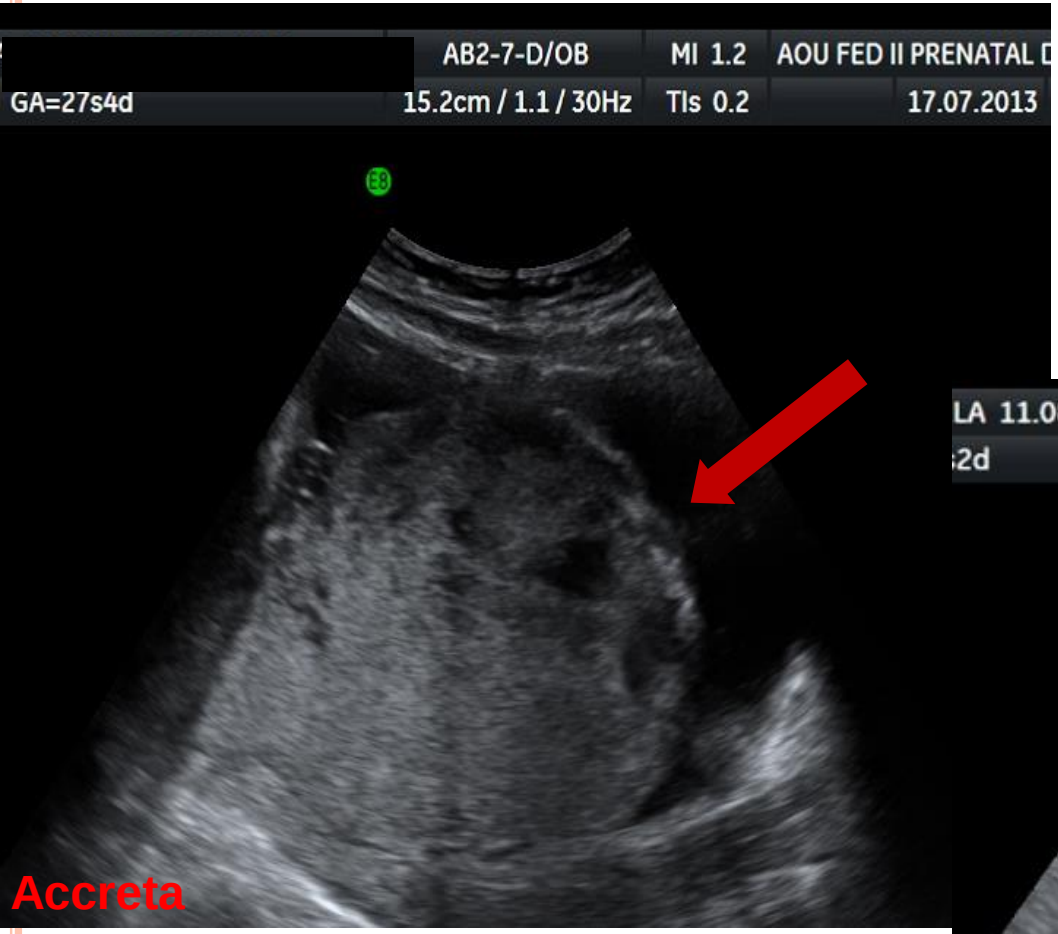
“BULGE” PLACENTARE

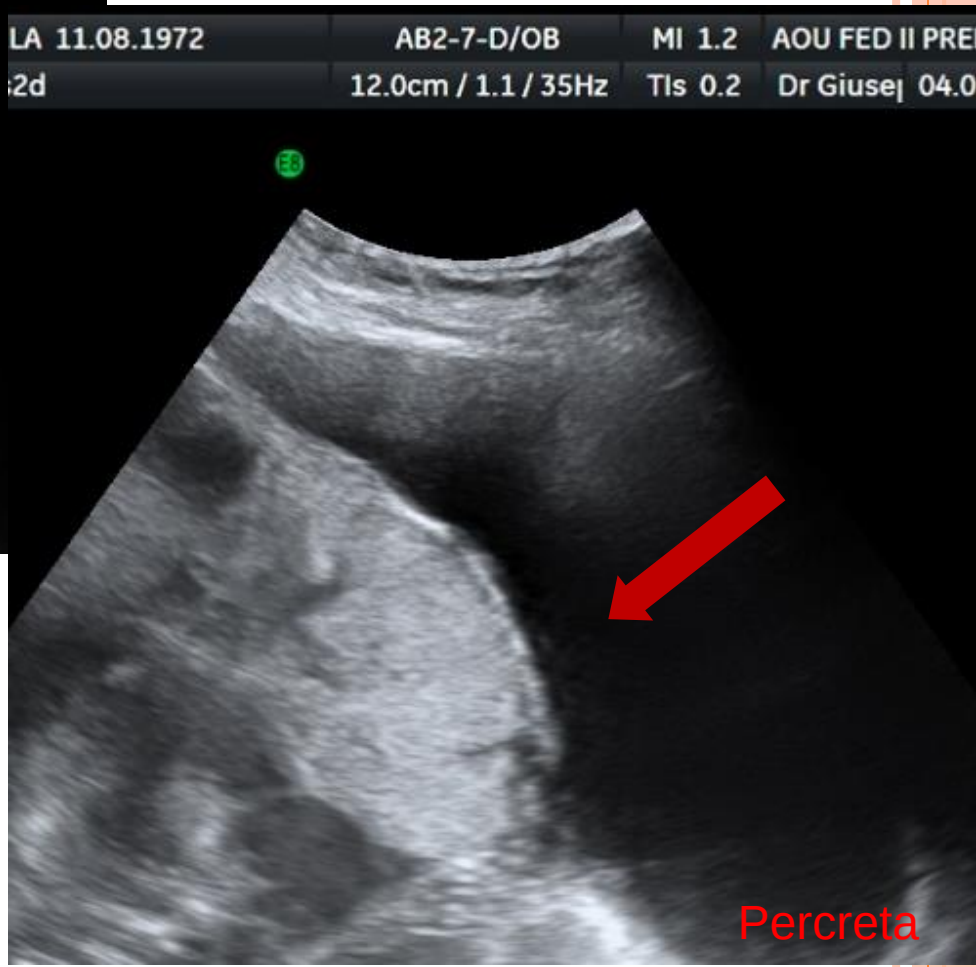




Deviazione della sierosa uterina rispetto al suo piano normale, causata da un’anomala protrusione della placenta verso gli organi adiacenti (tipicamente la vescica)

“BULGE” PLACENTARE



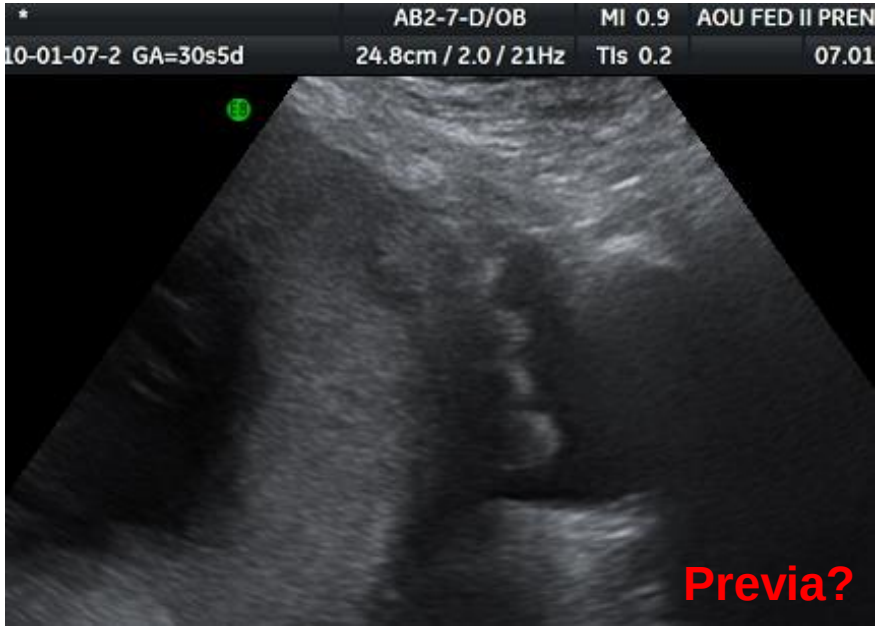


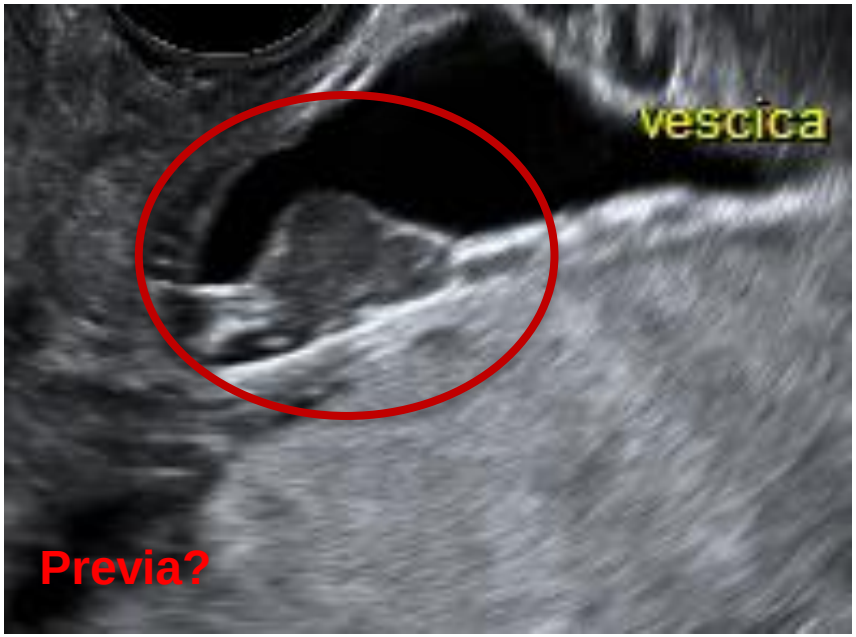
MASSE ESOFITICHE VESCICALI



Tessuto placentare che fa breccia nella sierosa
e si estende oltre di essa
(in genere all'interno della vescica piena)

MASSE ESOFITICHE VESCICALI

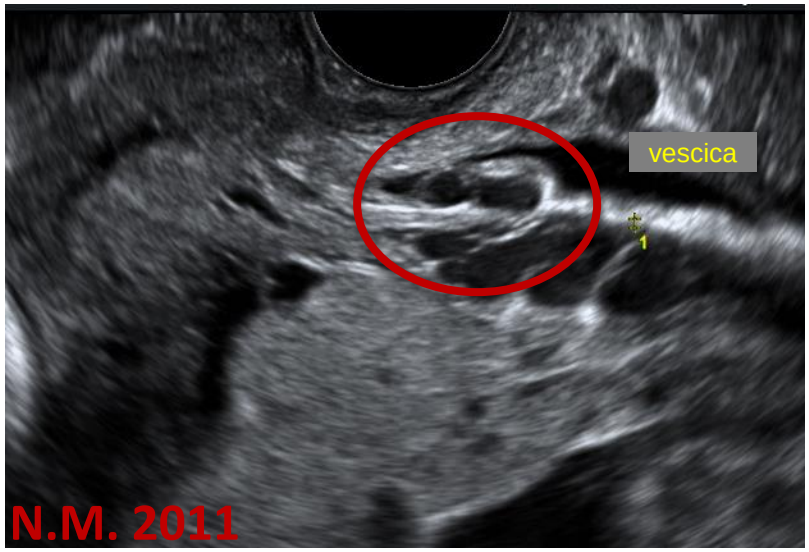


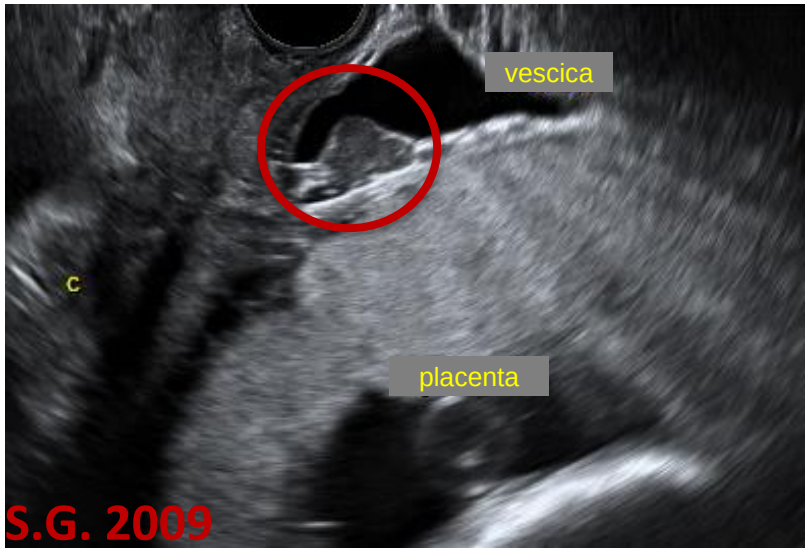


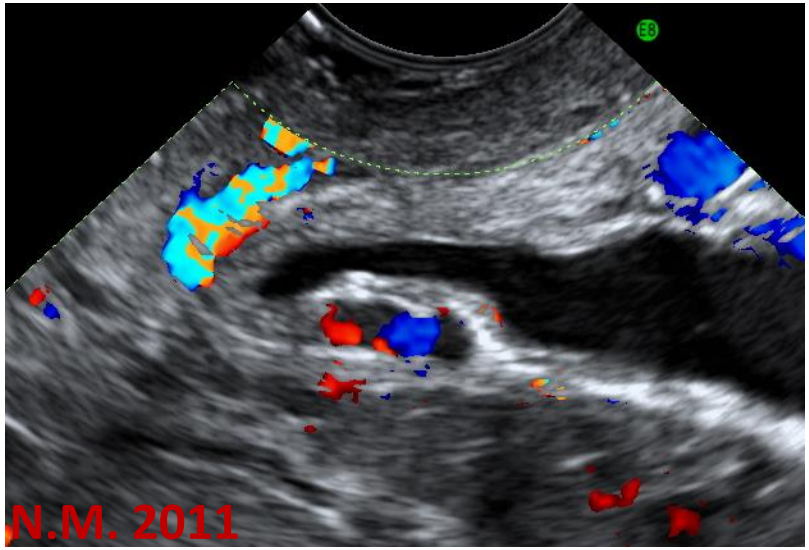


MASSE ESOFITICHE

SENS: NA **SPEC:** 100% **VPP:** NA **VPN:** 86%









Wong HS et al. 2008

Scala di grigio vs color Doppler

1. Flusso lacunare
2. Ipervascolarizzazione interfaccia sierosa uterina e vescica
3. Ipervascolarizzazione interfaccia placenta e margine uterino



Il color Doppler è sovrapponibile all'USG in B-mode e non consente di porre diagnosi di percretismo.

Comstock, Bronsteen 2013

ANOMALIE DOPPLER

DIAGNOSTIC ACCURACY OF COLOR DOPPLER ULTRASOUND IN DETECTING INVASIVE PLACENTATION: A SYSTEMATIC REVIEW AND META-ANALYSIS

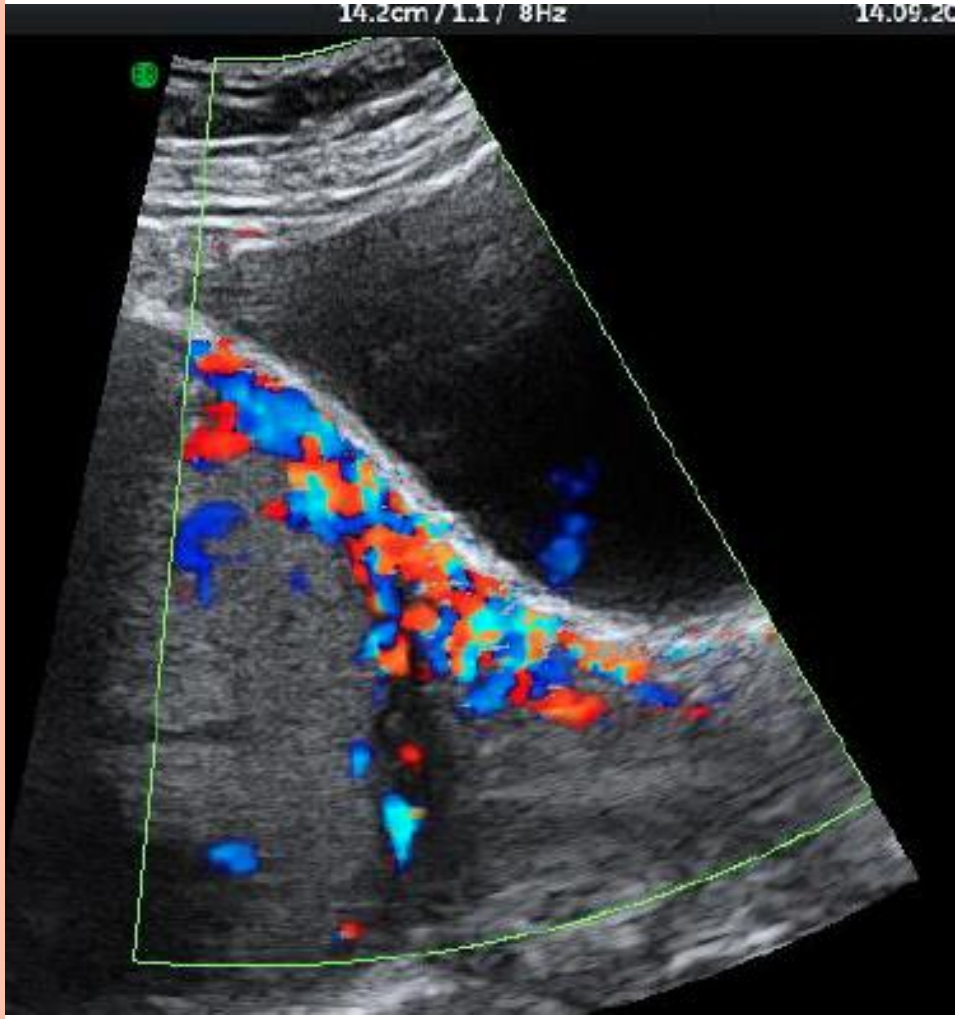
Lacunae	Uterine bladder interface	Sub-placental zone	3D Power Doppler
Large linear lacunae with low velocities CD flow	Hypervascularity/Abnormal vascularity of serosa–bladder interface	Increased subplacental vascularity	Numerous coherent vessels involving the whole uterine serosa–bladder junction (basal view)
Diffuse or focal lacunar flow pattern	Vessels extending from the placenta to the bladder	Markedly dilated vessels over peripheral subplacental zone	Hypervascularity (lateral view)
Vascular lakes with turbulent flow	Vessels crossing the interface disruption site	Absence of subplacental vascular signals in the areas lacking the peripheral subplacental hypoechoic zone.	Irregular intraplacental vascularization with tortuous confluent vessels across placental width (lateral view)
Vascular lakes with turbulent flow with high velocity (PSV >15cm/s)		Vessels bridging the placenta and the uterine margin	Inseparable cotyledonal and intervillous circulations (lateral view)
Dilated vascular channels with diffuse lacunar flow		Dilated peripheral subplacental vascular channels with pulsatile venous type flow over the cervix	

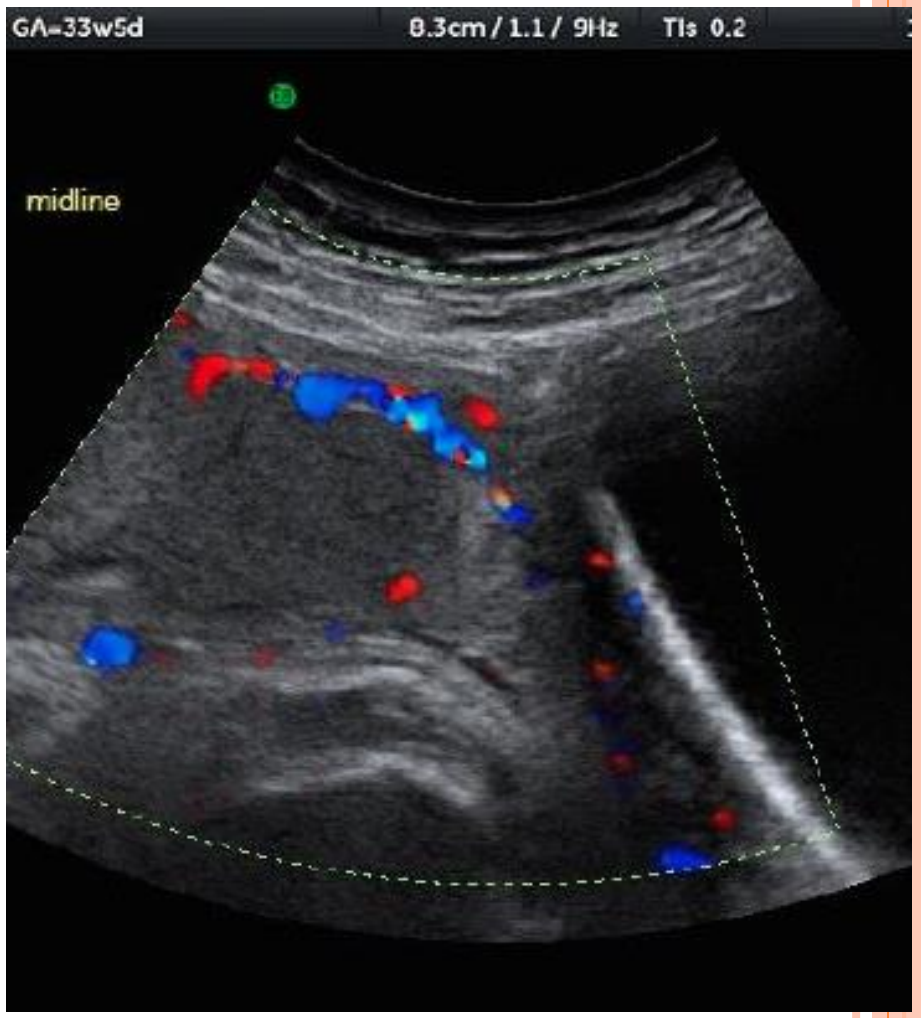
Morlando, D'Antonio et al. – *unpublished data*

Ipervascolarità dell'interfaccia tra sierosa uterina e vescica

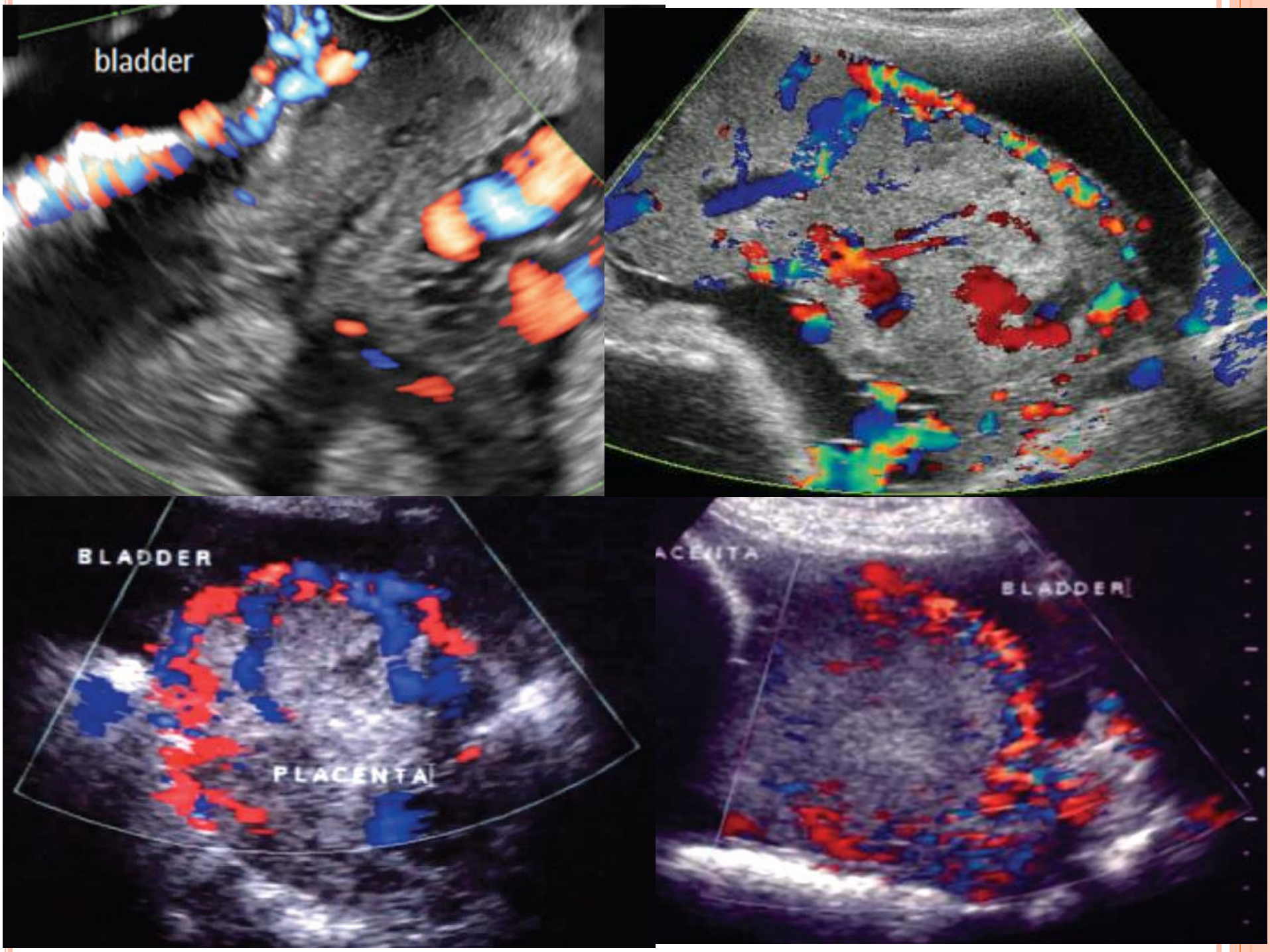
- Wong et al. hanno dimostrato che l'utilizzo del Color Doppler aumentava la specificità dell'interruzione della "bladder line" dal 96.8% al 100%, con assenza di falsi positivi
- Cali et al. hanno osservato un aumento della sensibilità dal 70% al 90% quando si utilizzava il Color Doppler

IPERVASCOLARITÀ UTERO-VESCICALE

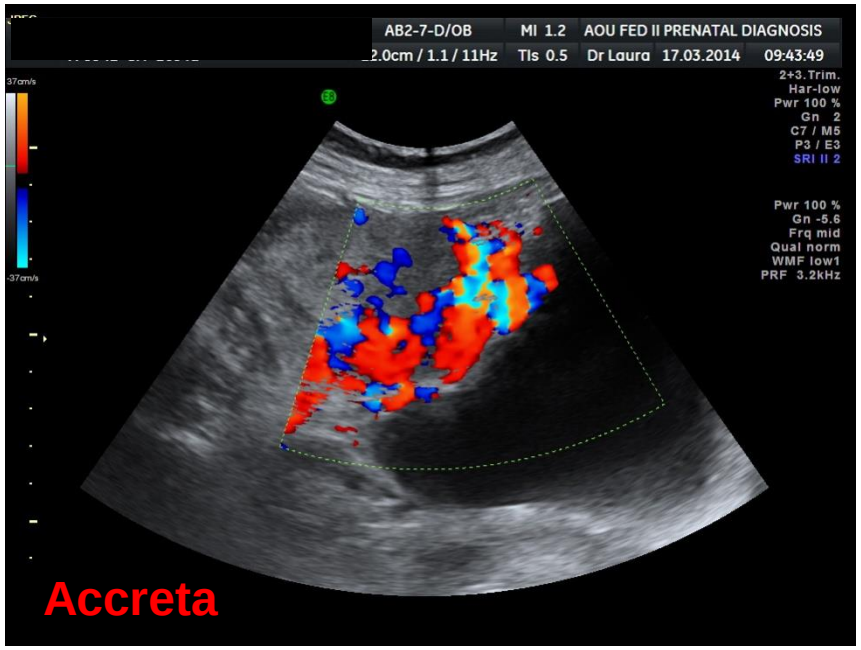


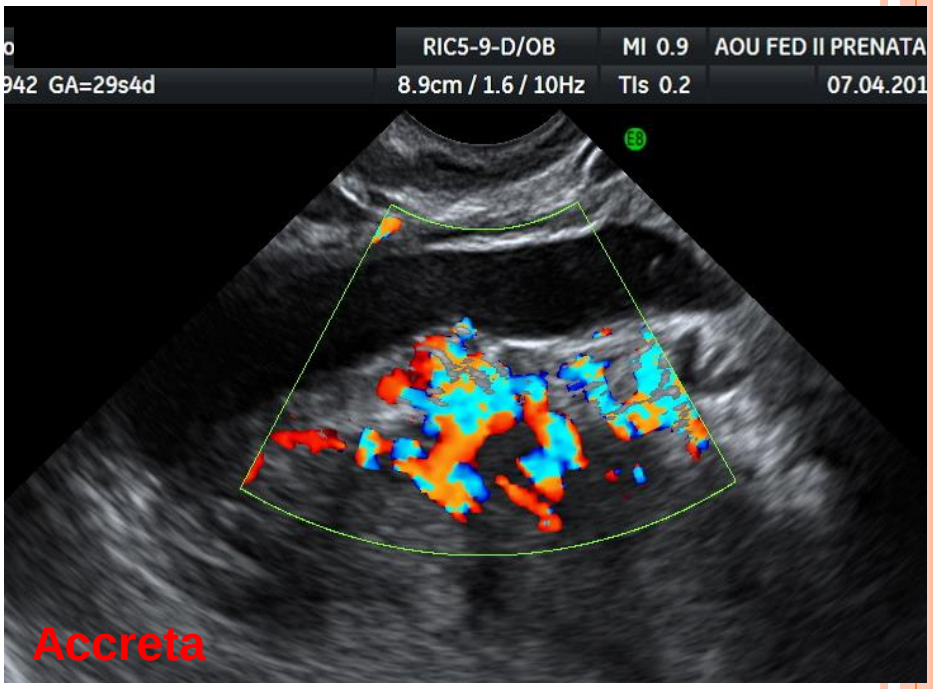


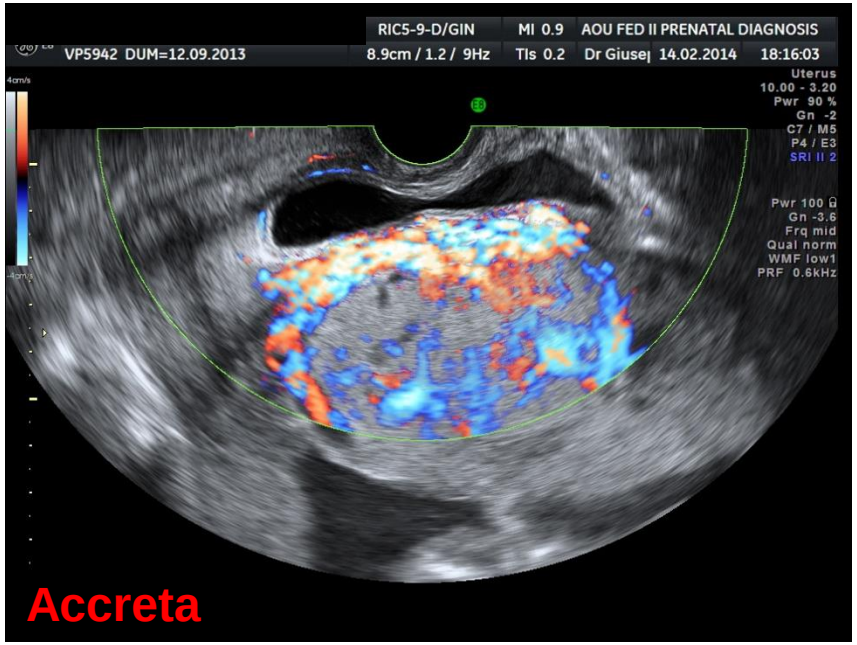
Notevole segnale color Doppler a livello dell'interfaccia utero-vescicale (indica probabilmente numerosi vasi tortuosi e ammassati, localizzati in questa regione)


bladder
BLADDER
PLACENTA
BLADDER

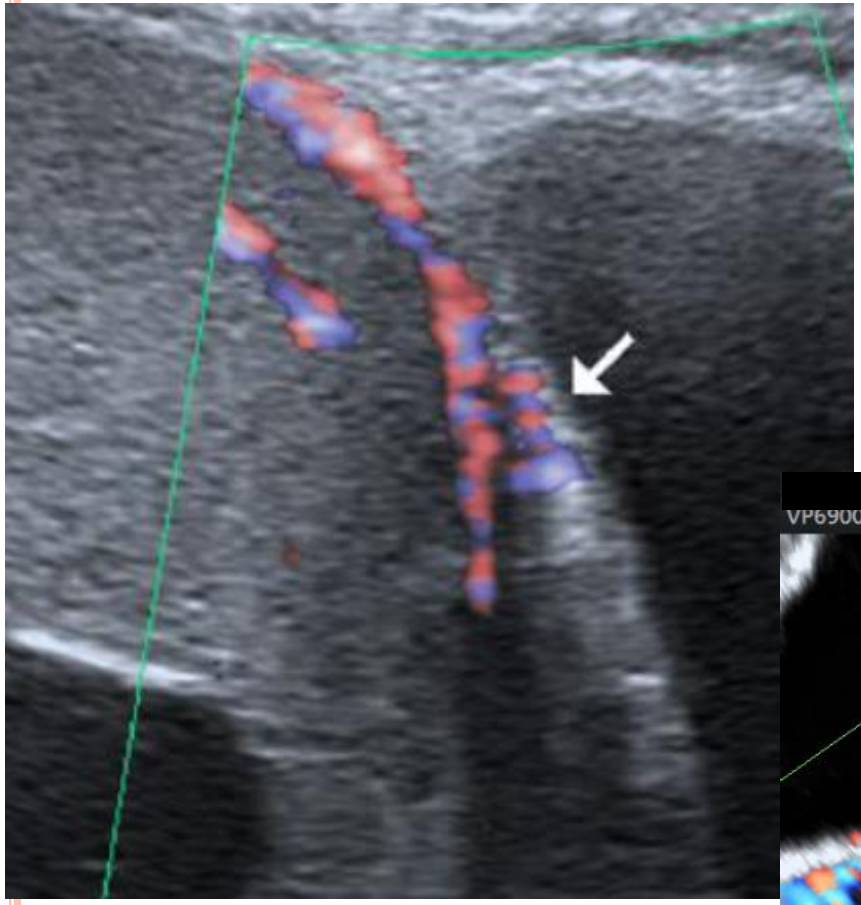
IPERVASCOLARITÀ UTERO-VESCICALE



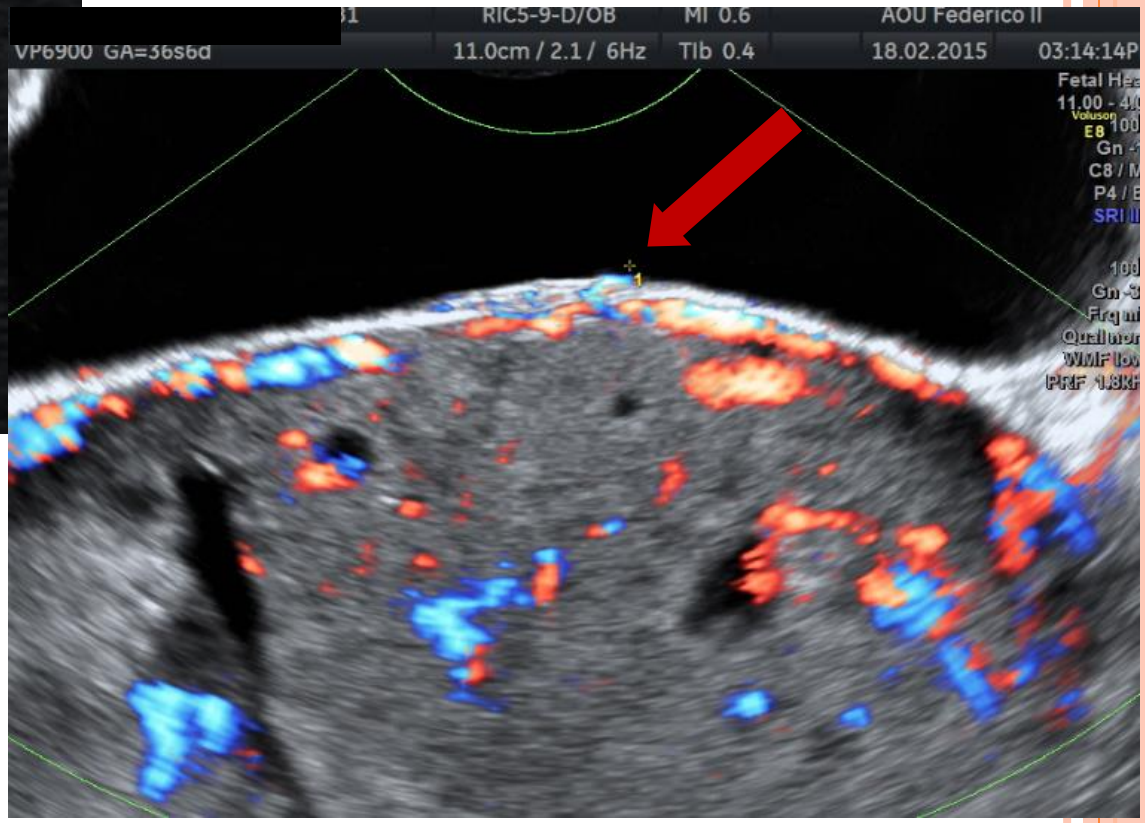




BRIDGING VESSELS



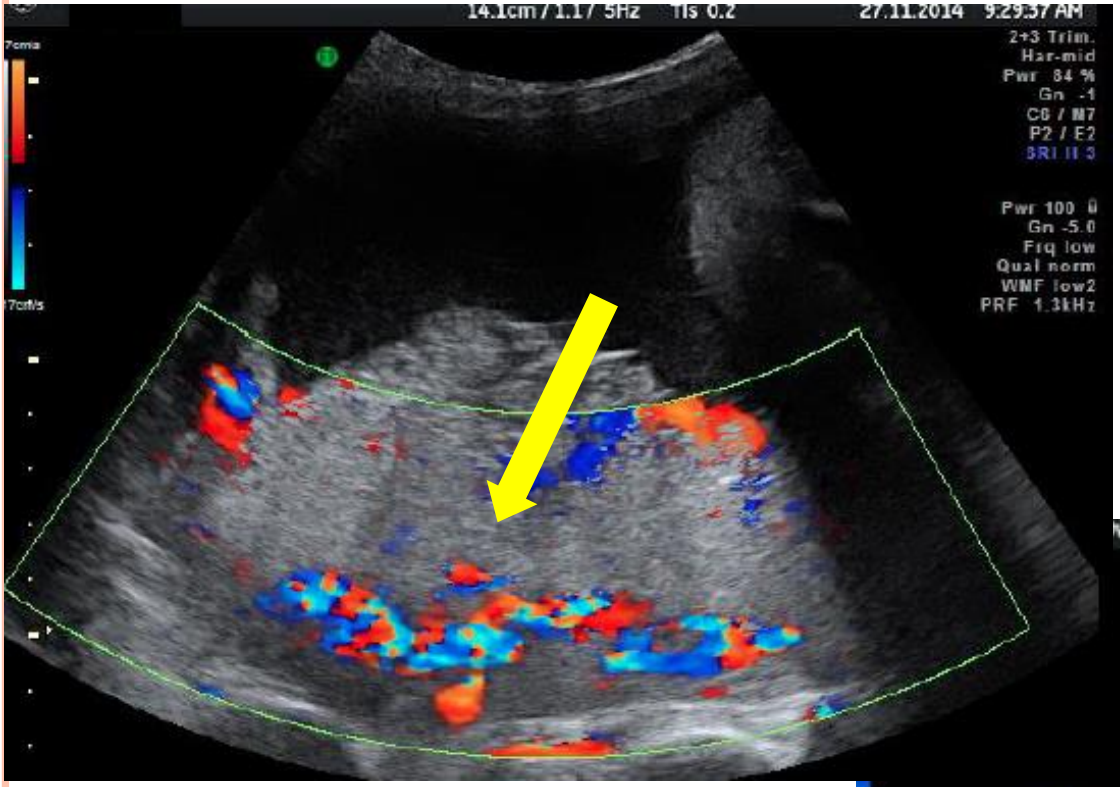
Vasi che sembrano estendersi dalla placenta, attraversare il miometrio e la sierosa, e raggiungere la vescica o altri organi adiacenti; spesso hanno decorso perpendicolare rispetto al miometrio

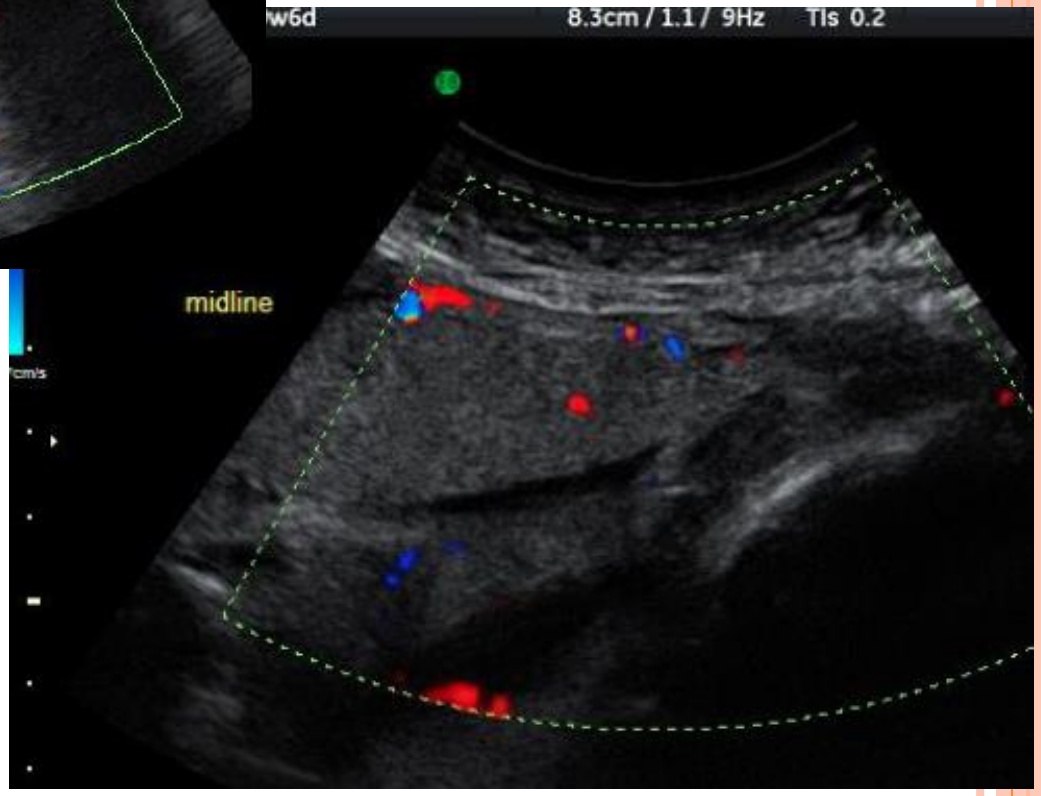


Ipervascolarità dell'interfaccia tra placenta e parete uterina

- Wong et al. hanno dimostrato che la presenza di vasi tra placenta e parete uterina aumenta la detection rate di accretismo:
  - Sensibilità: 89%
  - Specificità: 96%
  - VPP: 80%
  - VPN: 98%

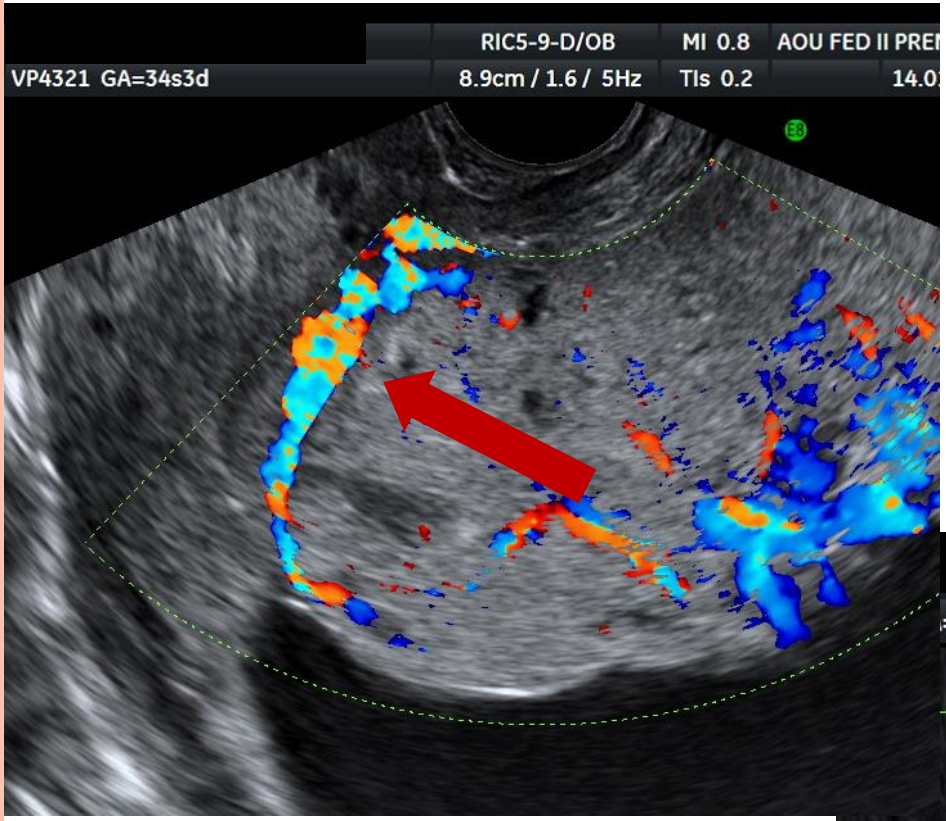
IPERVASCOLARITÀ SUB-PLACENTARE

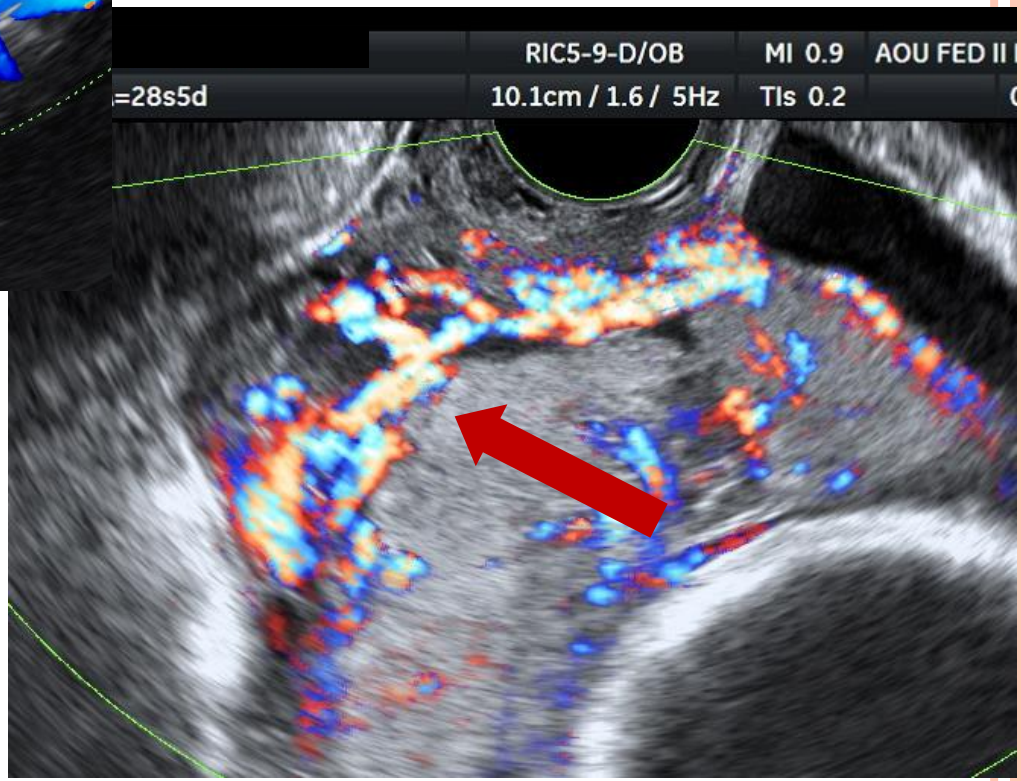


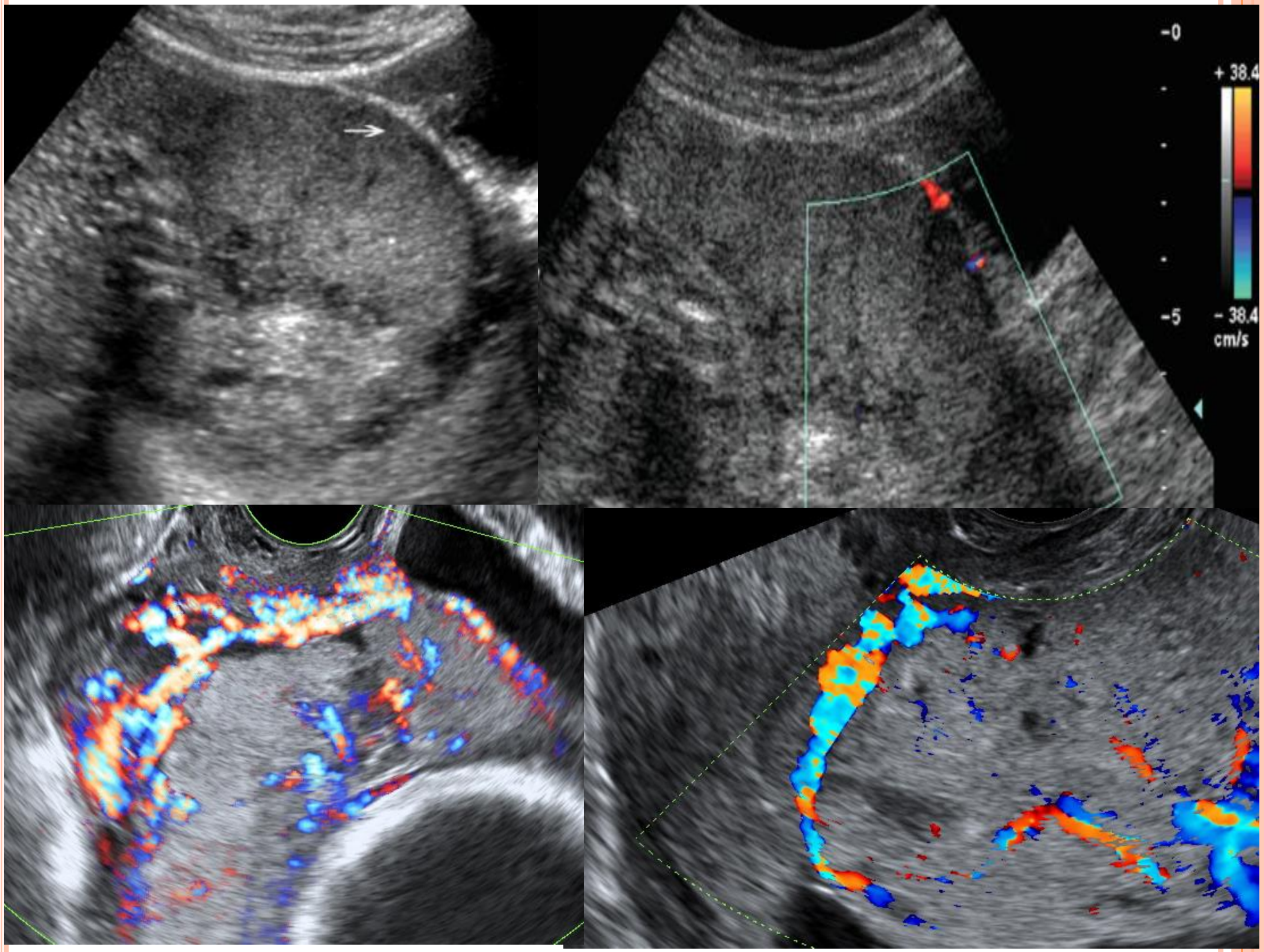


Notevole segnale color Doppler a livello del letto placentare

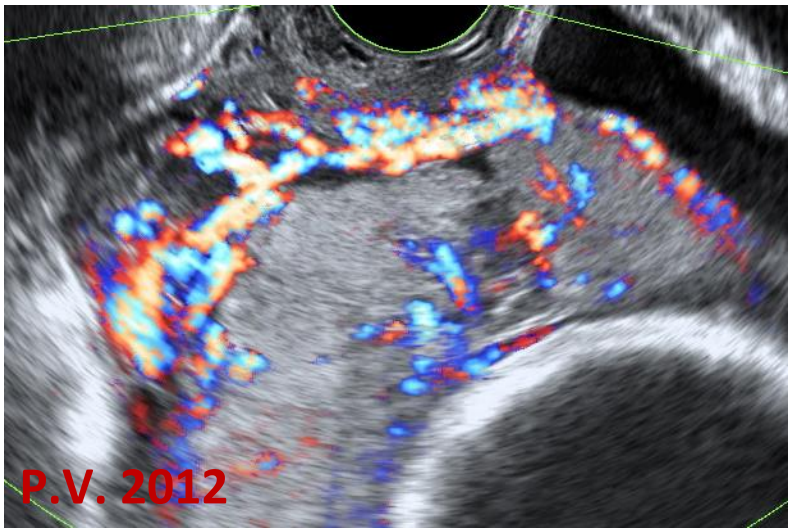
IPERVASCOLARITÀ SUB-PLACENTARE

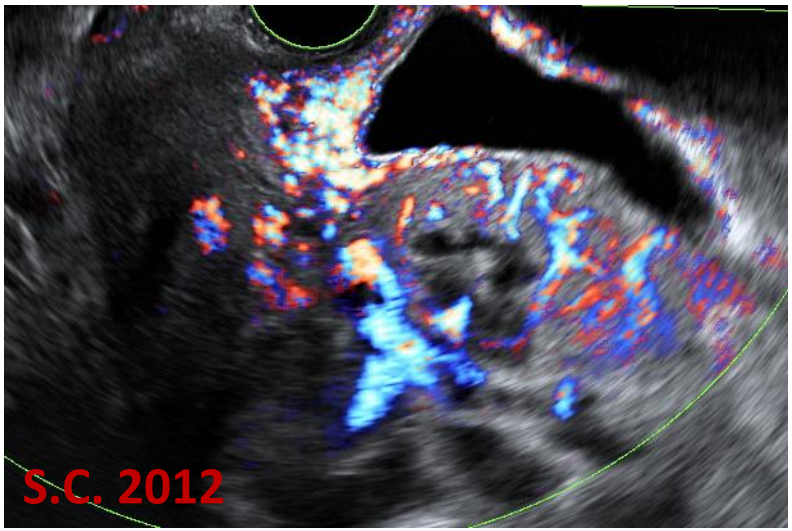


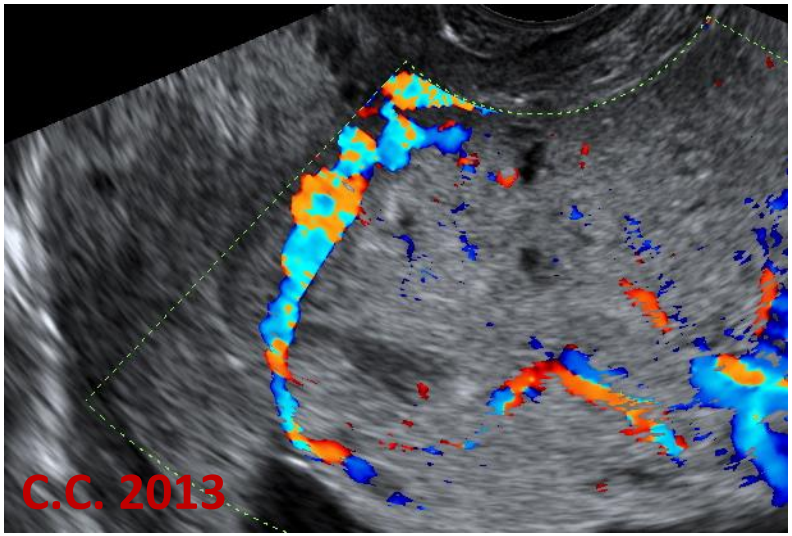



-0
+ 38.4
-5
- 38.4
cm/s

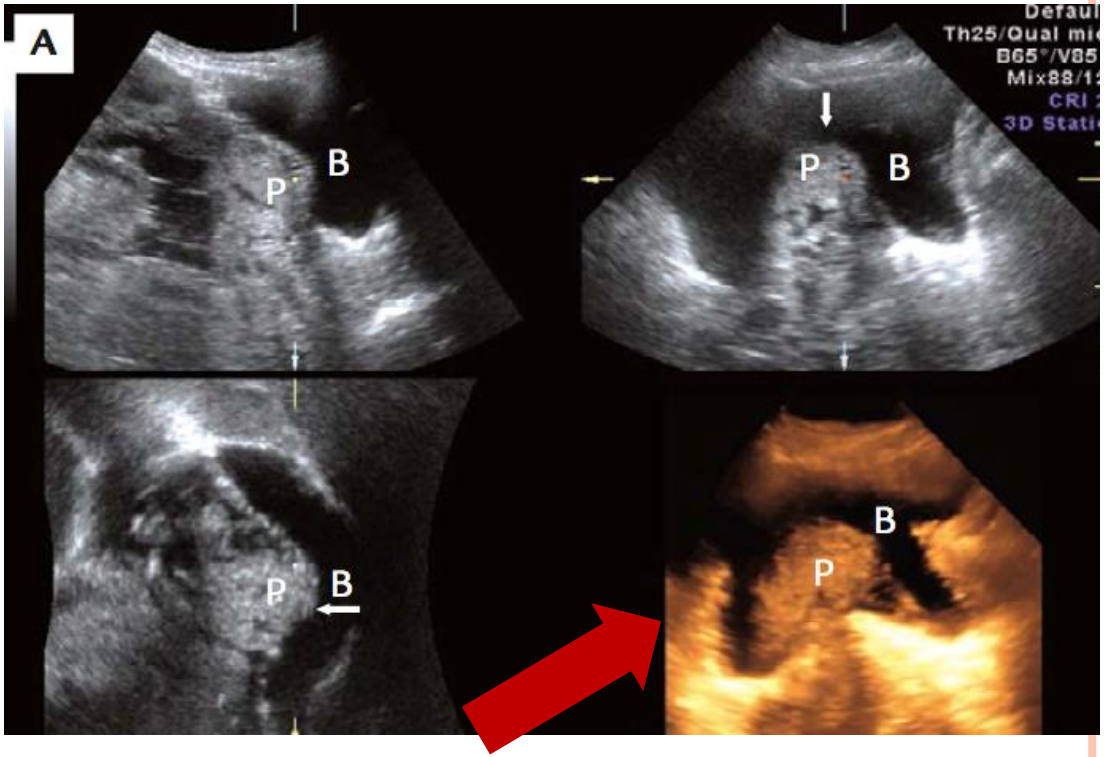
IPERVASCOLARITA' TRA PLACENTA E MARGINE UTERINO







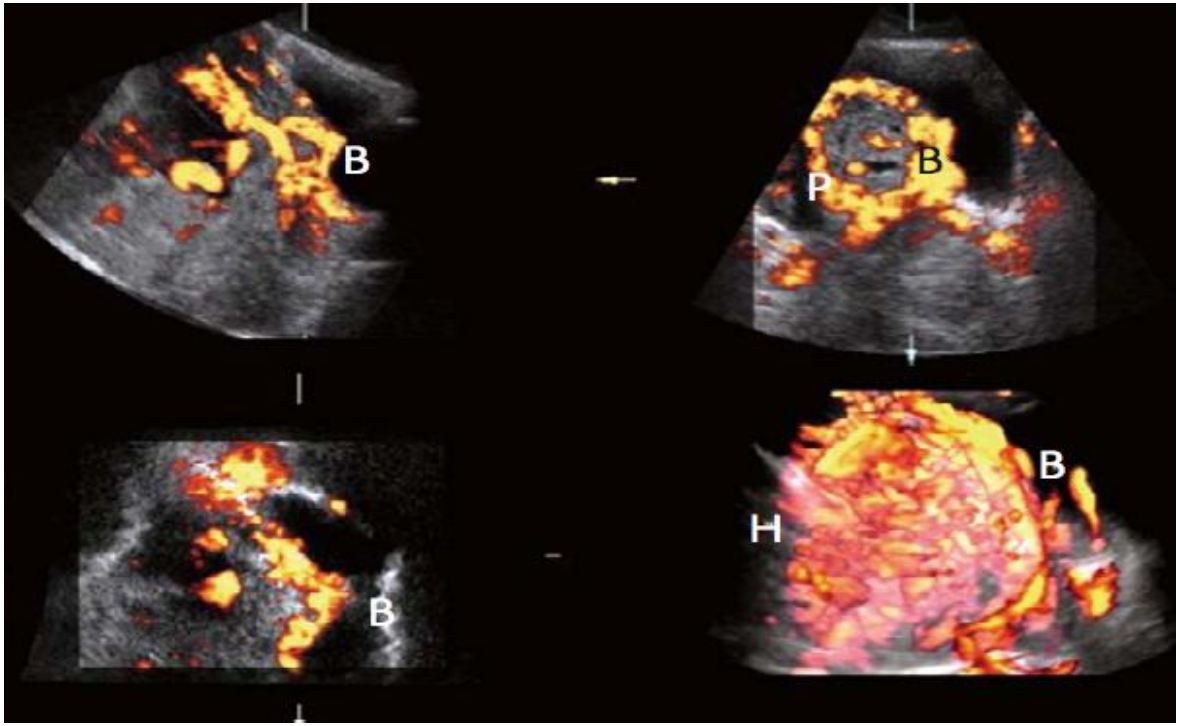
TECNICHE MULTIPLANARI



- Un'immagine multiplanare permette la visualizzazione contemporanea e sequenziale di una serie di piani sagittali, assiali e coronali dell'area sospetta.
- Utilizzando punti di riferimento in ogni immagine è possibile identificare l'area interessata effettuando uno scrolling lungo un piano, mantenendo fermi gli altri due.
- E' possibile effettuare una ricostruzione 3D dell'area interessata.

Chou MM et al. 2009

TECNICHE MULTIPLANARI



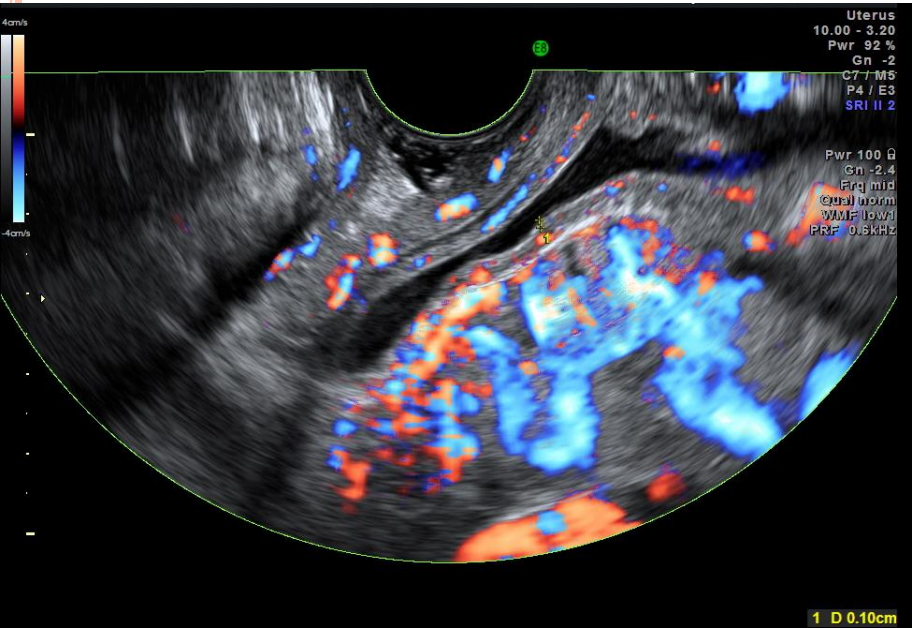
- Combinando tecnica power Doppler e 3D è possibile ottenere immagini dell'angioarchitettura all'interfaccia utero-vescicale.
- E' possibile manipolare i piani ottenuti per dimostrare la presenza di vasi aberranti che protrudono in vescica.

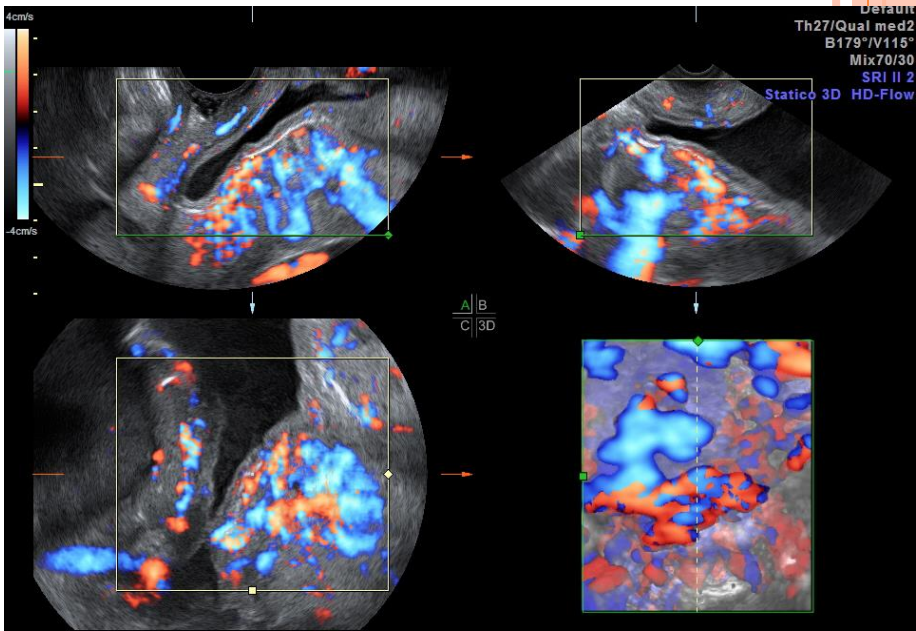
Chou MM et al. 2009

TECNICHE MULTIPLANARI

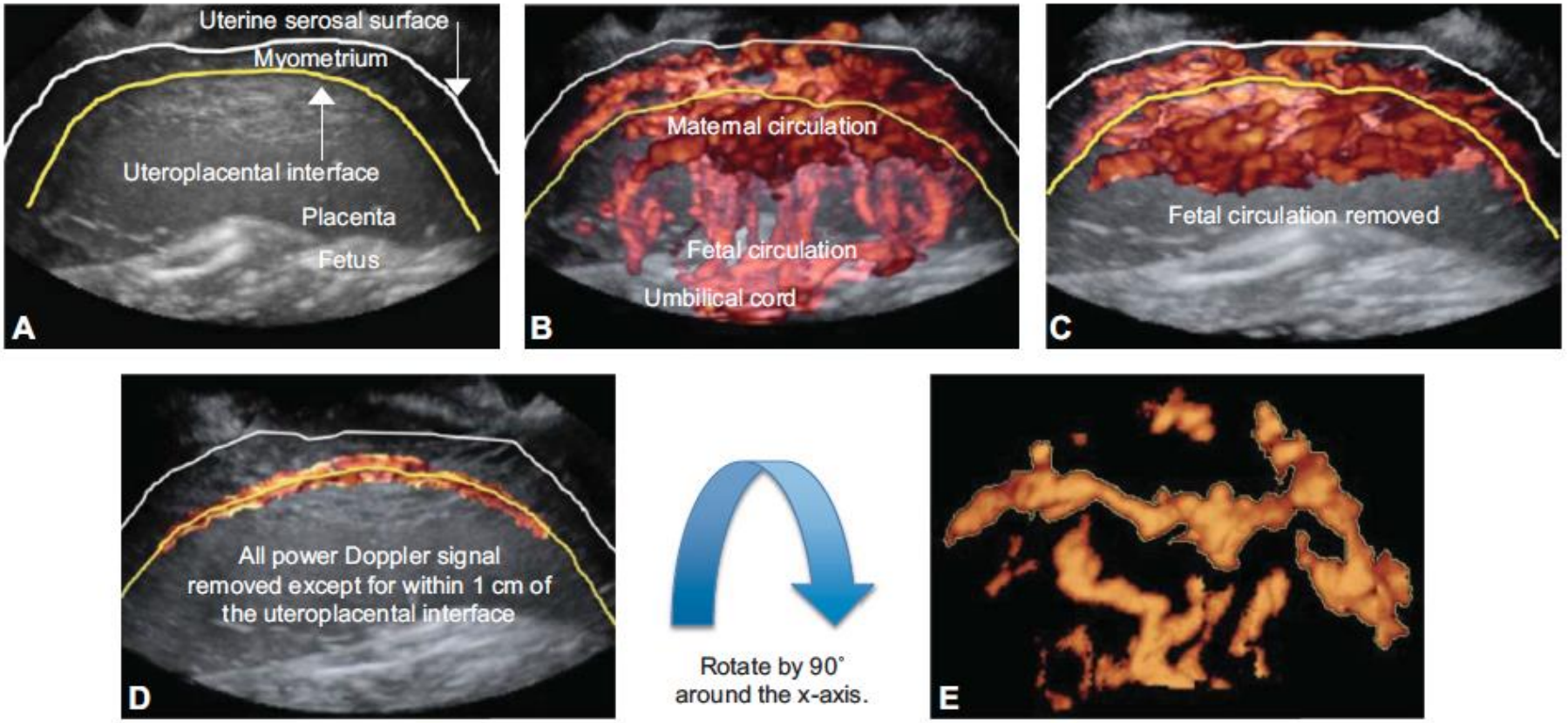
- Immagine multiplanare più accuratamente determina la localizzazione e l'estensione dell'invasione placentare
-Angioarchitettura della placenta meglio delineata per la valutazione dei numerosi vasi alla base e vasi aberranti protrudenti in vescica
- miglior effetto illustrativo
- criterio singolo Sensibilità 97% Specificità 92%
- Predittività 76%

Shih Ultrasound Obstet Gynecol. 2009





Three-Dimensional Power Doppler Ultrasonography for Diagnosing Abnormally Invasive Placenta and Quantifying the Risk

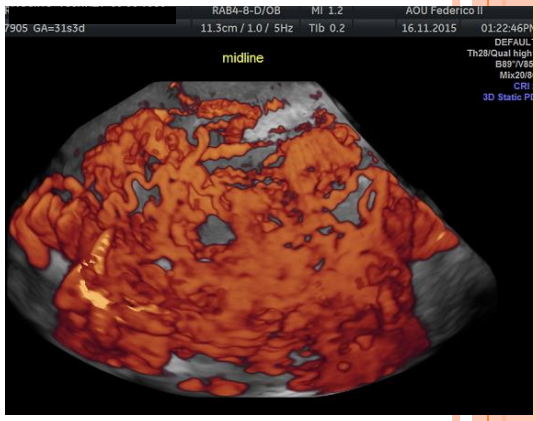


One theory is that it represents enlarged arteriovenous anastomoses located in the subplacental myometrium, generating a large circulating pool, which can be detected as an abnormal area of power Doppler signal in abnormally invasive placentas.

Collins SL et al. - Obstet Gynecol 2016

Three-Dimensional Power Doppler Ultrasonography for Diagnosing Abnormally Invasive Placenta and Quantifying the Risk

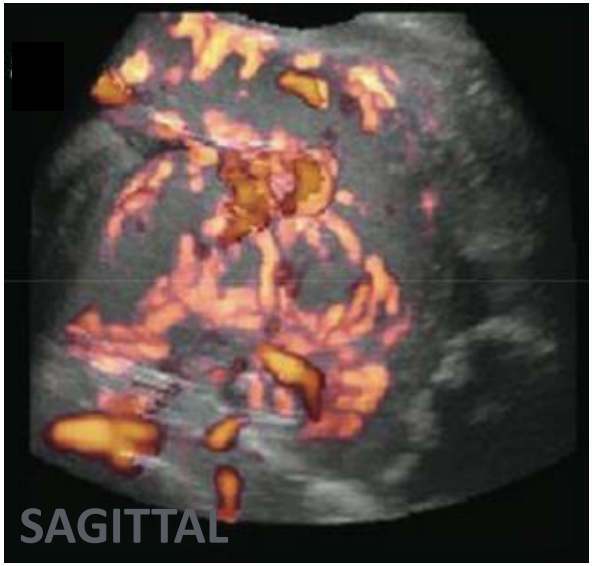
Sally L. Collins, BMBCh, DPhil, Gordon N. Stevenson, DPhil, Abdulla Al-Khan, MD, Nicholas P. Illsley, DPhil, Lawrence Impey, MBBS, Leigh Pappas, RDMS, RDCS, and Stacy Zamudio, PhD

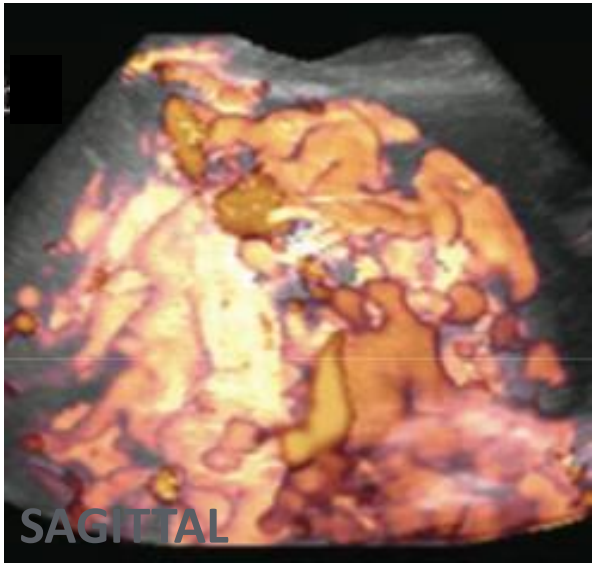


- 92 women
- Area of Confluence [Acon], at the uteroplacental interface was measured and compared in women with AIP and a control group
- Acon was greater for AIP [median (IQR)]:
  44.2 (31.4–61.7) cm^2 VS 4.5 cm^2 (2.9–6.6), P 0.001
- Even greater in the 36 requiring hysterectomy: 46.6 cm^2 (37.2–72.6), P 0.001.
- Acon rose with histopathologic diagnosis.
- With Acon of 12.4 cm^2 or greater, 100% sensitivity could be obtained with 92% specificity AUC: 0.99 (95% CI 0.94–1.0).

Obstet Gynecol 2014

TECNICHE MULTIPLANARI







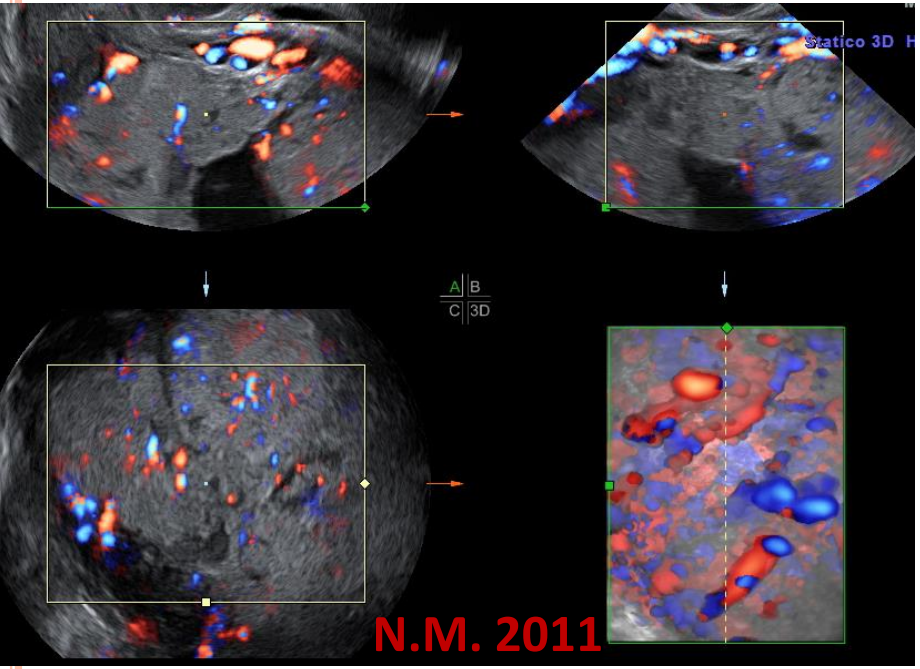


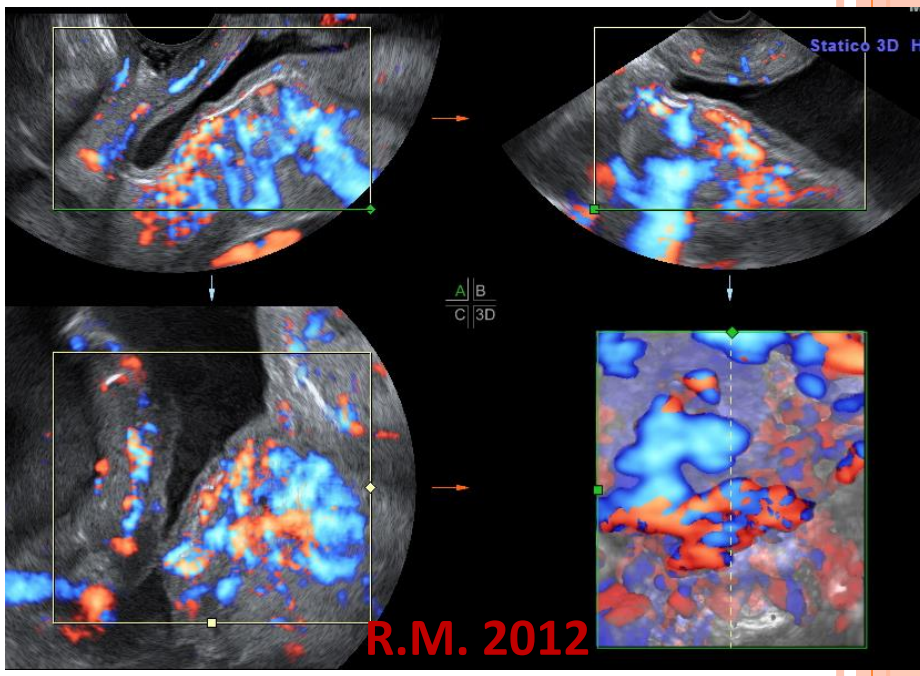
previa – non accreta

percreta

Calì G et al. 2012

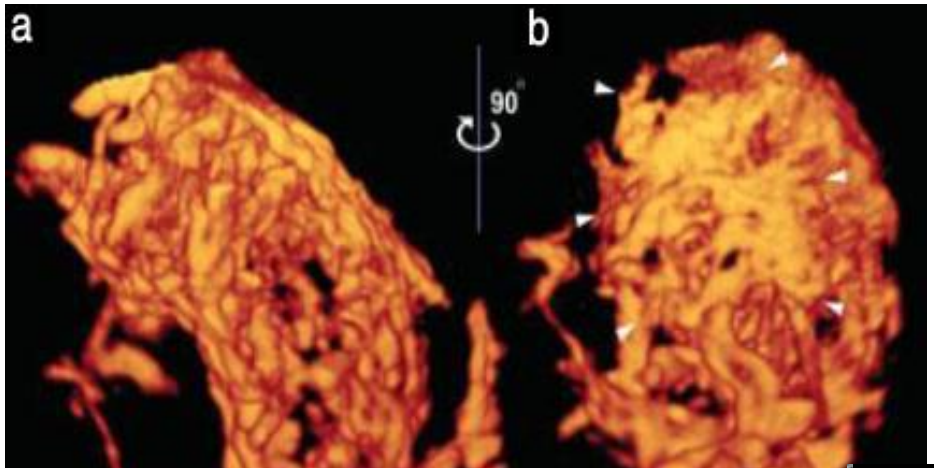
TECNICHE MULTIPLANARI

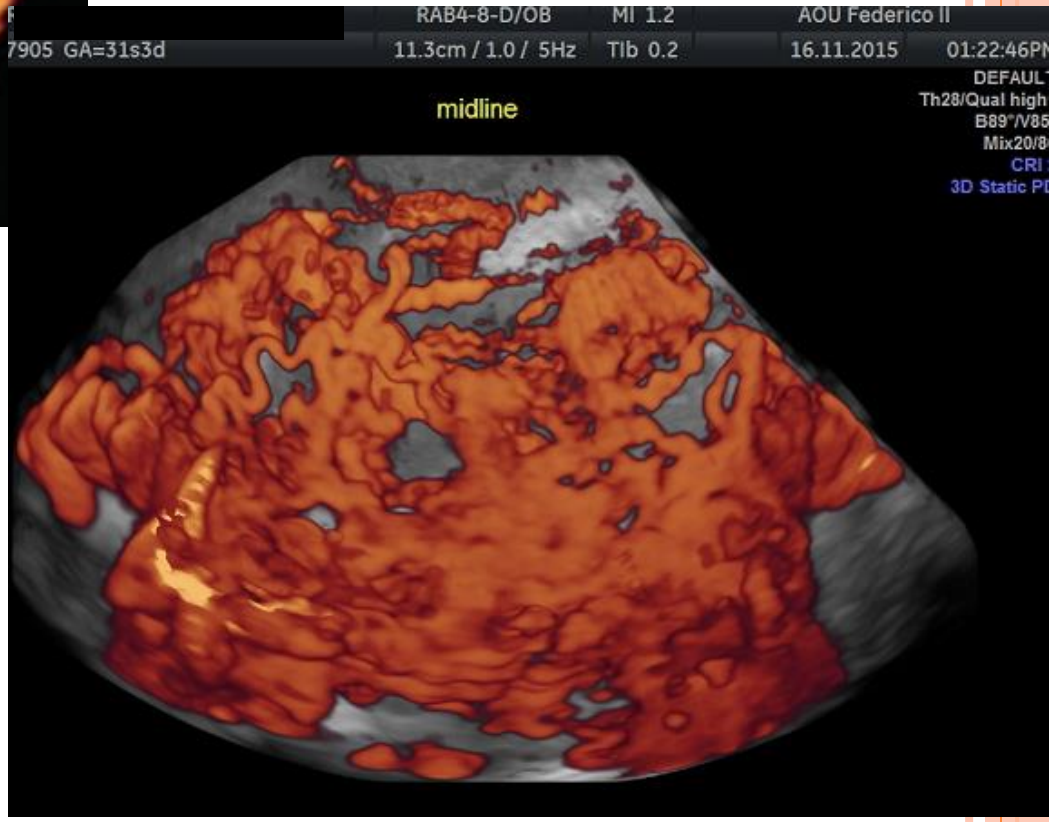




- Ricostruzione 3D di due casi di placenta accreta.
- Densa rete vascolare a struttura caotica a livello dell'interfaccia tra utero e vescica.

3D – IPERVASCOLARITA' INTRAPLACENTARE





Organizzazione complessa e irregolare di numerosi vasi placentari, a decorso tortuoso e calibro differente

Ultrasound Obstet Gynecol. 2013 Jan 3. doi: 10.1002/uog.12385. [Epub ahead of print]

Morbidly adherent placenta: an evaluation of ultrasound diagnostic criteria and an attempt to differentiate placenta accreta from percreta.

Calì G, Giambanco L, Puccio G, Forlani F.

Department of Obstetrics and Gynecology, ARNAS Civico, Di Cristina e Benfratelli, Palermo, Italy.

	Placenta accreta					
	Yes (41) n	No (146) n	Sensitivity (%) (95%CI)	Specificity (%) (95%CI)	Positive Predictive Value (PPV) (%) (95%CI)	Negative Predictive Value (NPV) (%) (95%CI)
2D ultrasonography						
1 **Clear space irregular/ absent**	37	28	90.2 (0.81-0.99)	80.8 (0.79-0.93)	57 (0.45-0.69)	96.7 (0.93-0.99)
2 **Bladder line Thinning/Interruption**	29	1	70 (0.54-0.83)	99 (0.96-0.99)	96 (0.82-0.99)	92 (0.87-0.95)
3 **Placental lacunae with turbulent high velocity flow**	30	20	73 (0.57-0.85)	86 (0.79-0.91)	60 (0.45-0.73)	90 (0.80-0.90)
3D ultrasonography						
4 **Irregular intraplacental vascularization with tortuous confluent vessels crossing the placental width.**	16* (percreta)	0	39 (0.24-0.55)	100 (0.96-1)	100 (0.71-1)	85 (0.79-0.9)
5 **Hypervascularity of uterine serosa-bladder wall interface**	37	0	90 (0.81-0.99)	100 (0.96-1)	100 (0.86-1)	97 (0.94-0.99)

- 41 casi di PA
- Perdita del *clear space* ha scarso VPP
- Vascolarizzazione intraplacentare irregolare con vasi tortuosi e confluenti nell'intero spessore placentare (4) e ipervascolarità dell'interfaccia tra sierosa e parete uterina (5) presenti solo nei casi di **PLACENTA PERCRETA**

Prenatal identification of invasive placentation using ultrasound: systematic review and meta-analysis

F. D'ANTONIO, C. IACOVELLA and A. BHIDE

Fetal Medicine Unit, Division of Developmental Sciences, St George's University of London, London, UK

23 studies included

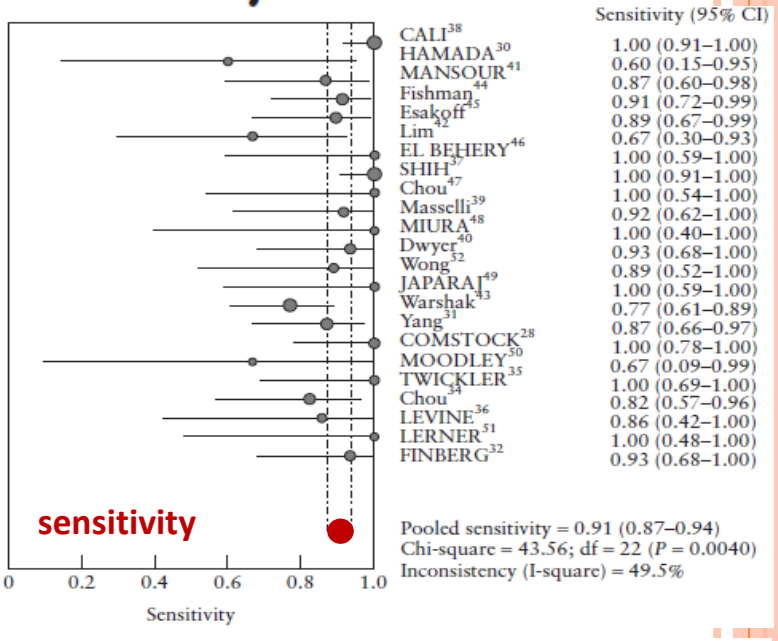
3707 pregnancies at risk for PA
(mainly based on the anterior placenta and a history of uterine surgery)

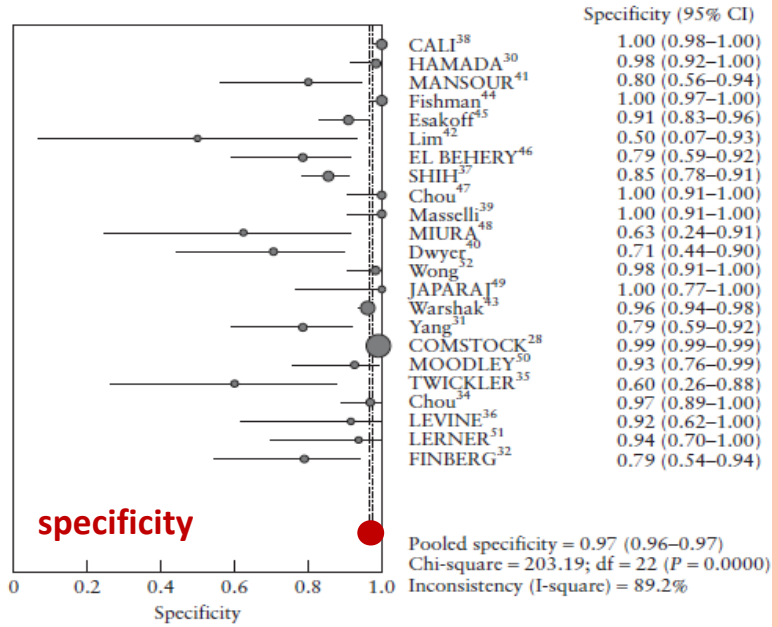
Overall performance of USG:

Sensitivity: 90.72 (95% CI, 87.2–93.6)
Specificity: 96.94 (95% CI, 96.3–97.5)

LR+: 11.01 (95% CI, 6.1–20.0)
LR–: 0.16 (95% CI, 0.11–0.23)

DOR 98.59 (95% CI, 48.8–199.0)





UOG, 2013; 42:509-517

Prenatal identification of invasive placentation using ultrasound: systematic review and meta-analysis

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3707 gravidanze a rischio
(placenta anteriore e chirurgia uterina)

Performance complessiva dell'USG:

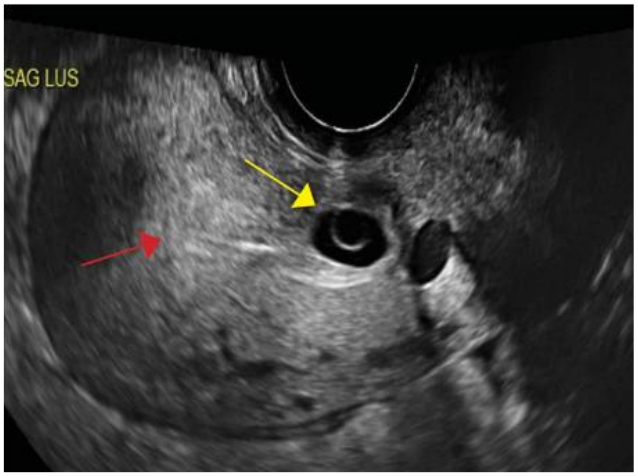
Sensitivity: 90.72 (95% CI, 87.2–93.6)
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Diagnostic method	*Studies (n)*	*Patients (n)*	*Sensitivity (95% CI) (%)*	*Specificity (95% CI) (%)*	*LR+ (95% CI)*	*LR– (95% CI)*	*DOR (95% CI)*
Ultrasound (overall)	23	3707	90.72 (87.2–93.6)	96.94 (96.3–97.5)	11.01 (6.1–20.0)	0.16 (0.11–0.23)	98.59 (48.8–199.0)
Placental lacunae	13	2725	77.43 (70.9–83.1)	95.02 (94.1–95.8)	4.52 (2.5–8.1)	0.29 (0.20–0.43)	24.32 (9.13–64.8)
Loss of hypoechoic space	10	2633	66.24 (58.3–73.6)	95.76 (94.9–96.5)	5.64 (2.3–14.1)	0.38 (0.20–0.69)	21.98 (6.8–70.6)
Abnormalities of uterus–bladder interface	9	2579	49.66 (41.4–58.0)	99.75 (99.5–99.9)	30.56 (8.1–115.5)	0.51 (0.34–0.77)	93.70 (35.5–247.5)
Color Doppler abnormalities	12	714	90.74 (85.2–94.7)	87.68 (84.6–90.4)	7.77 (3.3–18.4)	0.17 (0.10–0.29)	69.02 (22.8–208.9)

UOG, 2013; 42:509-517

Cesarean scar pregnancy (CSP) is a *relative "new"* type of ectopic pregnancy where the fertilized egg is implanted in the muscle or fibrous **tissue of the scar after a previous cesarean section**.

(Pędraszewski , 2018)



INCIDENCE AND RECURRENCE

- Since the first description of cesarean scar pregnancy in 1978, its **frequency has increased dramatically**

Development of transvaginal (TV) ultrasonography (US)

Significant increase in the percentage of cesarean section

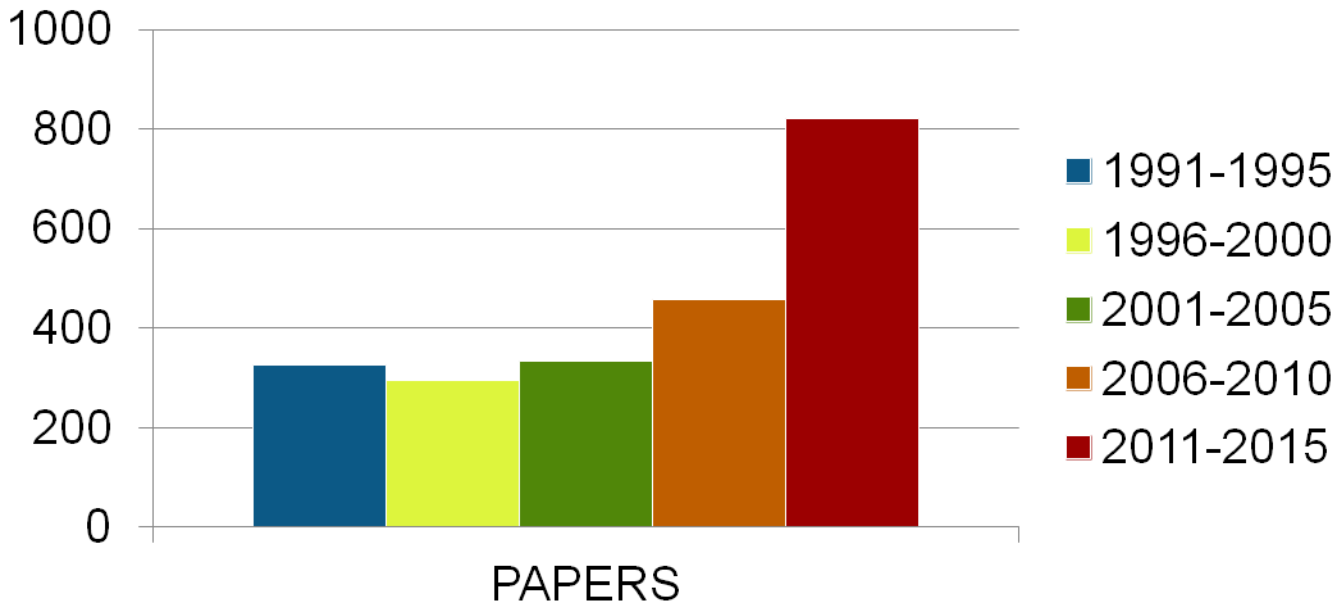
- **Incidence** of **1 in 1,800 to 1 in 2,200** pregnancies 0.05–0.04% of all pregnancies (Grechukhina et al. 2018).
- In **women after a cesarean section**, the frequency of CSP is approximately **0.15%**, which constitutes **6.1% of all ectopic pregnancies** in patients after at least one cesarean operation (Grechukhina et al. 2018).

PubMed.gov

PubMed | scar pregnancy

Search results

Items: 1 to 20 of 3971



… growing interest in this new condition.

+ 593
2016-2019

WHO'S AT RISK ?

The risk factors that favour implantation in the CS scar are not well understood.

Therefore, **there are no guidelines** for the practicing physicians to determine the women who are at risk.

It has been suggested that the early pregnancy travels through a **defect in the endometrium and outer myometrium** to reach its location.
Risk factors for such defects include :

Uterine surgery

- Cesarean delivery,
- Myomectomy,
- Curettage…

Incomplete or prolonged healing of the scar

- postoperative infections,
- decreased blood flow due to scar tissue,
- medical conditions (such as diabetes) that predispose to poor wound healing

(Marcus et al 1999; Fylstra et al. 2002; Jurkovic et al. 2003)

The Journal of Obstetrics and Gynaecology

Journal of Obstetrics and Gynaecology

ISSN: 0144-3615 (Print) 1364-6893 (Online) Journal homepage: http://www.tandfonline.com/loi/ijog20

Caesarean scar pregnancy: time to explore indications of the caesarean sections?

Muzibunnisa A. Begam, Hisham Mirghani, Wafa Al Omari, Howaida Khair, Hassan Elbiss, Tahira Naeem & Sultan M. Salahudeen

- **Multiple CS ? NO.**

Most of patients had **one** previous CS .
(Rotas et al. 2006; Shi et al. 2014; Begam et al. 2019)



- **Preterm CS without labour or a term elective CS ? YES.**

The majority of our patients had undergone CS prior to the establishment of labour with a **non-contracting uterus**.
Non-developed LUS might facilitate implantation of the blastocyst within the scar.
(Maymon et al. 2004; Rotas et al. 2006 ; Begam et al. 2019)



- **Breech presentation ? YES.**

Lack of adequate stretching of the LUS by the bony foetal skull.
(Cunningham et al. 1997; Begam et al. 2019)



GYNECOLOGICAL ENDOCRINOLOGY
https://doi.org/10.1080/09513590.2018.1526276

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ORIGINAL ARTICLE

Early clinical features and risk factors for cesarean scar pregnancy: a retrospective case-control study

Lanrong Luo[a,b], Xiangyan Ruan[a,c], Changdong Li[b], Suwen Chen[b], Qiaofei Hu[b] and Alfred O. Mueck[a,c]

- **Short intervals between the present and last pregnancy? YES.**

Especially shorter than one year, is an independent risk factors for CSP .

- **Last pregnancy ended with abortion ? YES.**

The risk of CSP was 4-fold increased. One reason is, that abortion surgery may impair the endometrium which can contribute to an increased risk of implantation in the cesarean scar.

Table 1. Demographic and clinical features in both two groups.

Variables	Control groups（n = 412）	Study group（n = 206）	t/ χ^2	*p* value
Interval between present and last pregnancy (years)			61.117	<.001
0–1	64 (15.5%)	84 (40.8)		
2–3	124 (30.1%)	68 (33.0%)		
>3	224 (54.4%)	54 (26.2%)		
Outcome of last pregnancy			69.457	<.01
Cesarean section	304 (73.8%)	81 (39.3%)		
Abortion	108 (26.2%)	125 (60.7%)		

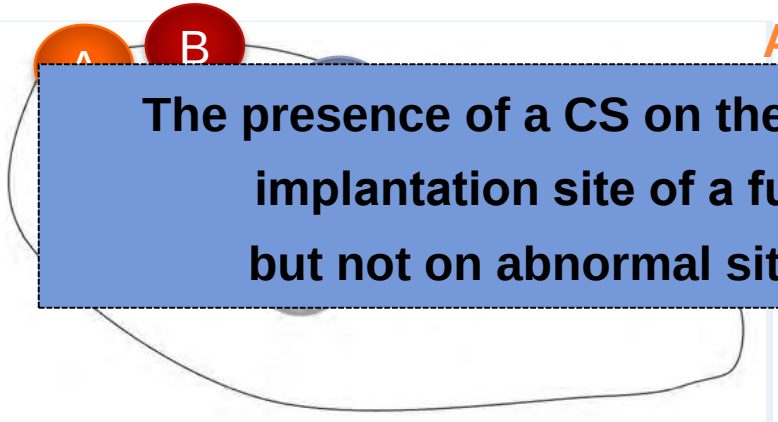
Human Reproduction, Vol.28, No.6 pp. 1489–1496, 2013
Advanced Access publication on April 12, 2013 doi:10.1093/humrep/det110
human reproduction ORIGINAL ARTICLE *Early pregnancy*

CS AND IMPLANTATION SITE

Does the presence of a Caesarean section scar affect implantation site and early pregnancy outcome in women attending an early pregnancy assessment unit?

O. Naji[1,2], L. Wynants[3,4], A. Smith[1], Y. Abdallah[1,2], S. Saso[1], C. Stalder[1], S. Van Huffel[3,4], S. Ghaem-Maghami[2,*], B. Van Calster[5], D. Timmerman[5,6], and T. Bourne[1,2,5]

- **Ben-Nagi** suggested there might be a **link between altered uterine immunobiology, CS and embryo implantation** (Ben-Nagi et al., 2009).
- They studied the effect of CS on the endometrium in women with a history of CS: most significant difference was that **fewer leukocytes and less vascularization** were found at the scar site than in the endometrium of the unscarred uterus… his delay might have been a result of **disruption in steroid receptor expression**.



The presence of a CS on the uterus impacts on the implantation site of a future pregnancy…
but not on abnormal site of implantation !

The US criteria of CSP are:

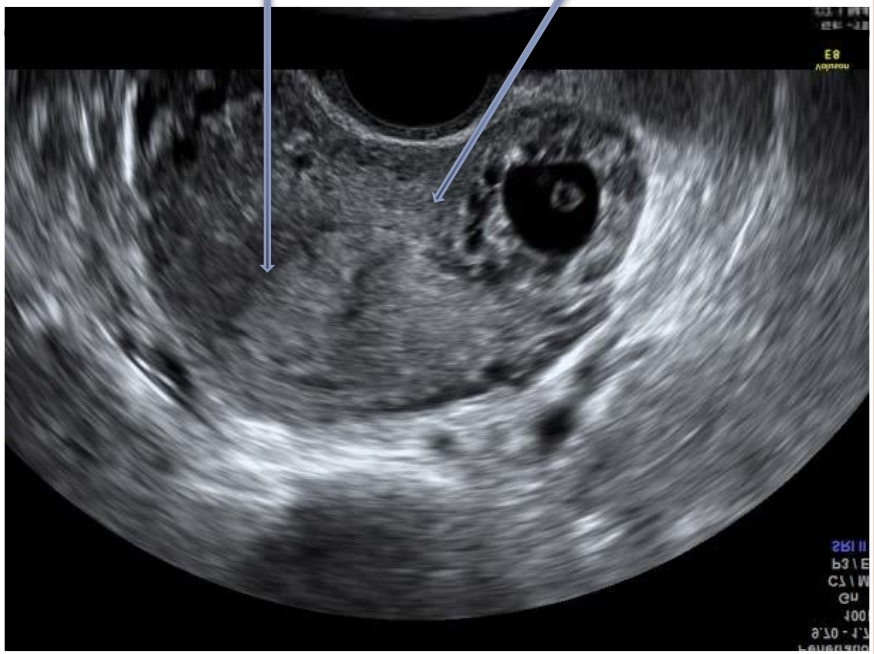
A gestational sac located in the **anterior isthmus**, surrounded by the cesarean scar tissue, **separated from the uterine cavity**



Presence or not of a **thin myometrial layer** between the bladder and the gestation sac (from 1–3 mm to 4.6 mm)

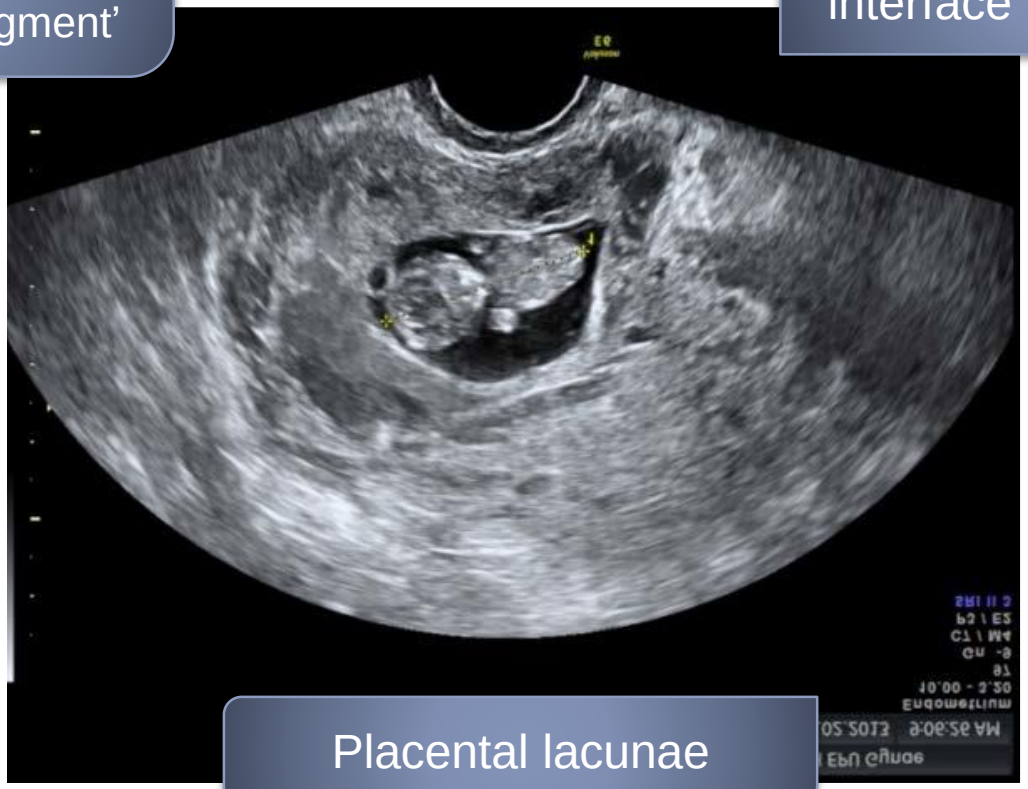
Absence of intrauterine gestation and empty cervical canal with clearly visible endometrium.

Discontinuity of the anterior uterine wall on longitudinal section of the uterus



Sac ‘completely surrounded by myometrium and fibrous tissue of the scar in the prior low uterine segment’

Disruption of endometrial / myometrial interface by trophoblast



Placental lacunae

Other signs suggesting CSP include so-called **negative organ sliding sign**.

These criteria exclude other diagnoses, such as cervico-isthmic pregnancy, cervical pregnancy or inevitable spontaneous abortion

On Doppler imaging, the gestational sac embedded in a scar defect is surrounded by **vascular flows characterized by high velocity and low impedance blood flow**.

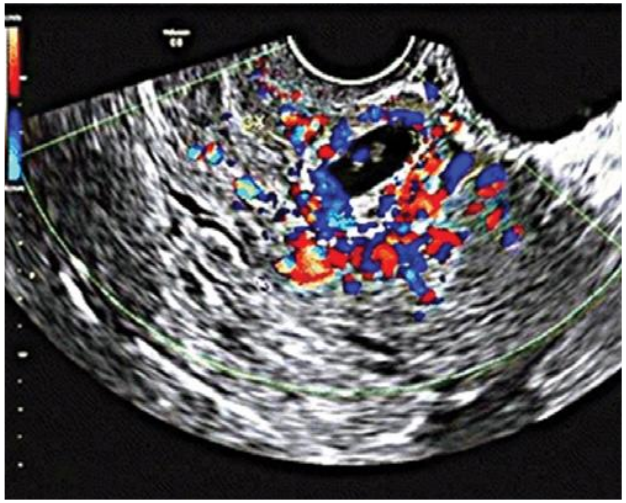


Fig. 3. *TV US with color Doppler imaging. Longitudinal section of the uterus with CSP (week 6 day 3) with visible fetal heart rate; CSP protruding towards the urinary bladder with strong peripheral color Doppler signal*[5]

In CSP, color Doppler imaging shows **increased blood flow** with peak systolic velocity (PSV) greater than 20 cm/s and pulsatililty index (PI) lower than 1

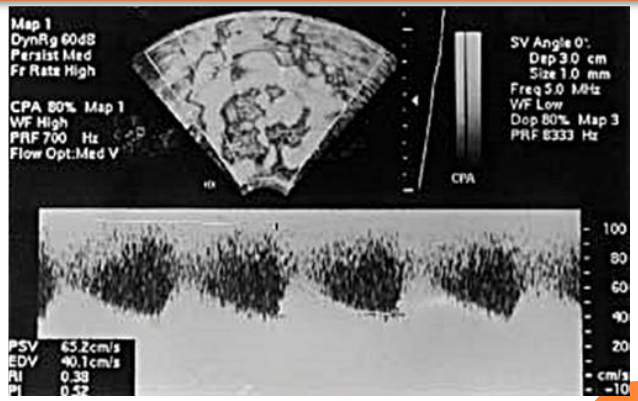


Fig. 4. *Color Doppler US. Turbulent flow surrounding CSP, with high peak systolic velocity (65.2 m/s) and low resistance index (0.52)*[14]

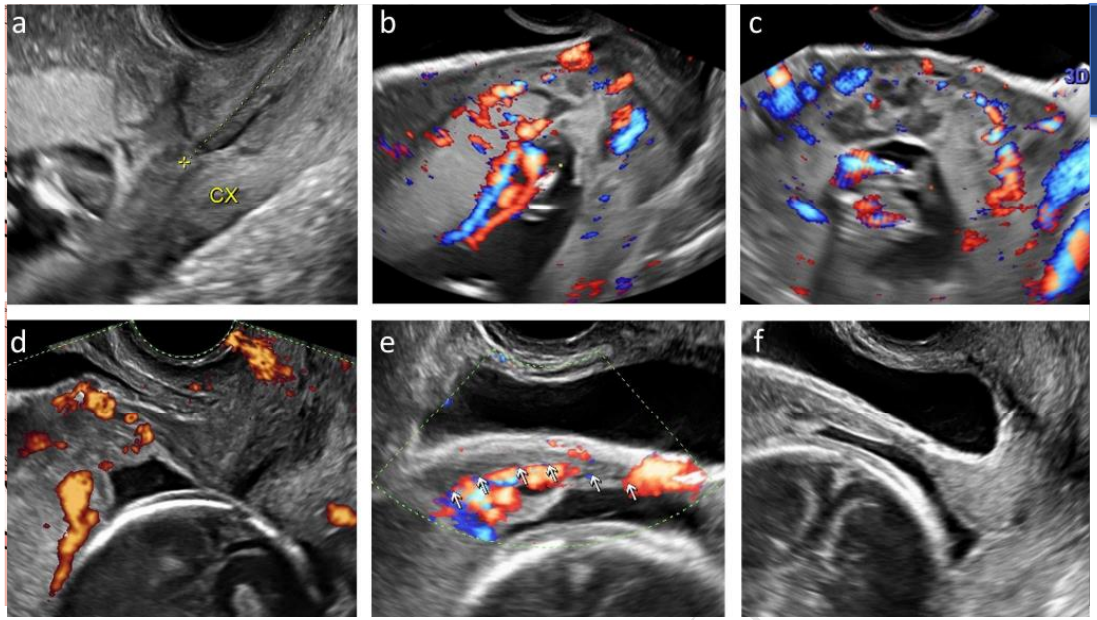
ONCE DIAGNOSIS IS MADE ?

It is a common clinical practice to **offer termination of pregnancy** in view of the reported high rate of morbidity associated with this entity.

BUT… the recently proposed association between CSP and **abnormally invasive placenta (AIP)** poses a dilemma:

How women with prenatally diagnosed CSP should be counselled ?

…and whether termination of pregnancy should be the only therapeutic option offered?



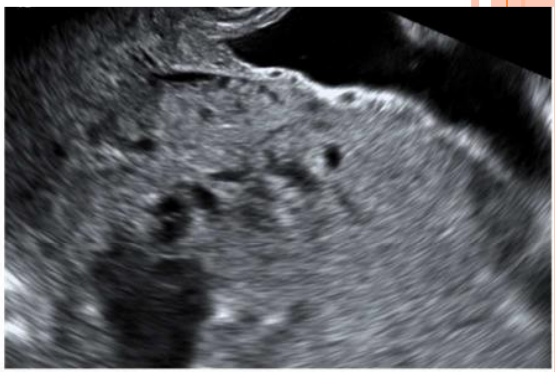
On the Scar

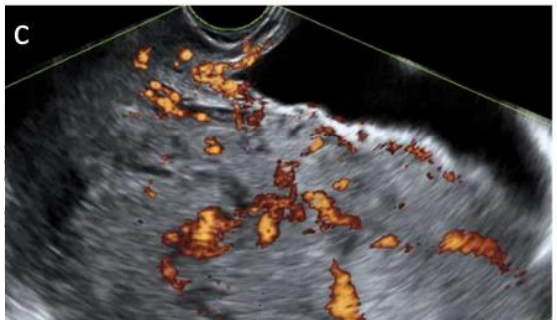
a. 10 w
b. 14 w
c. 14 w
d. 22 w
e. 28 w
f. 32 w

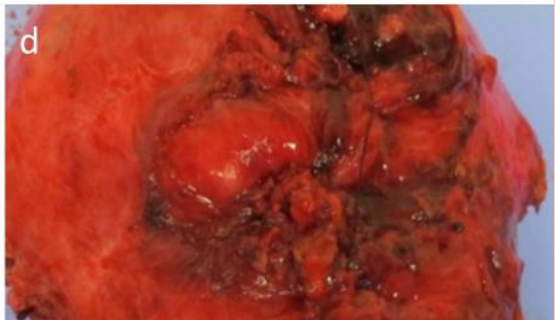
In the Niche

a. 9 w
b. II trimester
c. II trimester
d. After delivery









TYPE I

CSP with progression to cervicoisthmic space or uterine cavity

"endogenic type"

Viable pregnancy with a high risk of bleeding at the placental site

TYPE II

CSP with deep invasion of scar defect with progression towards bladder and abdominal cavity

"exogenic type"

Complicated with uterine rupture and bleeding early in pregnancy.

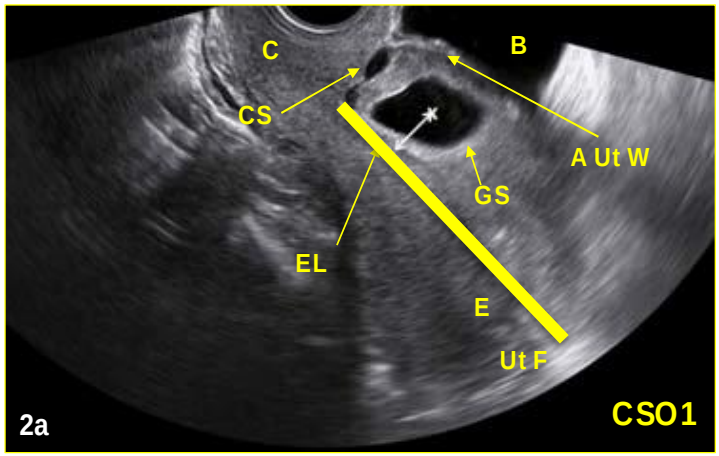
Gonzalez, 2017

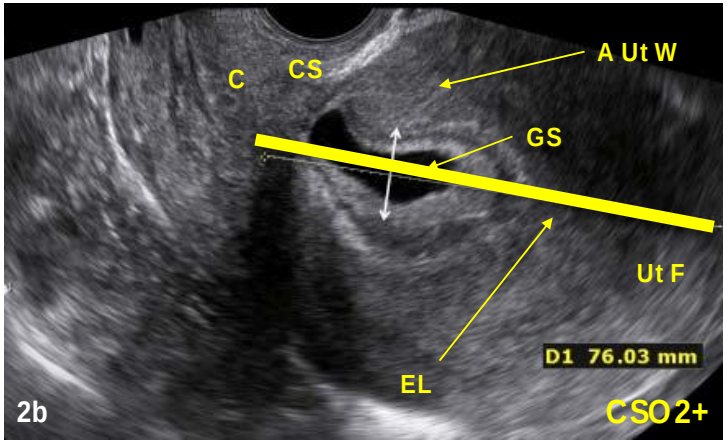
How to improve the performance of prenatal ultrasound in predicting the natural history of CSP ?

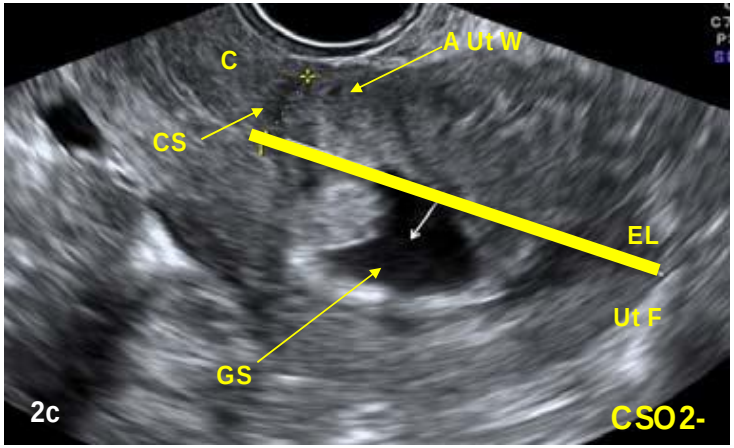
CrossOver Sign

Natural history of caesarean scar pregnancy on prenatal ultrasound: the cross-over sign

Giuseppe Cali[1], Francesco Forlani[1], Ilan Timor-Trisch[2], Jose Palacios-Jaraquemada[3], Gabriella Minneci[1], Francesco D'Antonio[4]





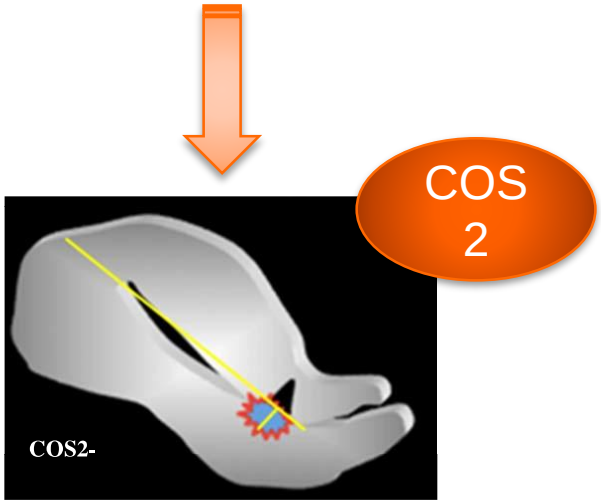


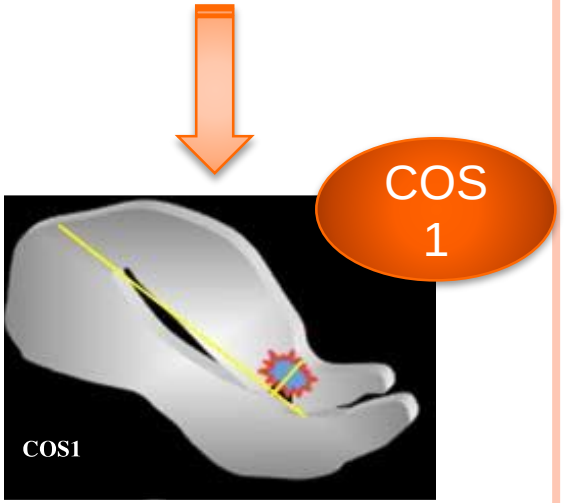
TYPE I

TYPE II

“endogenic type”

“exogenic type”





Placenta percreta was significantly higher in COS1 compared to COS2 group : 83.3% vs 42.9% (p= 0.002)

All pregnancies with COS1 implantation resulted in severe forms of MAP, such as placenta increta or percreta, while there was no case of placenta accreta in this group.

TAKE HOME MESSAGE

- USG B-mode consente di porre diagnosi di SOSPETTO accretismo
- Color-Doppler aumenta la detection rate della diagnosi di accretismo
- 3D color-Doppler fornisce informazioni sul grado di infiltrazione placentare
- RMN utile nei casi dubbi (placenta posteriore, paziente obesa).

Trattamento standardizzato?

However, early and correct diagnosis and the personalized evaluation of risk factors could support physicians in making the best choice in terms of safety and efficacy.

