Stepwise diagnosis of endometriosis and Adenomyosis by ultrasound for the beginners

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Guinness World Record Holder

FOGSI Presidential candidate election year 2026

Vice President,
FOGSI 2020

Present Positions

Chairperson MP
ISAR 25-27

Fellow Representative
AICC RCOG West Zone

Joint secretary
ISPAT 25-27

Organising secretary,
AICOG 2021 Indore

Past Positions

Chairperson, FOGSI Imaging Science Committee 2015-2017

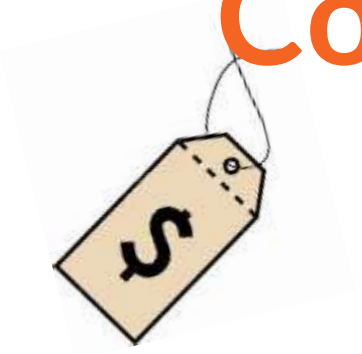
Organising secretary, ISAR 2016

Managing Committee Member: ISAR 2018-20, IAGE 2018-19 & ICOG 2017-21

Imaging science Member AOFOG

Imaging Science Committee Chair, SAFOG 2020-2023

Endometriosis is a Costly Chronic Disease




NEARLY 10% OF WOMEN OF
REPRODUCTIVE AGE GROUP
SUFFER FROM ENDOMETRIOSIS

Facts and figures of Endometriosis

One in 10 women have endometriosis

It takes an average of seven years for most women to get diagnosed

Endometriosis can often be confused with or misdiagnosed as IBS

Endometriosis is the second most common gynaecological condition (after fibroids)

Overview -

Definition of endometriosis and adenomyosis

- Ultrasound appearances of endometriosis within the pelvis
- How to assess for pelvic mobility
- What to look for during an ‘endometriosis’ scan

Definition of endometriosis

The presence of endometrial – like tissue (glands and stroma) outside the uterus which induces a chronic inflammatory reaction

Endometriosis typically manifests itself in three ways

Endometriomas, adhesions and endometriotic nodules (deep or superficial)

Diagnostic modalities

Clinical

Ultrasound ,contrast Ultrasound

MRI / CT

Endoscopy , laparoscopy , sigmoidoscopy

Biochemical screening

Histopathology definitive diagnosis

Ultrasound

Most preferred modality for assessment of pelvic pathology

Routes:

1. Transvaginal (Route of choice)
2. Transabdominal
3. Transrectal

Ultrasound

Widely available, cost effective

Ultrasound scan can pick up Ovarian - Lesions - Endometrioma

DIE -deep invasive endometriosis

Scanning Technique

Scanning should ideally begin with survey of whole abdomen with 3.5 MHz probe

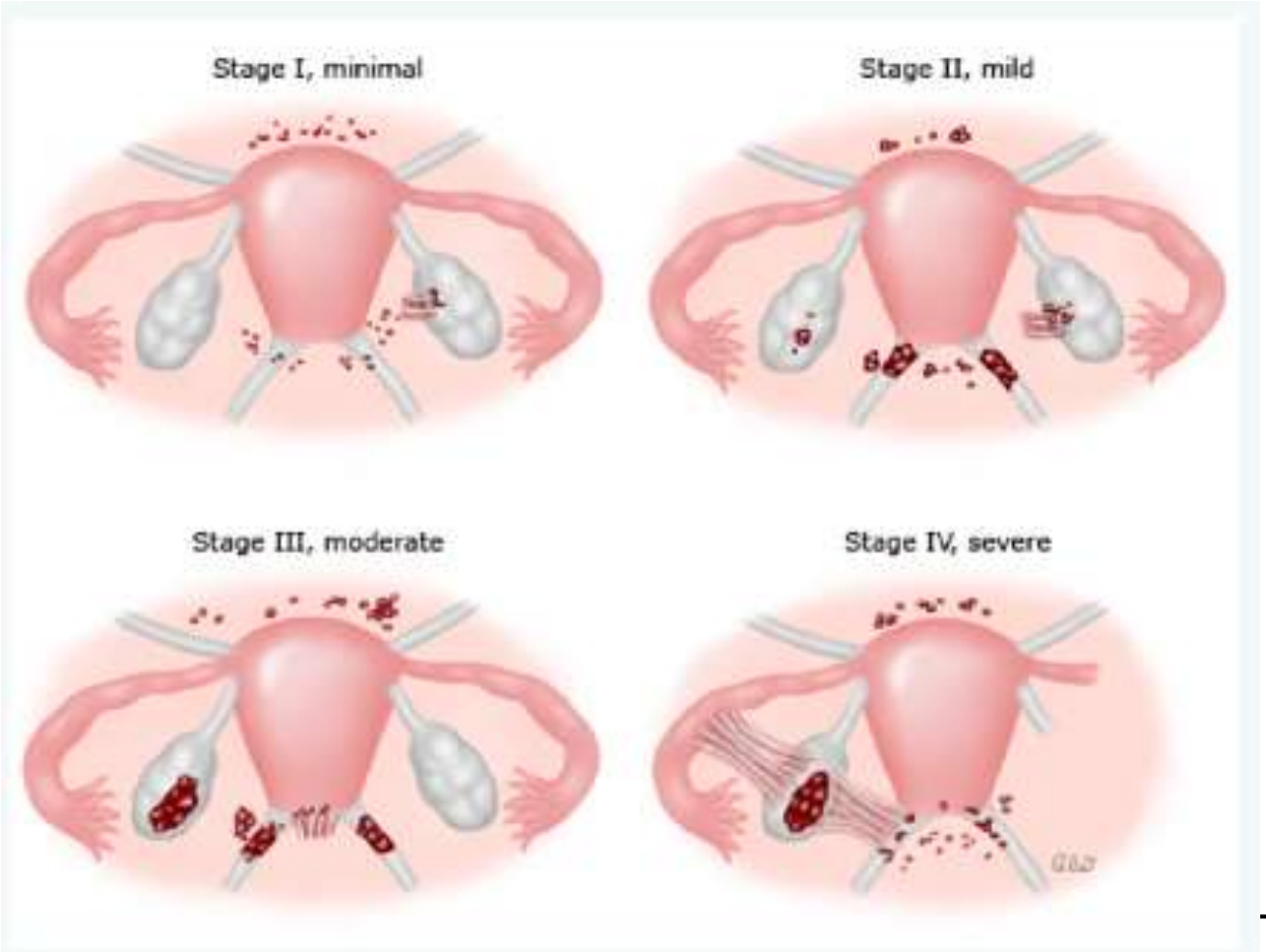
Follow it with TVS ask partially full bladder so bladder wall can be evaluated

Grey scale imaging can be improved by using HI ,CRI with this even subtle textural changes associated with endometriosis can be appreciated

3D volume ultrasound may be used to assess the multi organ involvement and adhesions .

Surgical Staging of endometriosis

- Stage 1: minimal disease is characterised by isolated implants and no significant adhesions.
- Stage 2: mild disease, superficial implants that are less than 5cm in total aggregates and scattered over the peritoneum or the ovary.
- Stage 3: moderate disease, multiple implants, both superficial and deep +/- presence of adhesions around the tubes or ovaries
- Stage 4: severe disease, multiple superficial and deep implants including large ovarian endometrioma, dense bowel/bladder/ureteric adhesions


Stage I, minimal
Stage II, mild
Stage III, moderate
Stage IV, severe

Simplified staging on ultrasound

- For the purpose of this lecture I will be describing how to identify structures involved by endometriosis and showing corresponding laparoscopic images to improve correlation.
- These can then be staged by any classification system you are comfortable with.
- So let us go step by step.

Structures involved in endometriosis

- Ovaries
- Uterosacral ligaments and POD
- Bowel
- Rectum
- Bladder
- Uterus

Ovarian Endometrioma

Endometriomas are probably the most commonly diagnosed form of endometriosis because of relative ease and accuracy of ultrasound diagnosis

Although their exact prevalence and incidence are not known they have been reported in 17-44% of women with endometriosis

The presence of ovarian endometriosis has been reported as a marker for Deep Endometriosis and Multifocal deep vaginal intestinal and ureteric lesion

Ovarian endometrioma

Endometriomas are common, can mimic other adnexal masses

- Endometriomas result from cyclic haemorrhage
- The walls are thick and fibrotic
- The contents consist of thick, dark degenerate blood product also known as a ‘chocolate cyst’
- If unilateral more likely to occur within the left ovary
- Are bilateral in approximately 50% of cases
- Usually regress substantially after menopause

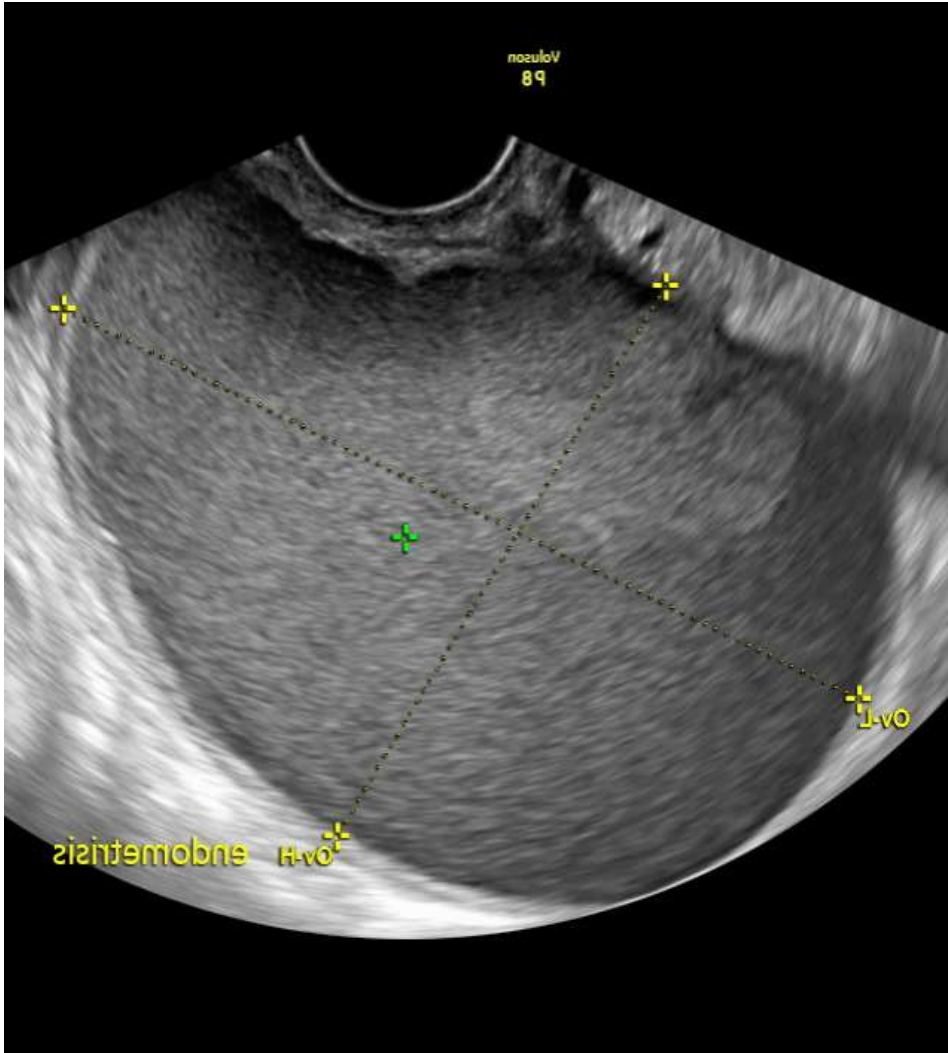
Typical features of endometrioma

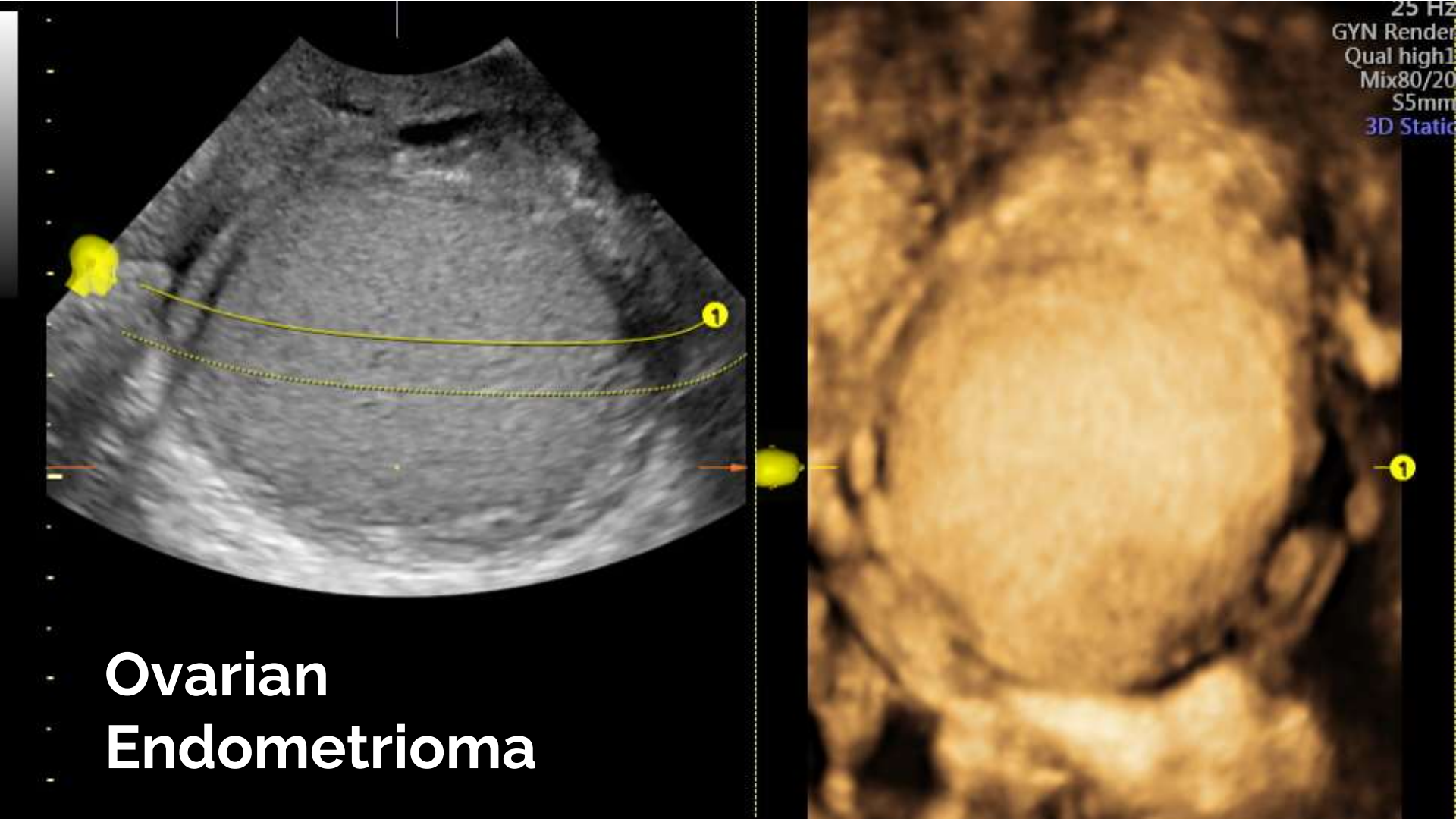
Fluid level, the hyperechoic layer will be the dependent portion of the cyst

- Can have calcified foci within the cyst (acoustic shadowing)

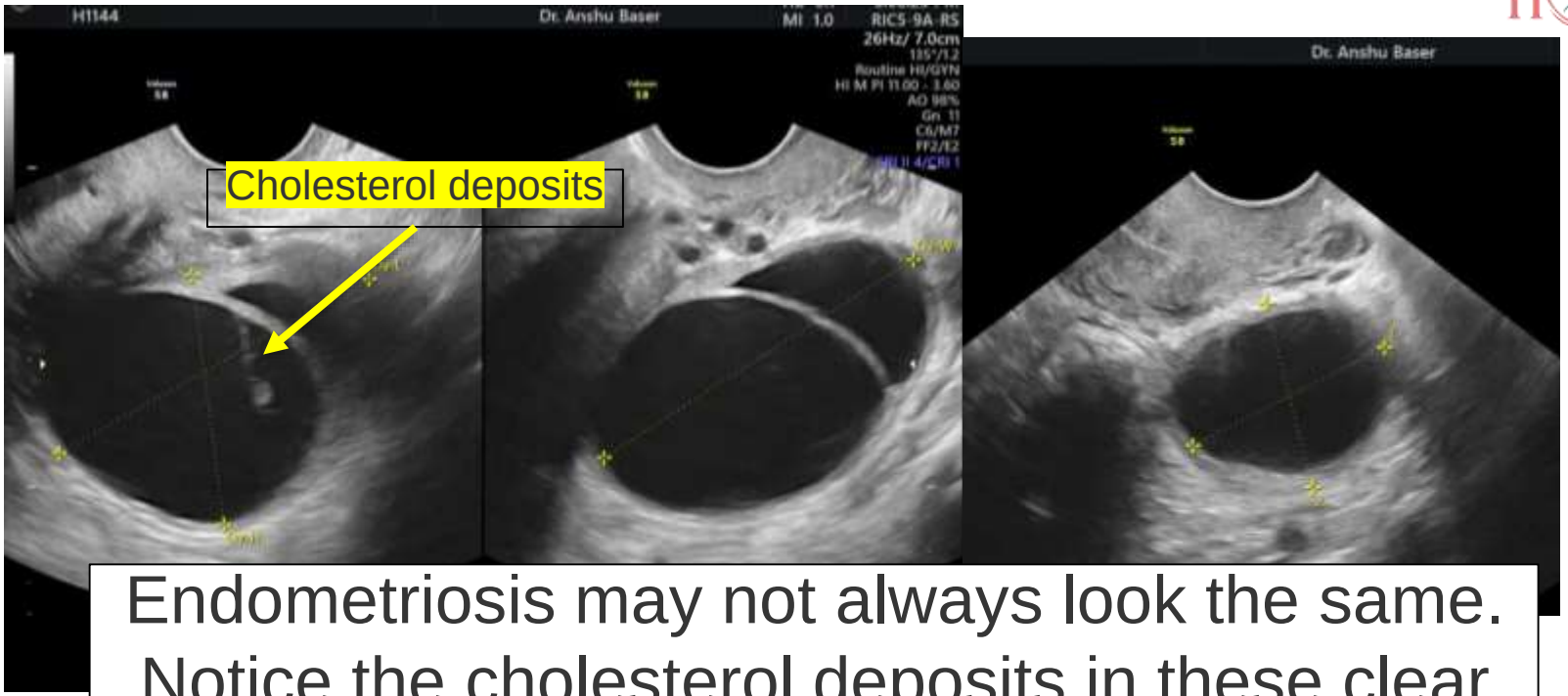
- Typically avascular or low flow

- ‘Acoustic streaming’ can help discriminate from mucinous/ serous cystadenomas





Ovarian Endometrioma



Endometriosis may not always look the same. Notice the cholesterol deposits in these clear looking cyst

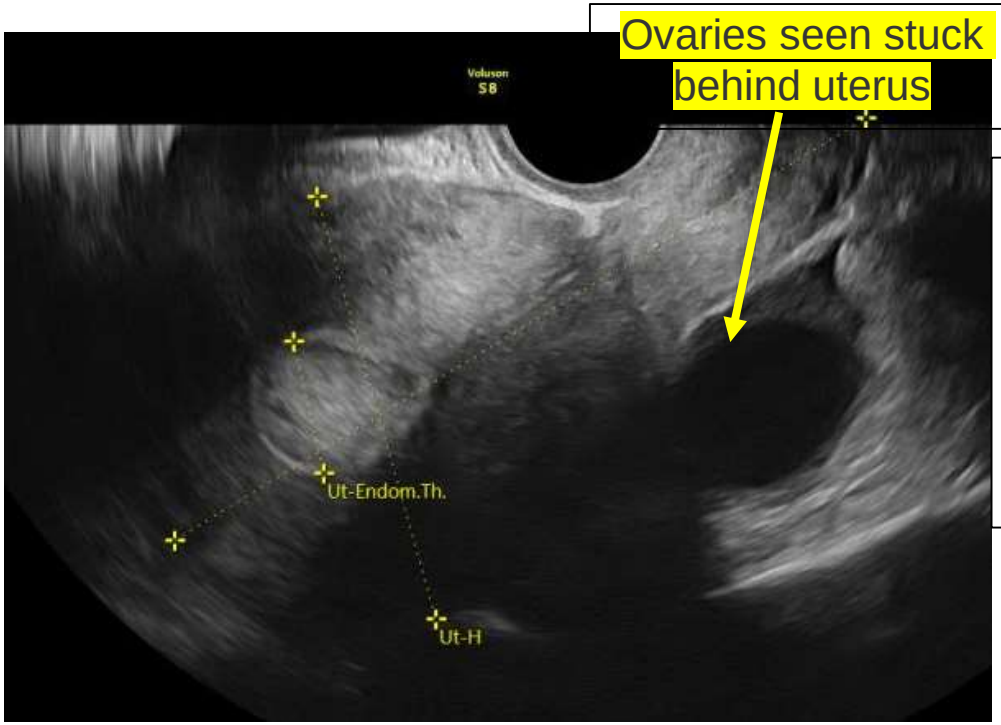
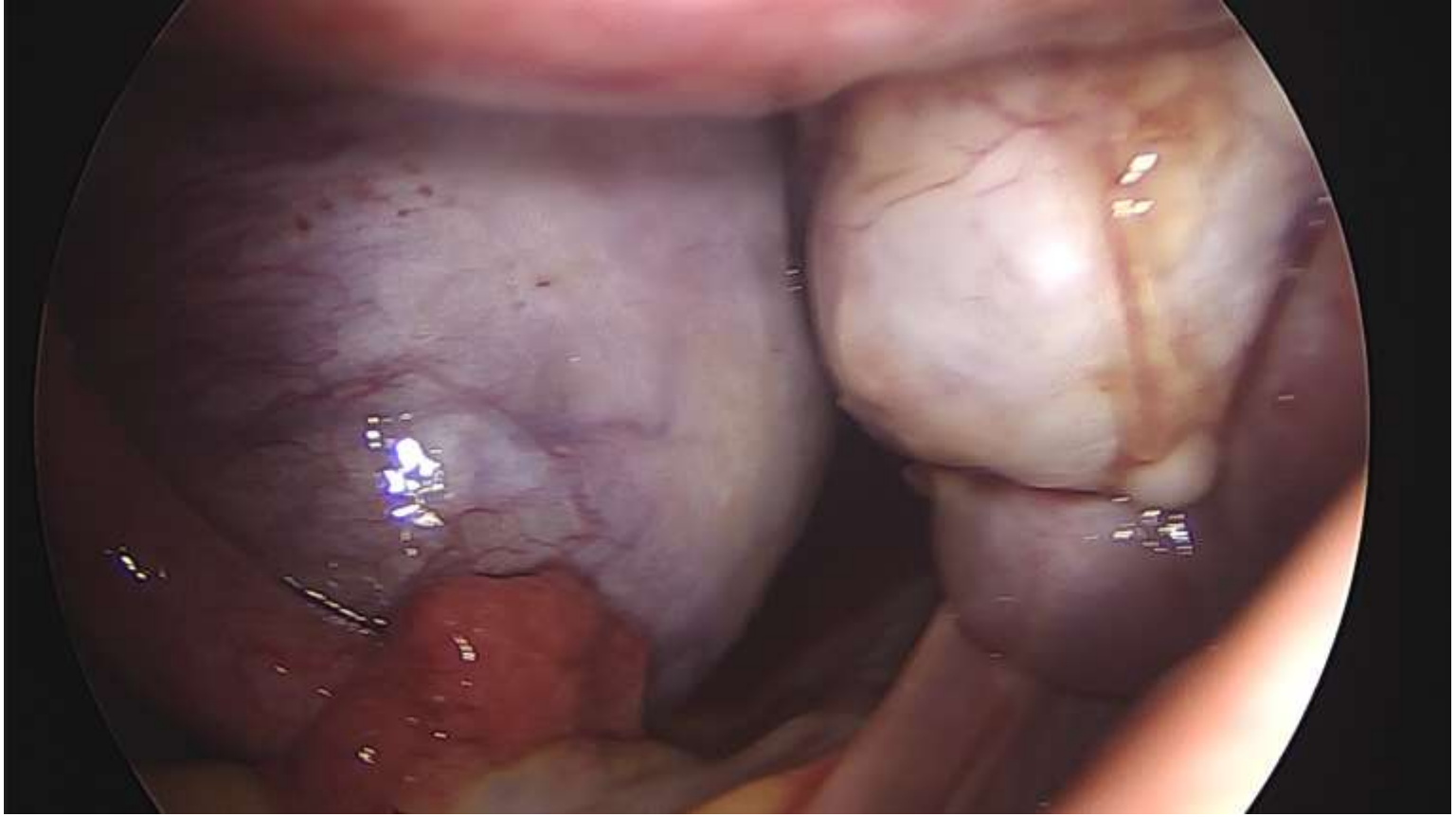


Image of the same patient showing the ovaries stuck behind the uterus

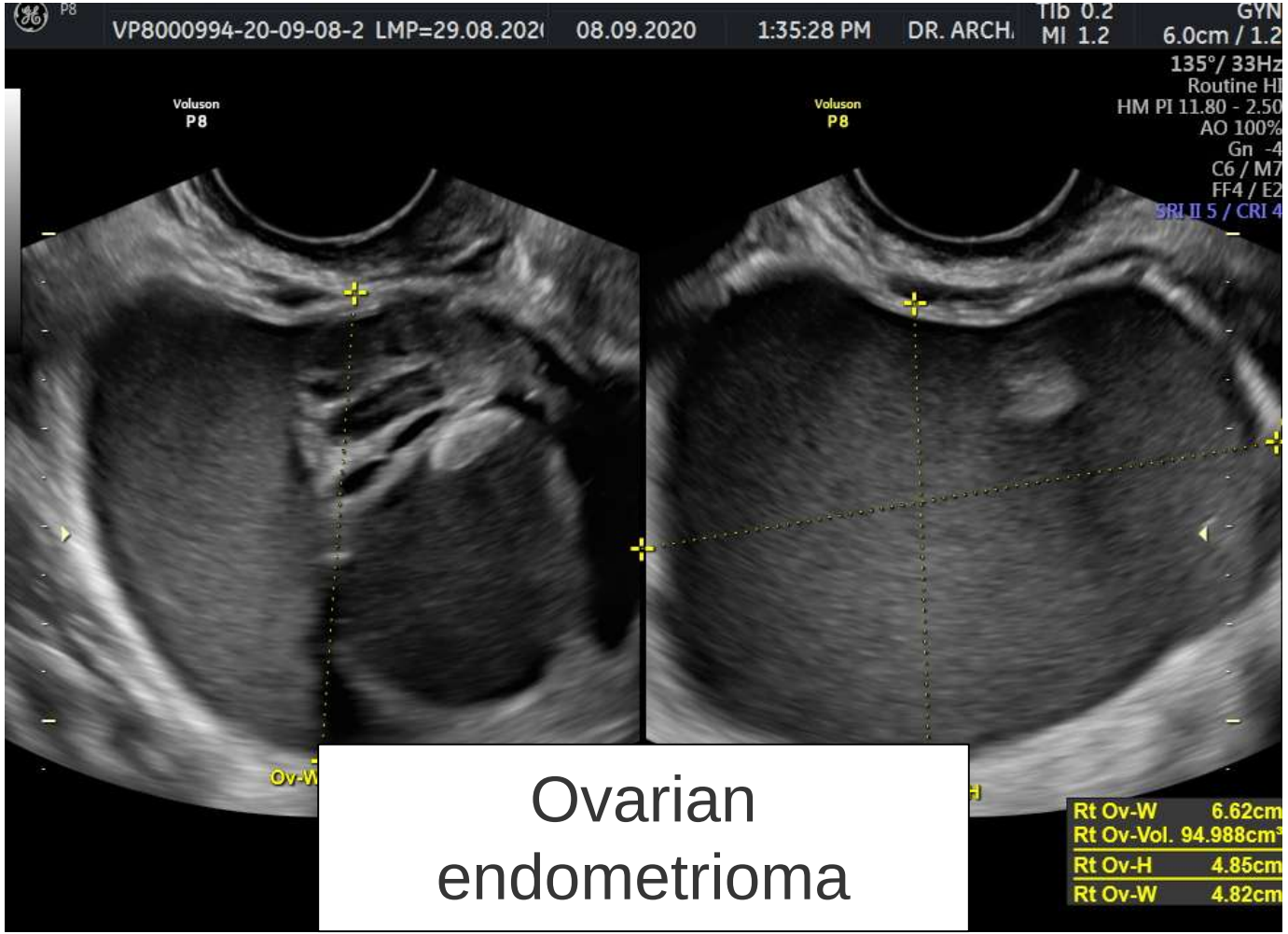


Laparoscopic view of the same patient

Multiple ovarian endometriomas in same ovary

A clip showing multiple endometriomas in the same ovary. It is important this assessment be made prior to surgery in order to avoid residual endometriosis

An image showing multiple endometriomas in the same ovary. It is important this assessment be made prior to surgery in order to avoid residual endometriosis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Tib 0.2
MI 1.2
GYN
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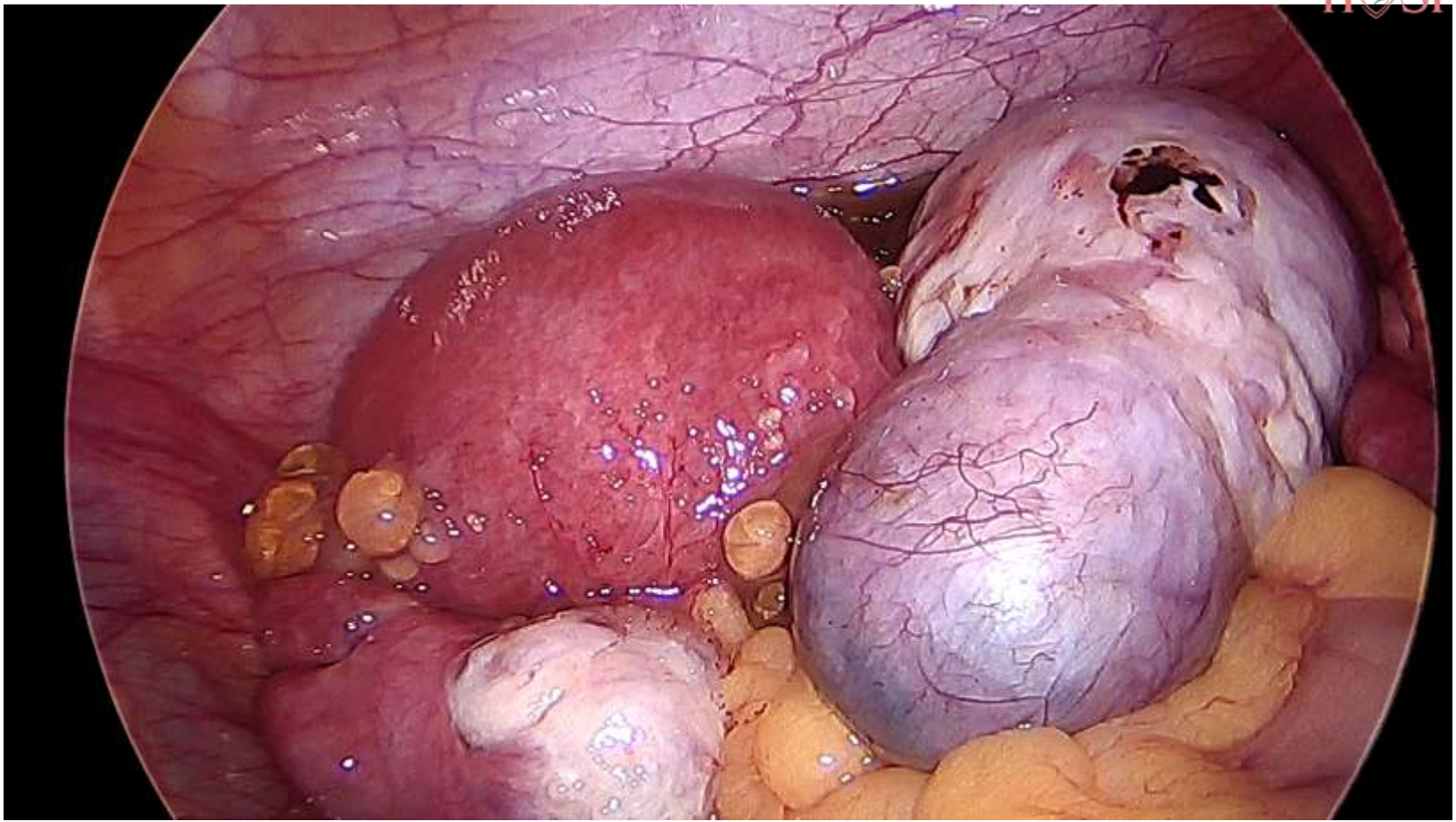
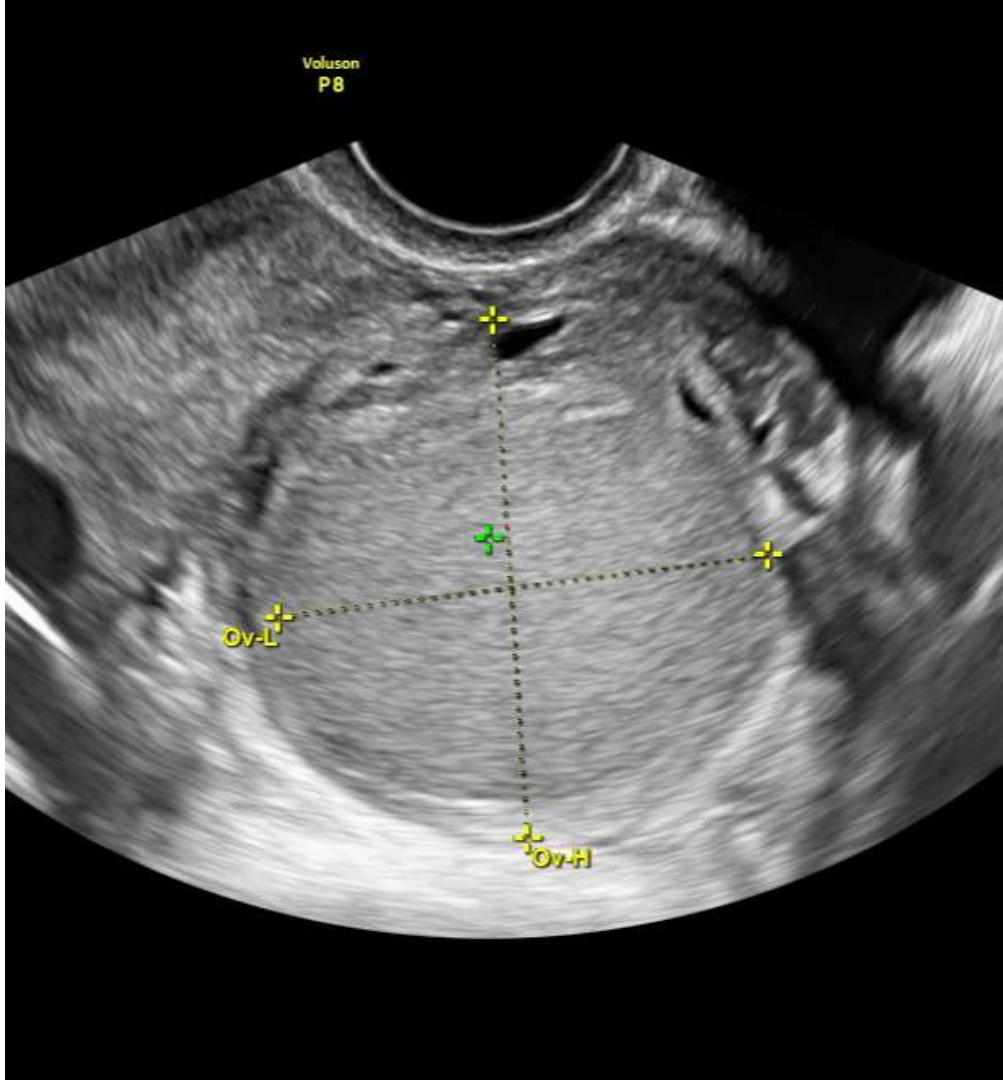
135°/ 33Hz
Routine HI
HM PI 11.80 - 2.50
AO 100%
Gn -4
C6 / M7
FF4 / E2
3RI II 5 / CRI 4
Voluson
P8
Voluson
P8
Ov-W
Rt Ov-W 6.62cm
Rt Ov-Vol. 94.988cm³
Rt Ov-H 4.85cm
Rt Ov-W 4.82cm
Ovarian endometrioma

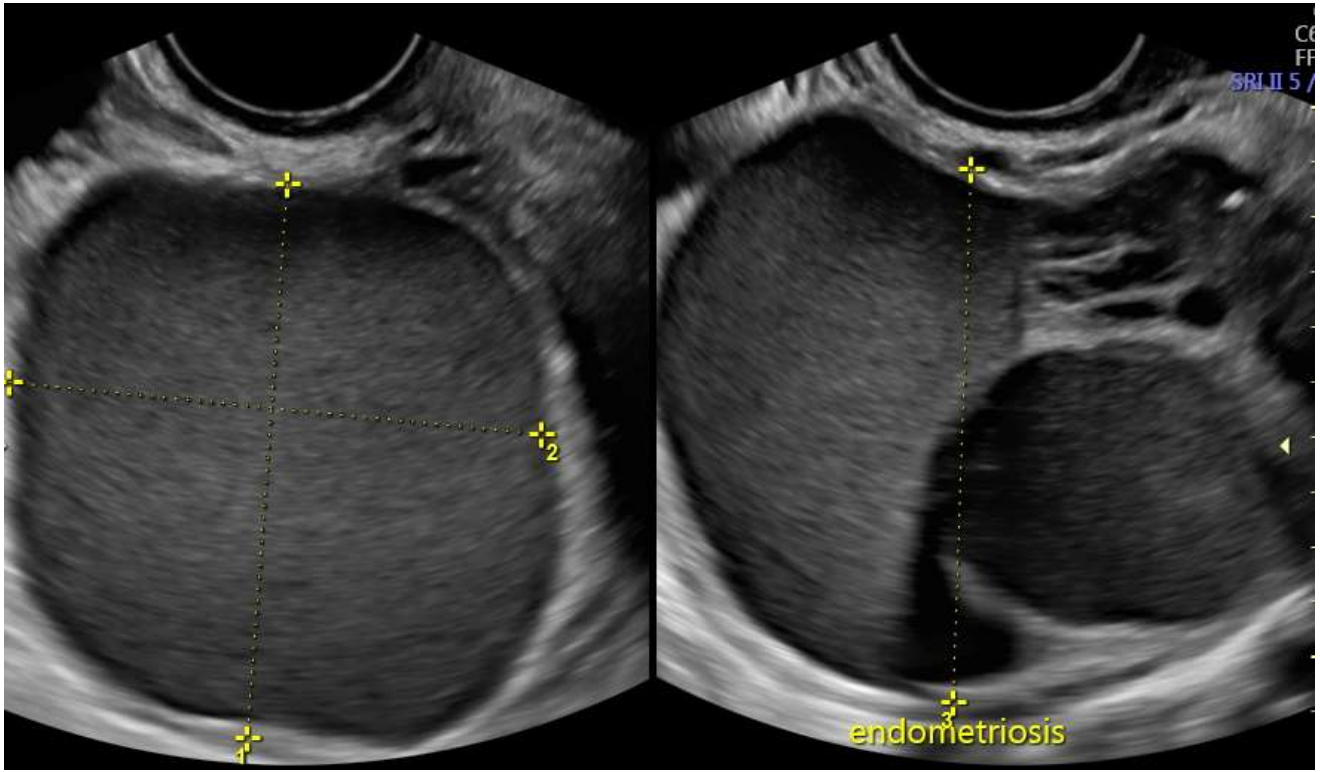


Ovarian Endometrioma

Small endometriotic lesions are usually uniform and slightly hyperechoic than stroma

These lesions usually do not change their echotexture during diff phase of menstrual cycle




endometriosis

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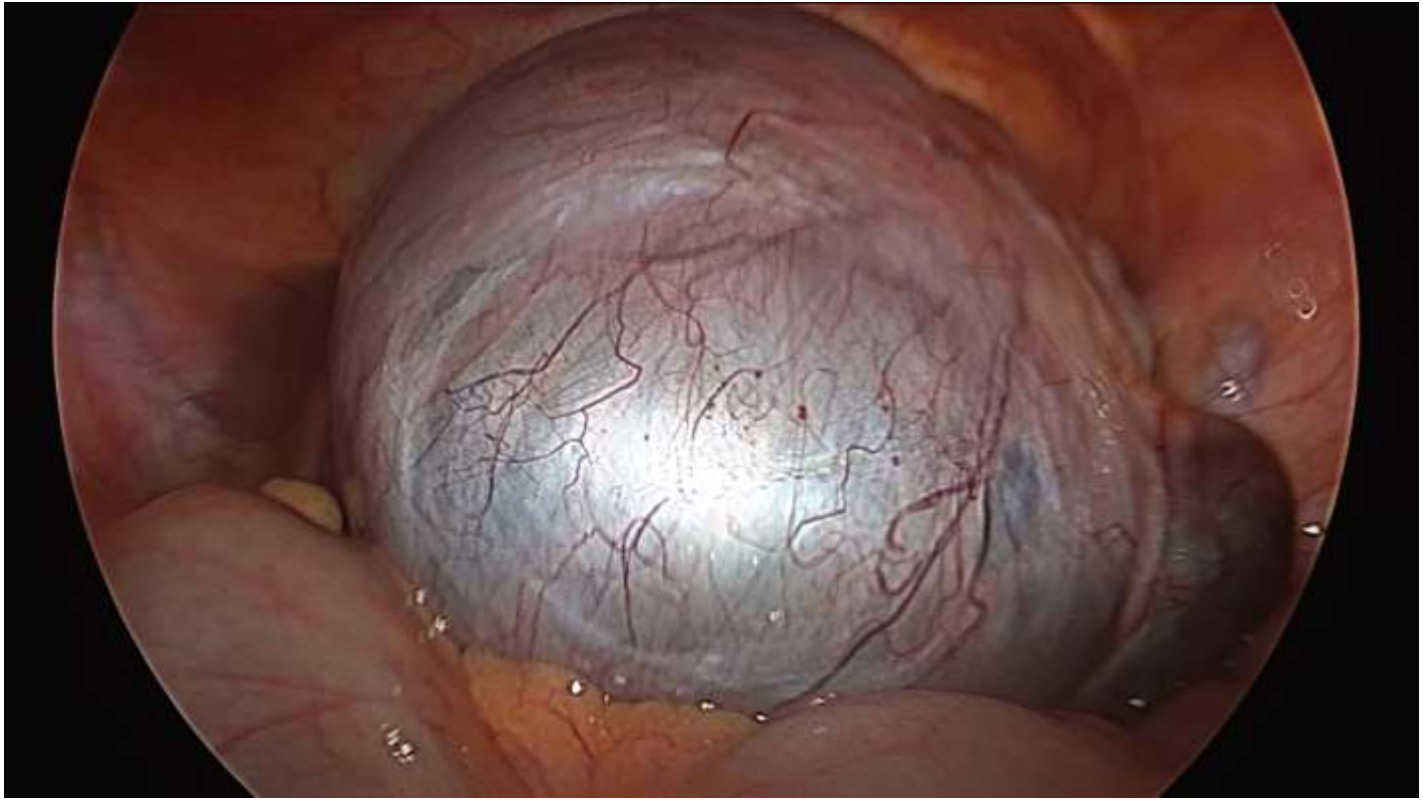
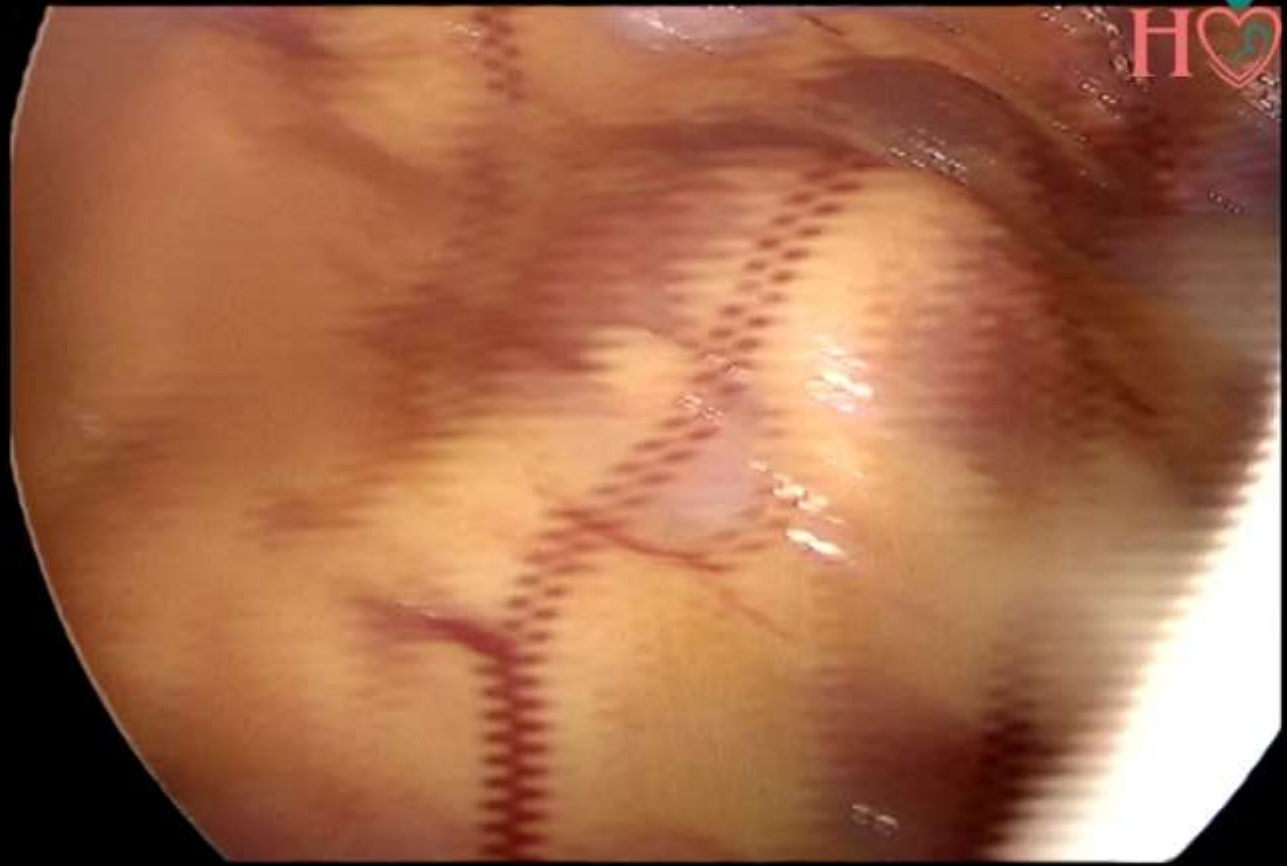
Large Endometriomas

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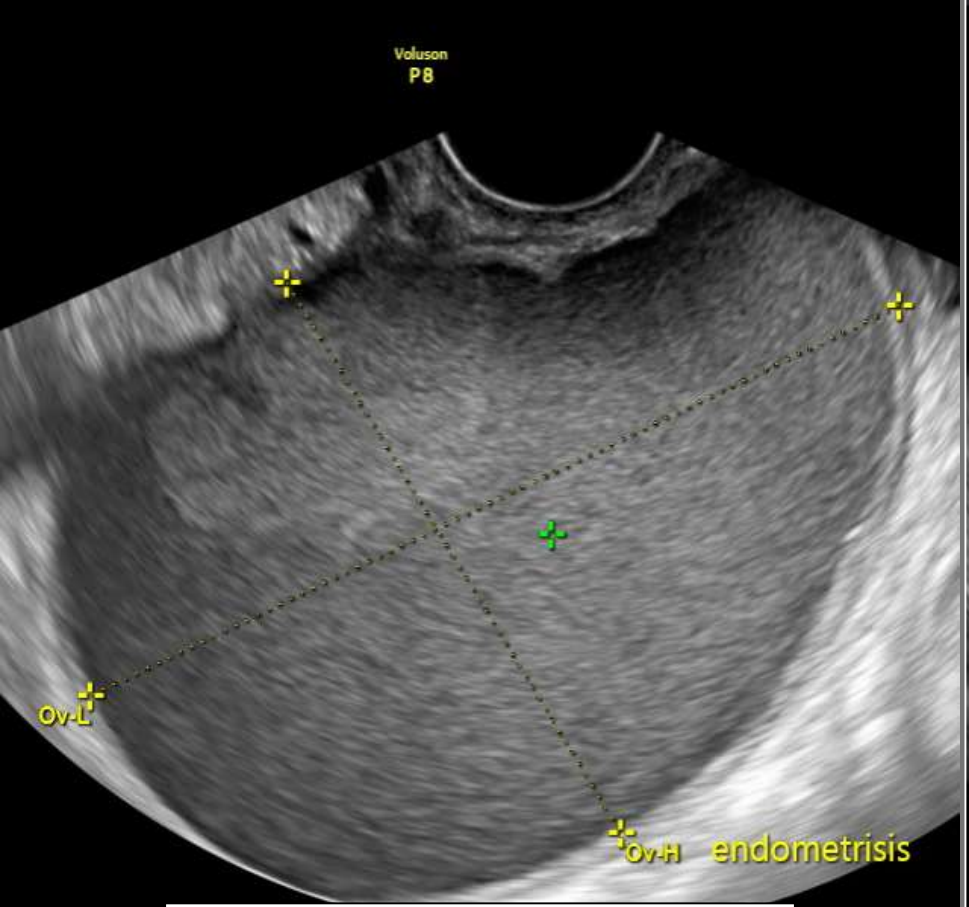
Differential Diagnosis of Endometrioma

Dermoid Cyst

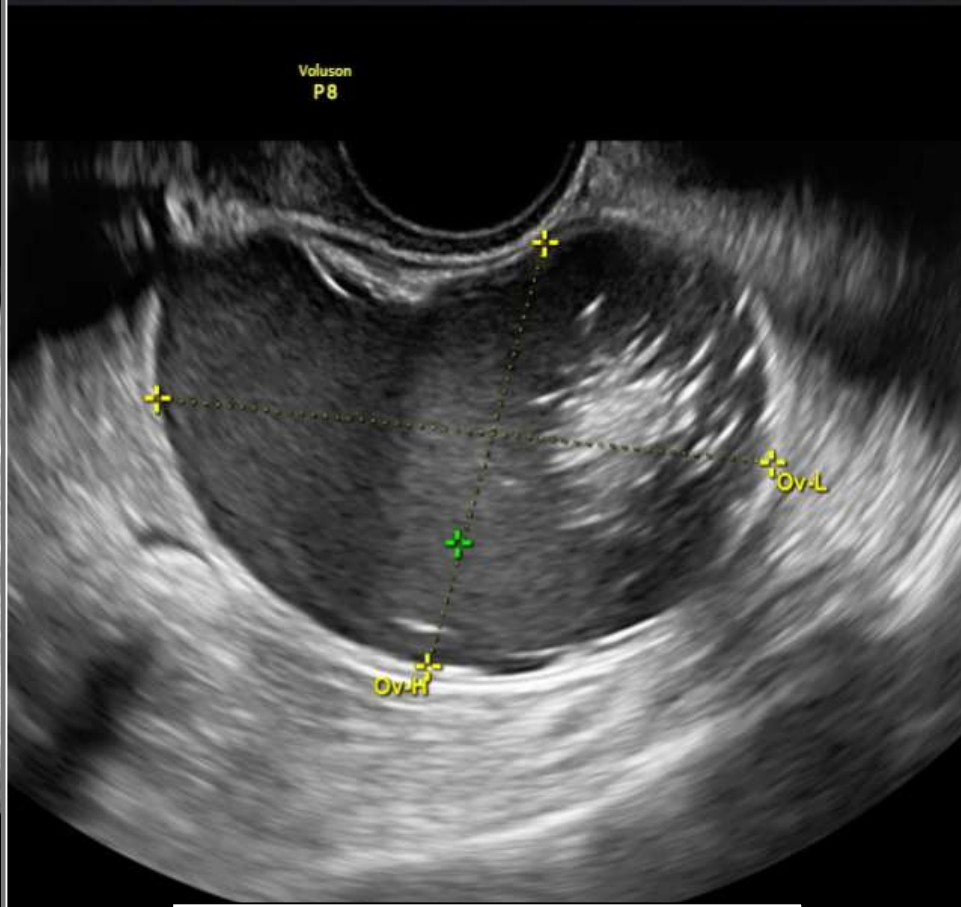
Haemorrhagic Cyst of Ovary

Serous cyst adenoma

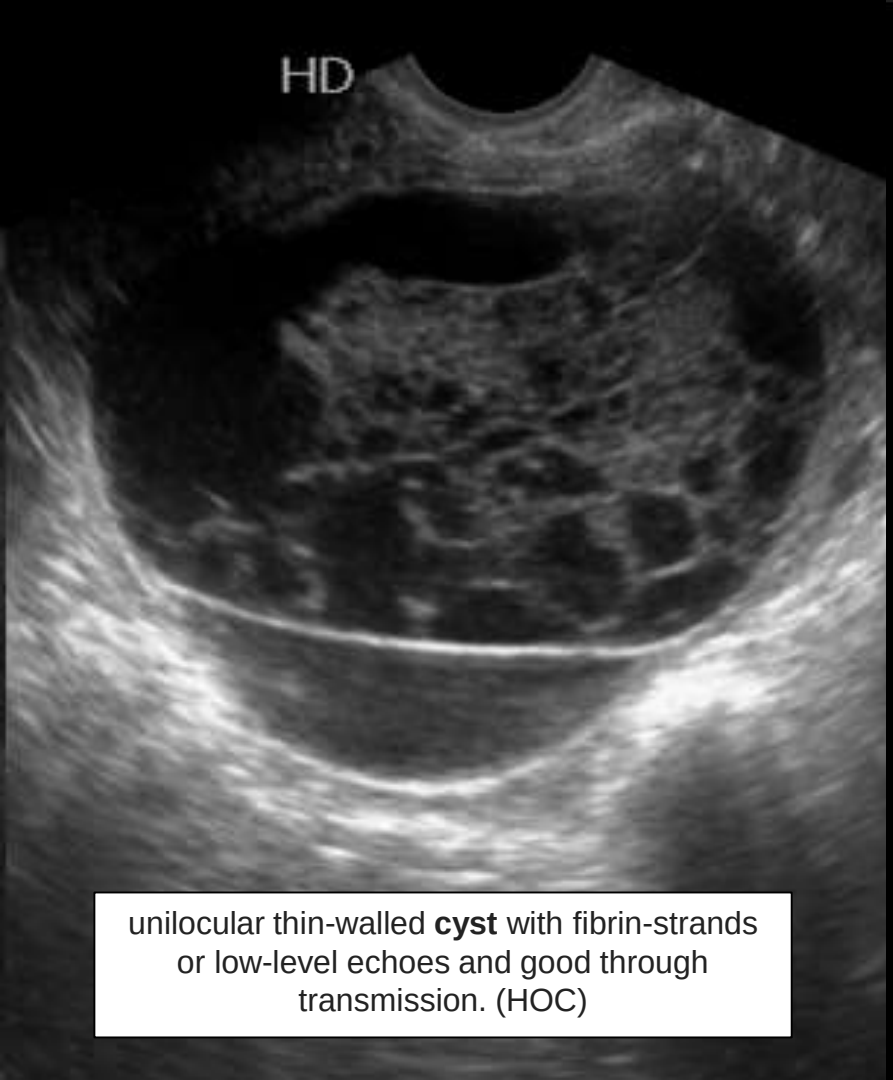
Pseudocystademoma



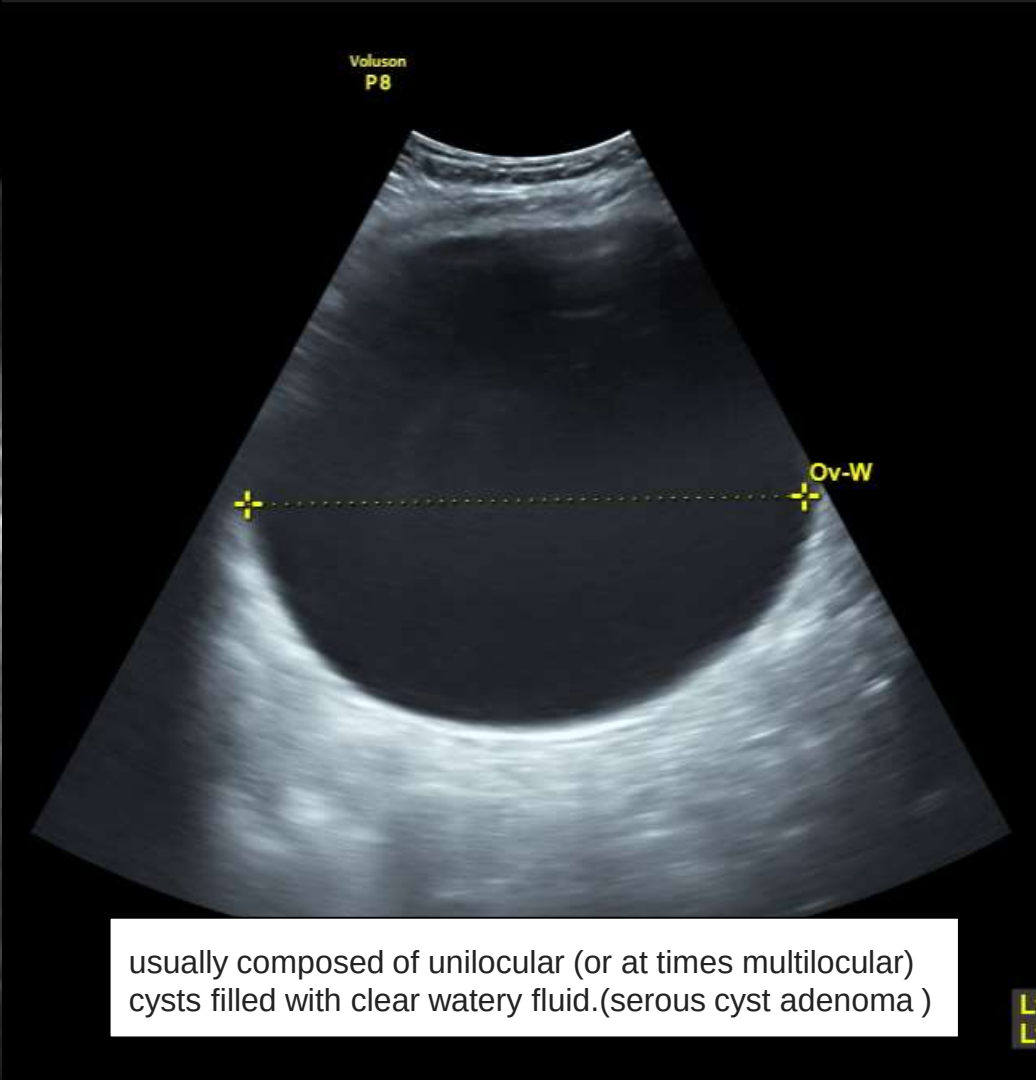
Endometrioma



Dermoid plug; this is the most common **sonographic feature** of a **dermoid cyst**.

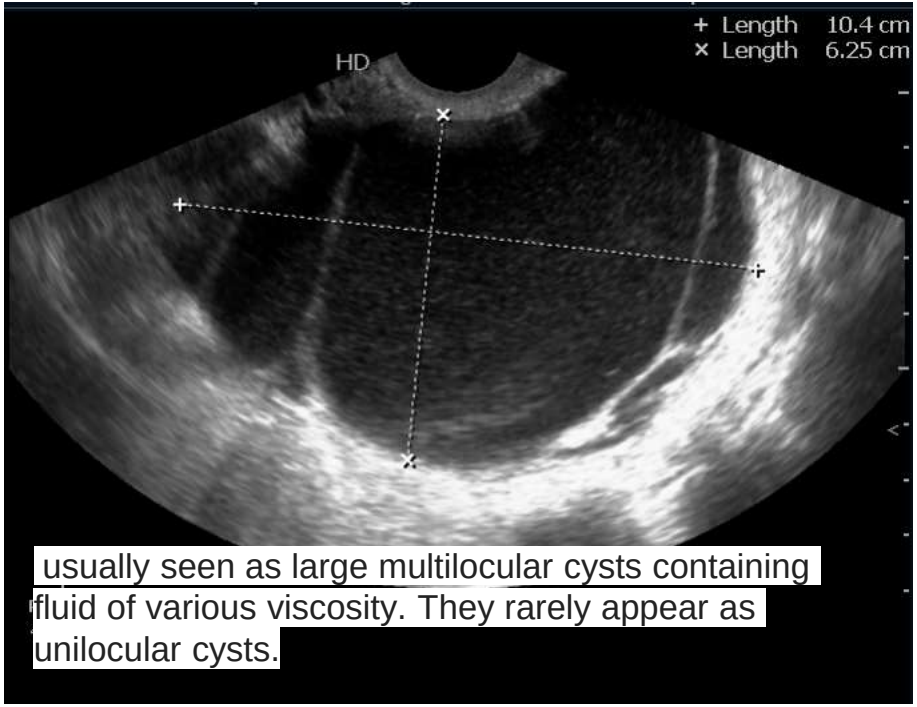


unilocular thin-walled **cyst** with fibrin-strands or low-level echoes and good through transmission. (HOC)

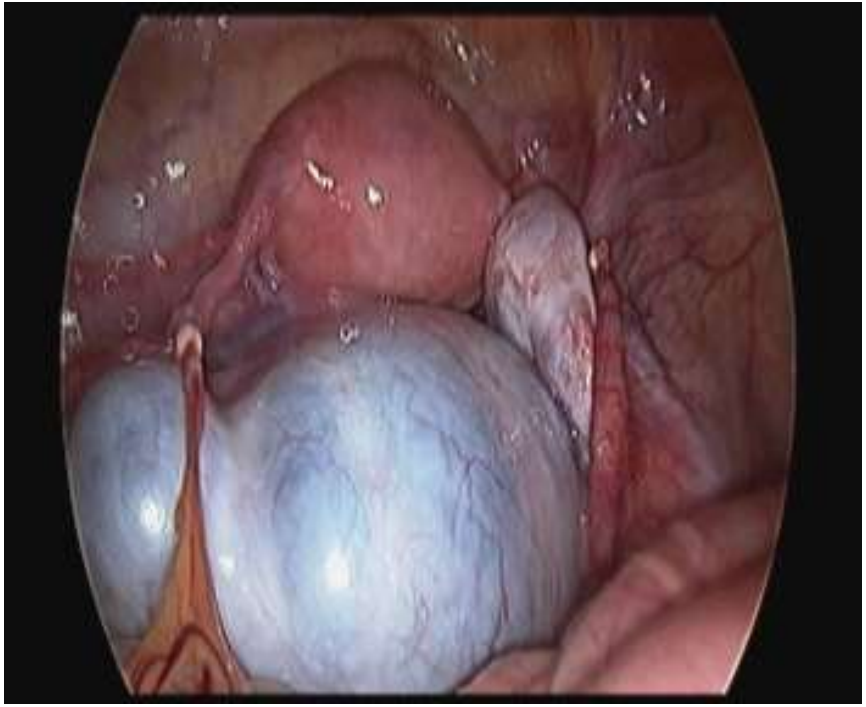


usually composed of unilocular (or at times multilocular) cysts filled with clear watery fluid.(serous cyst adenoma)

Pseudo cystadenoma



usually seen as large multilocular cysts containing fluid of various viscosity. They rarely appear as unilocular cysts.



Endometrioma rules

Single best discriminator between endometrioma and other cysts is ground glass echogenicity of cyst fluid – sensitivity 73%, specificity 94%

- Premenopausal status
- One to four locules
- Absence of papillations with detectable blood flow

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Ovarian endometrioma only are rarely the sole findings

Ovarian endometriomas are the easiest to diagnose however by this stage the endometriosis has already reached stage 4

Women with ovarian endometriomas have more pelvic and intestinal areas invaded by endometriosis, compared to women without ovarian endometriomas

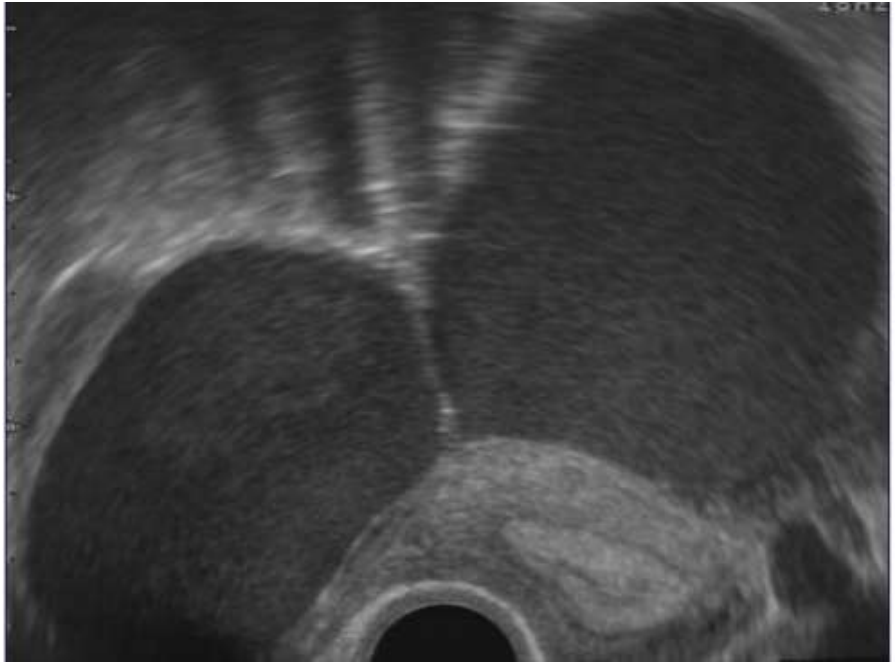
So it is important to identify other structures involved

Kissing Ovaries

Both ovaries are joined behind the uterus in the pouch of Douglas

• Negative sliding sign (no movement) on applying gentle pressure with the trans-vaginal ultrasound probe

• Strongly associated with the presence of endometriosis and indicates a severe form of the disease (i.e. significant pelvic adhesions)



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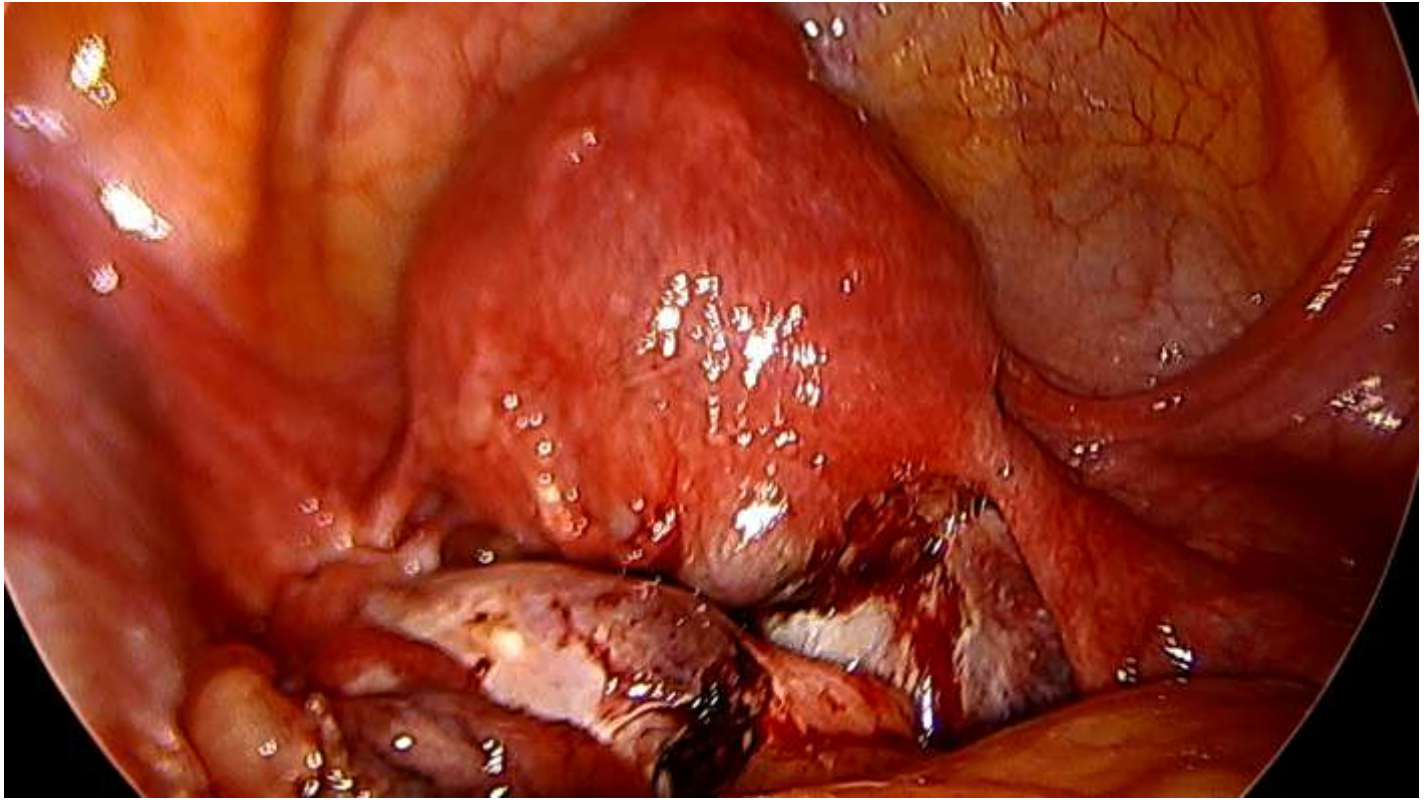
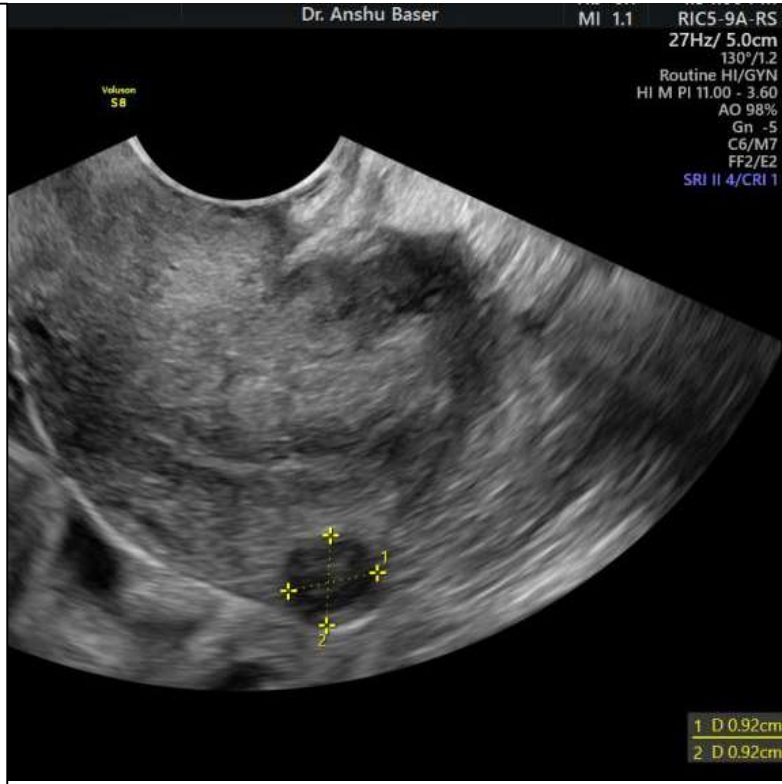
Severe Endometriosis kissing ovaries

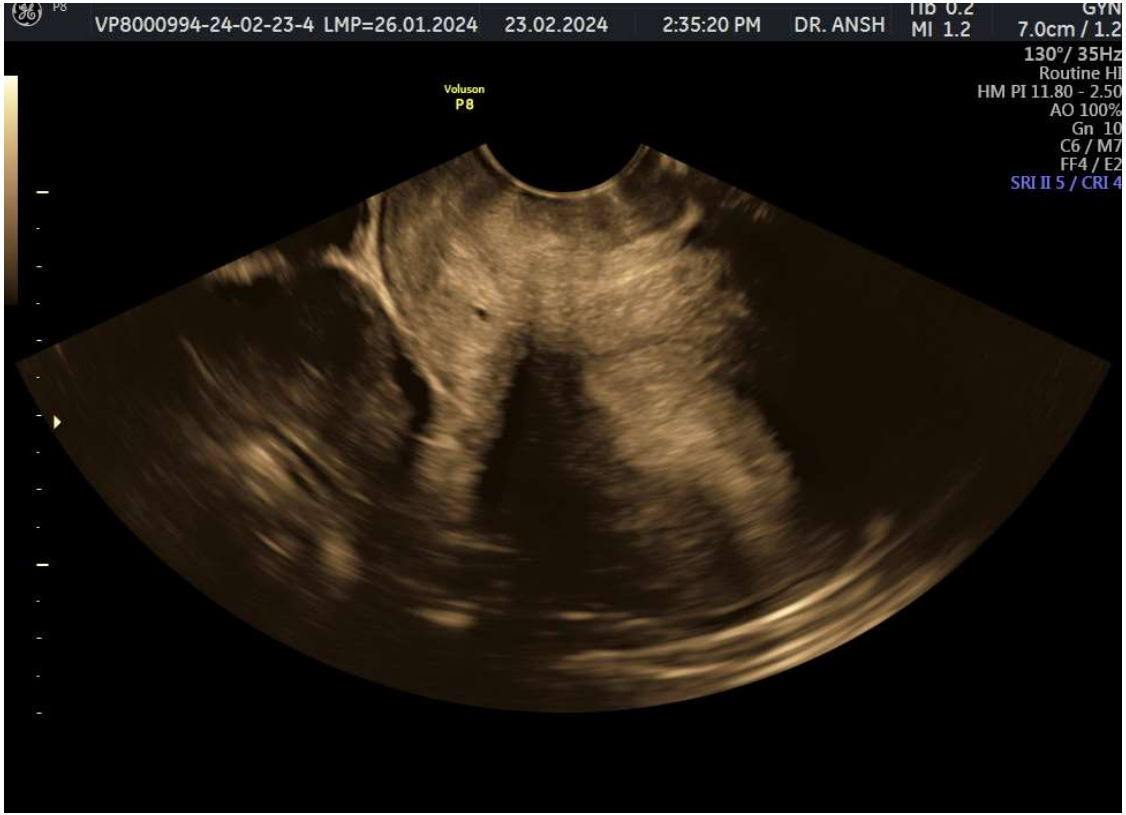


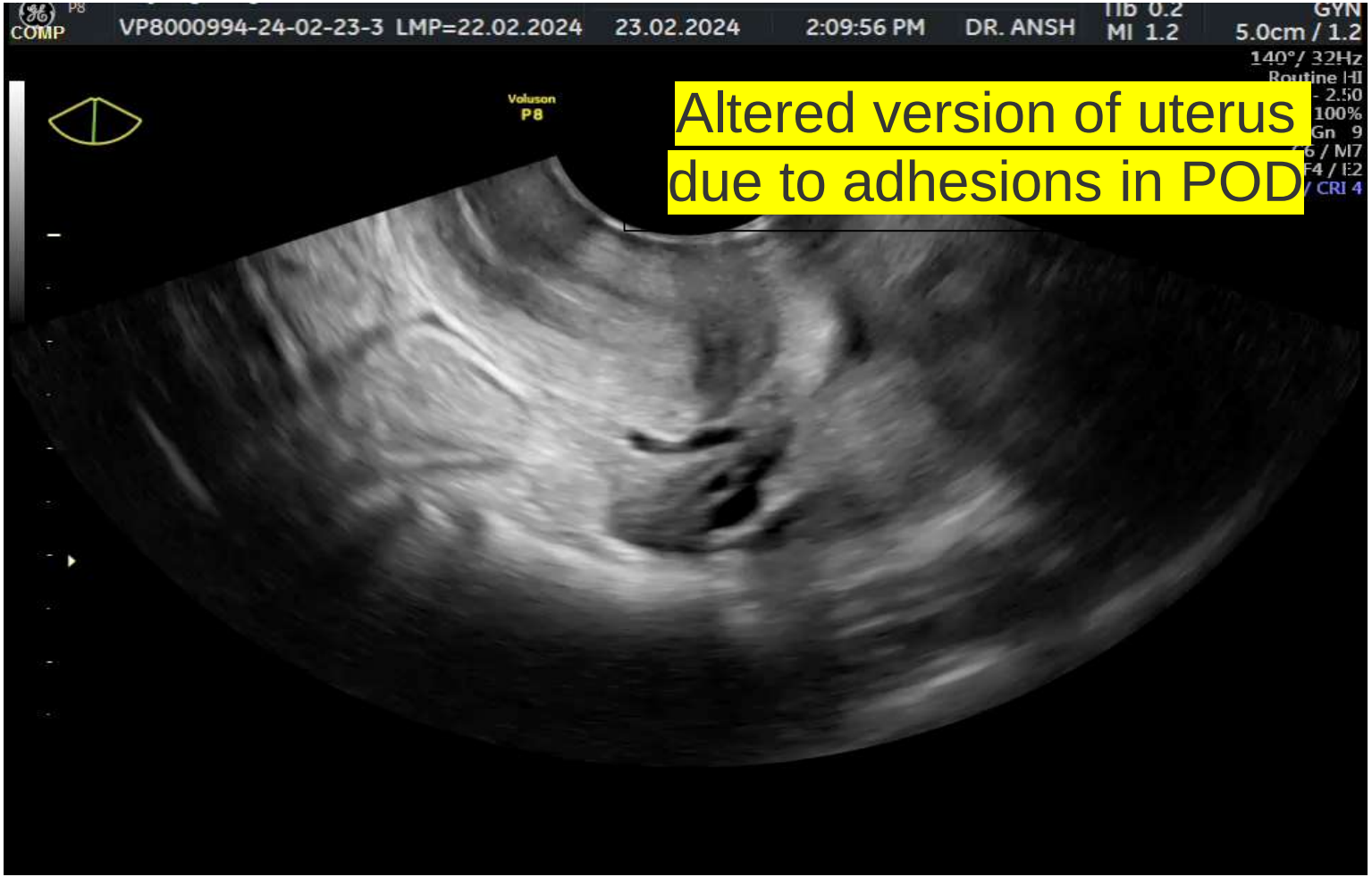
Uterus in endometriosis

- Due to involvement of the uterosaccrals leading to adhesions endometriosis tends to cause retroflexion and retroversion of the uterus.
- This should alert us to the possibility of involvement of POD and need for further assessment



Uterus in endometriosis

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DR. ANSH
TIb 0.2
MI 1.2
GYN
5.0cm / 1.2
Voluson
P8
Altered version of uterus due to adhesions in POD

Nodules or implants

Nodules vary in size from a few mm to a few cm and are superficial or deep

• Nodules may change appearance during the menstrual cycle – becoming more swollen and congested during menses and develop internal haemorrhage

• Only laparoscopy can detect superficial peritoneal implants

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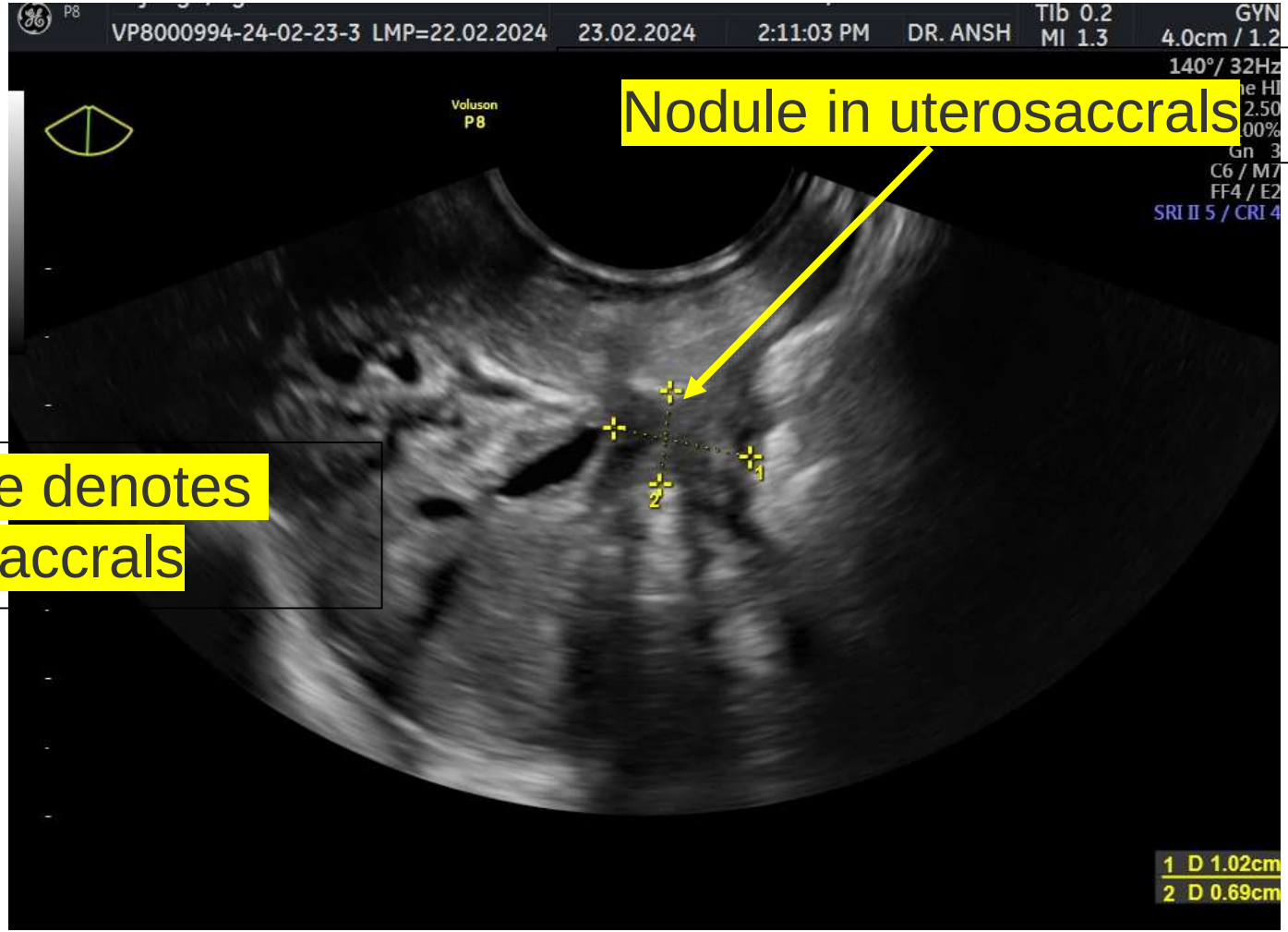
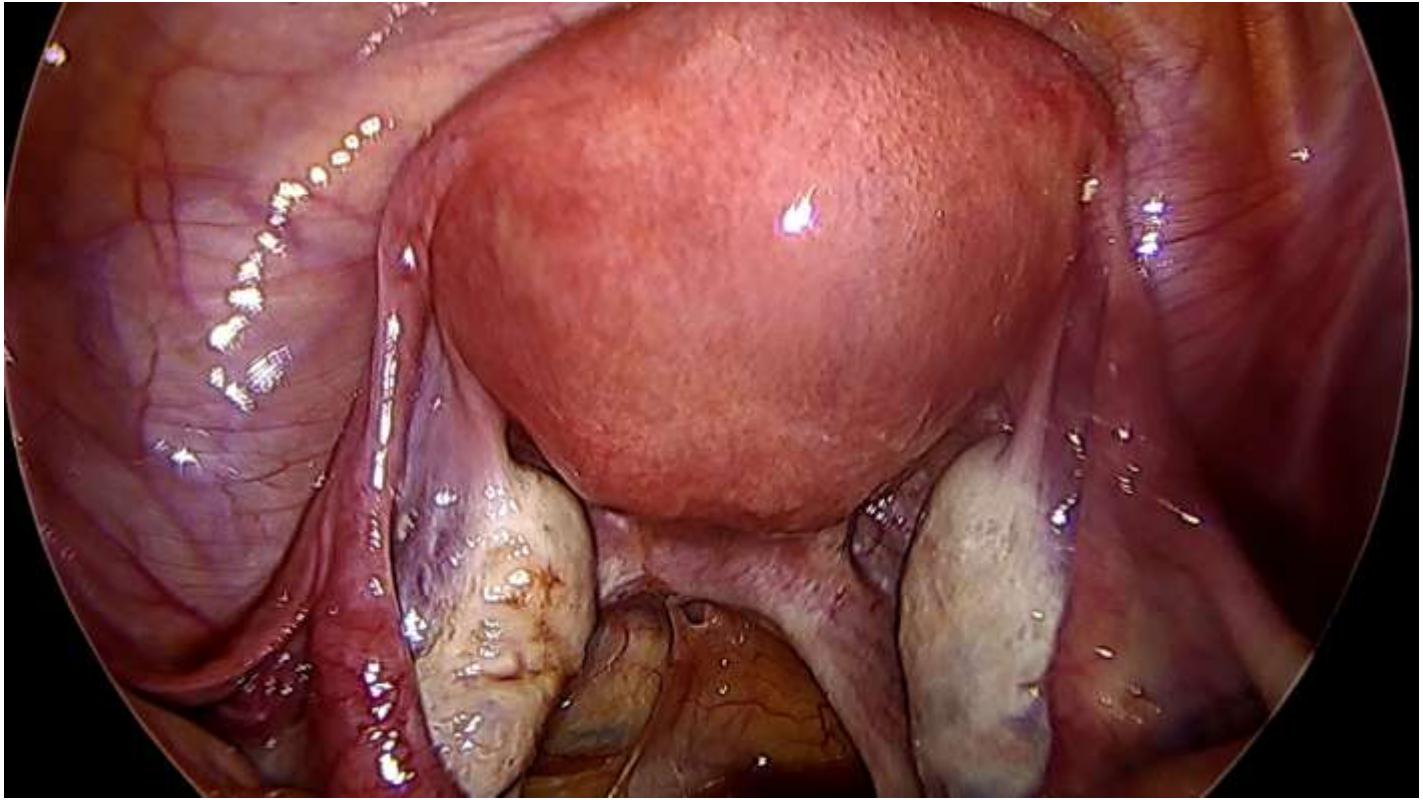


White line denotes uterosaccrals

Moderate Endometriosis



DIE

Definition is the infiltration of endometriotic nodules >/= 5mm

- Locations includes - rectosigmoid -

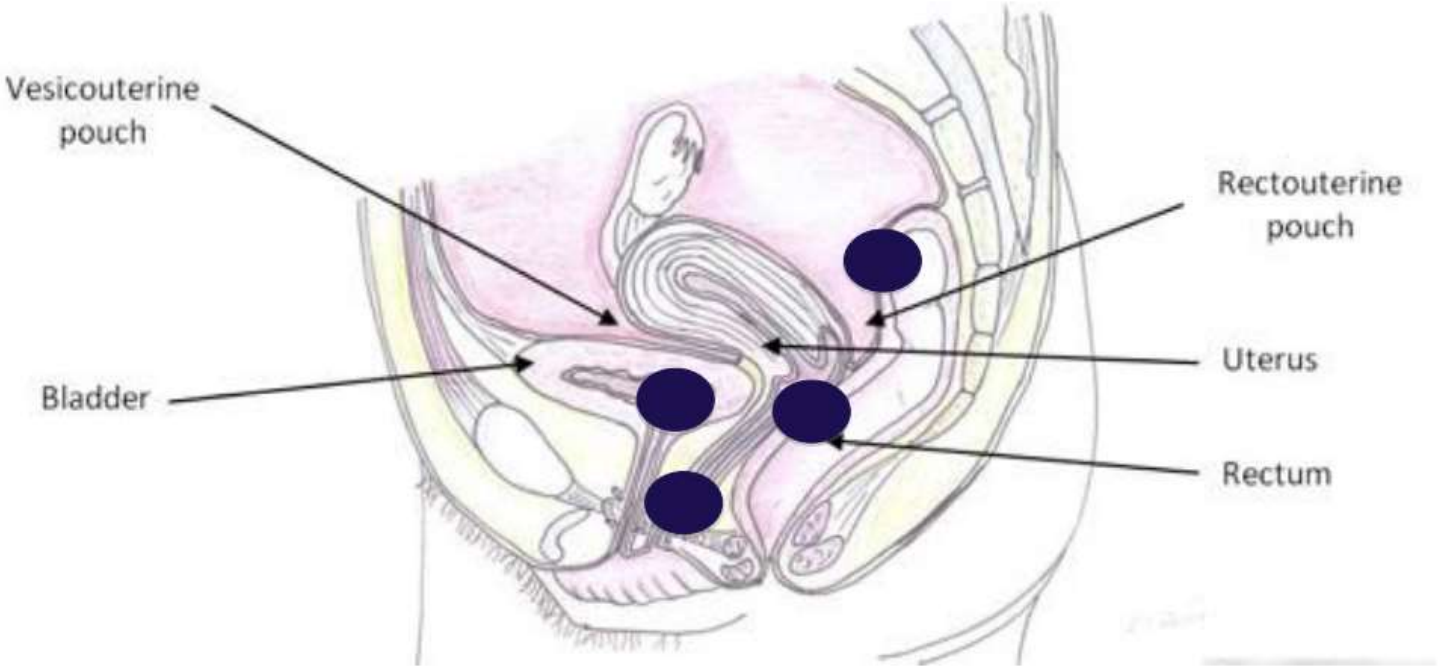
  utero-sacral ligaments -

  recto-vaginal septum -

  vagina -

  bladder

DIE



Bowel nodule

Histologically definition is the presence of endometrial glands and stroma in the bowel reaching at least the muscularis propria

- Involves anterior rectum, rectosigmoid junction and/ or sigmoid colon
- Typically hypoechoic or isoechoic solid masses with irregular outer margins
- Tender on palpation

December 2017 Volume 108, Issue 6, Pages 886–894

Fertility and Sterility®

asrm American Society for Reproductive Medicine

Diagnosis of deep endometriosis: clinical examination, ultrasonography, magnetic resonance imaging, and other techniques

Marc Bazot, M.D.[a,b,*], Emile Daraï, M.D., Ph.D.[b,c,d]

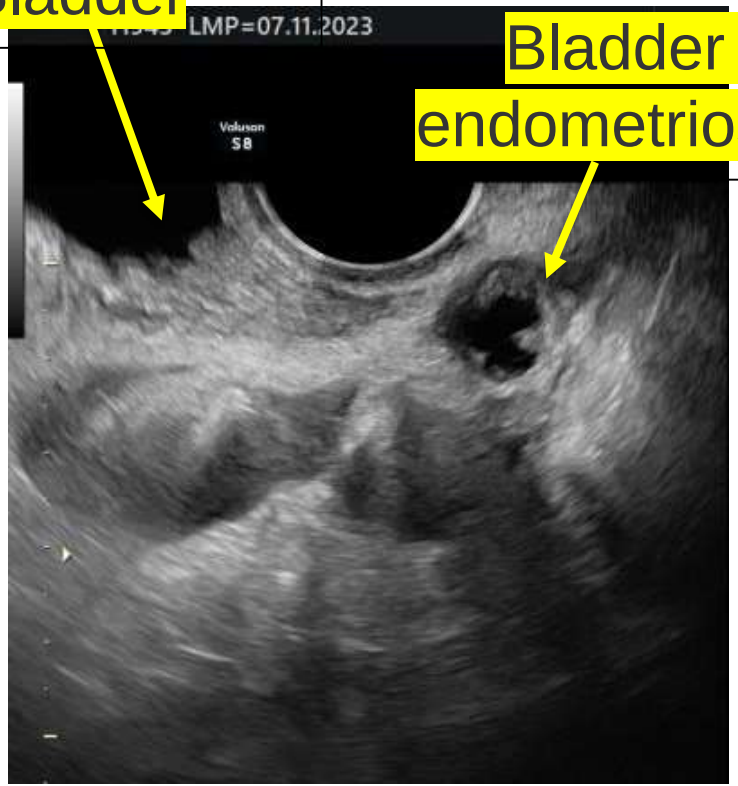
FOR rectosigmoid endometriosis, pooled sensitivity and specificity of MRI were 92% and 96%, respectively fulfilling criteria of replacement test. conclusion, advances in imaging techniques offer high sensitivity and specificity to diagnose DE with at least triage value and for rectosigmoid endometriosis replacement value imposing a revision of the concept of laparoscopy as the gold standard.

Bladder nodule

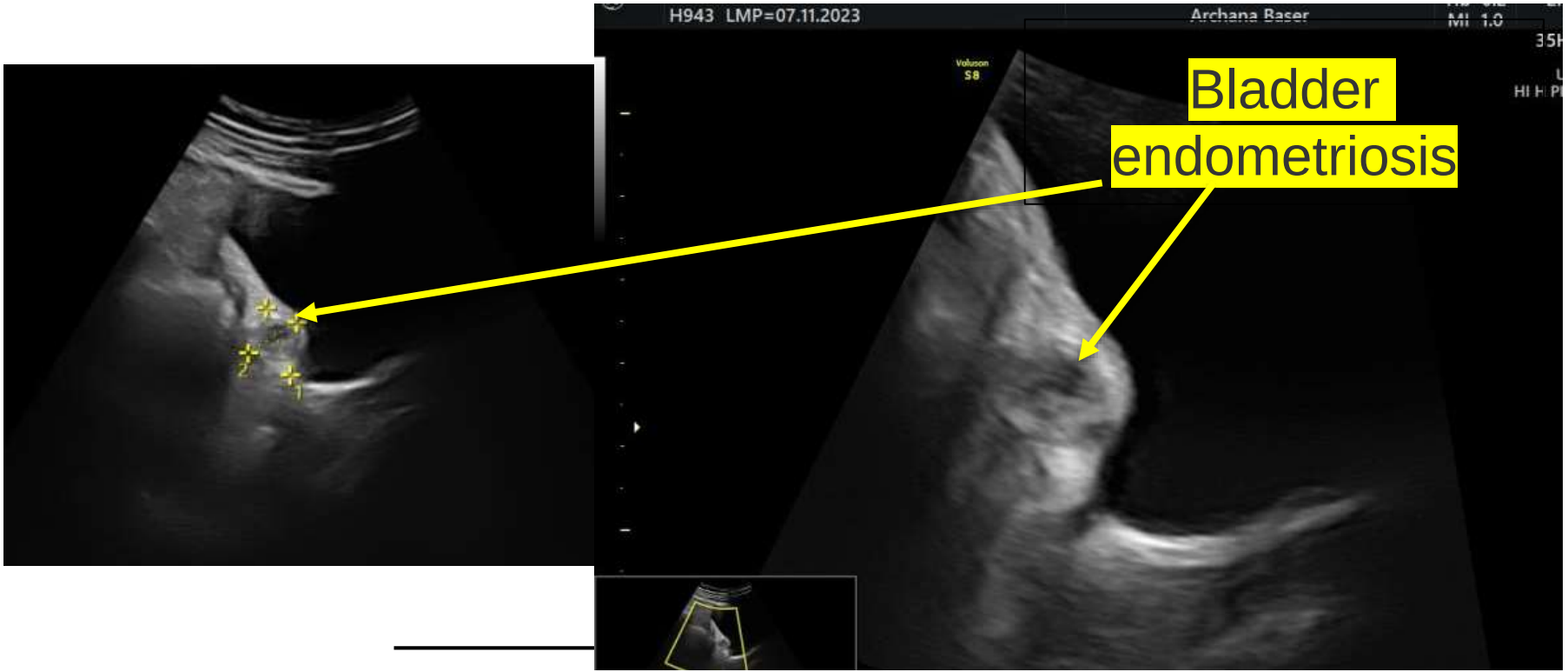
Hypo-or iso echogenic nodule within the bladder base (close to the ureteral ostia) or in the bladder dome

- ‘Nodular’ or a ‘comma’ shape

- Small internal anechoic cystic areas are seen in approximately 30% of the nodules



Bladder endometriois

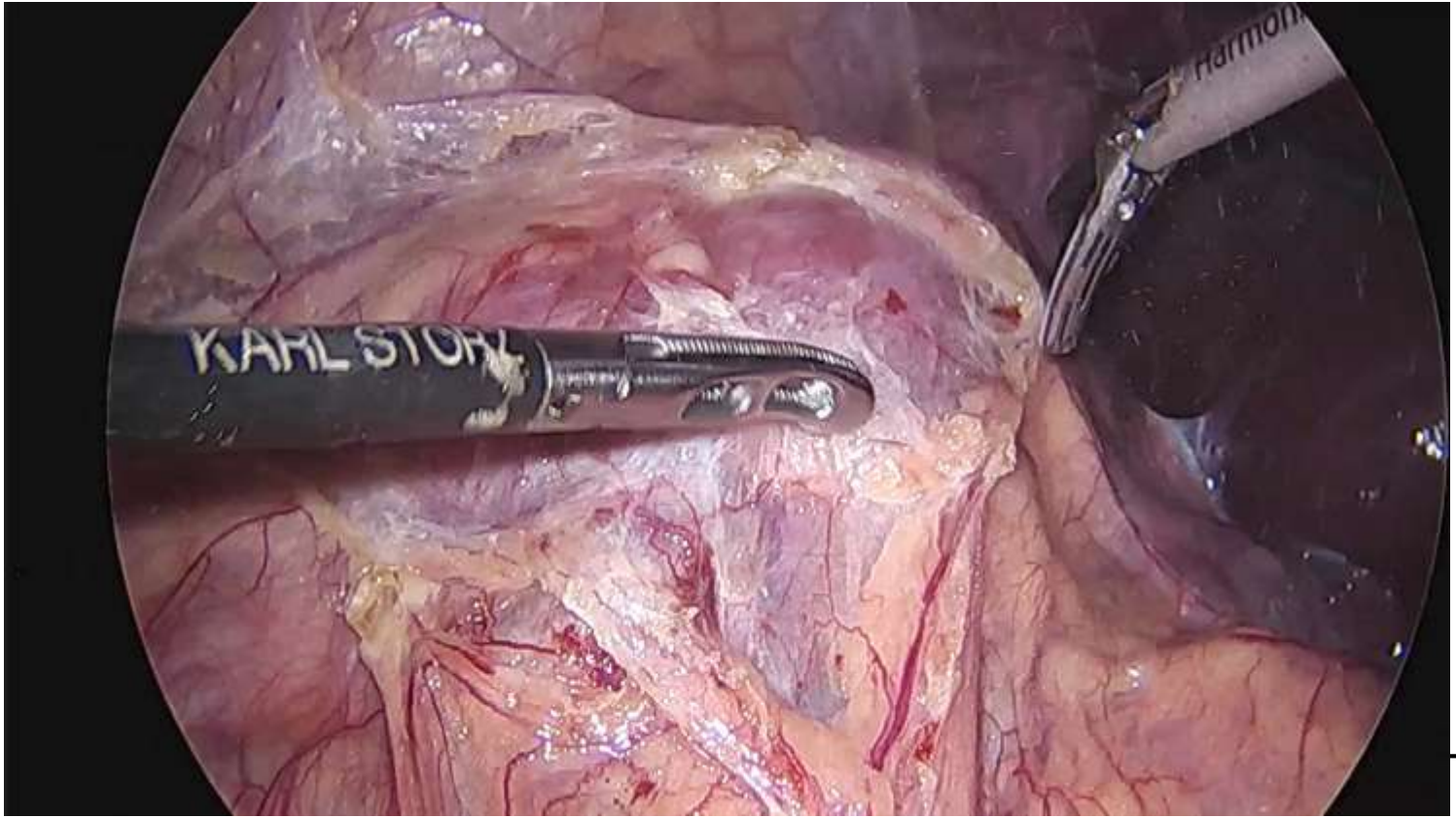


Why is it important to diagnose bladder endometriosis?

Bladder endometriosis mimics recurrent cystitis with dysuria, urgency, frequency, suprapubic pain and incontinence

- Macroscopic haematuria relatively rare
- Occurs in 1 – 4% of women with laparoscopic diagnosis of endometriosis
- Diagnosis is often delayed or not considered at all

Ureteric endometriosis leading to hydronephrosis



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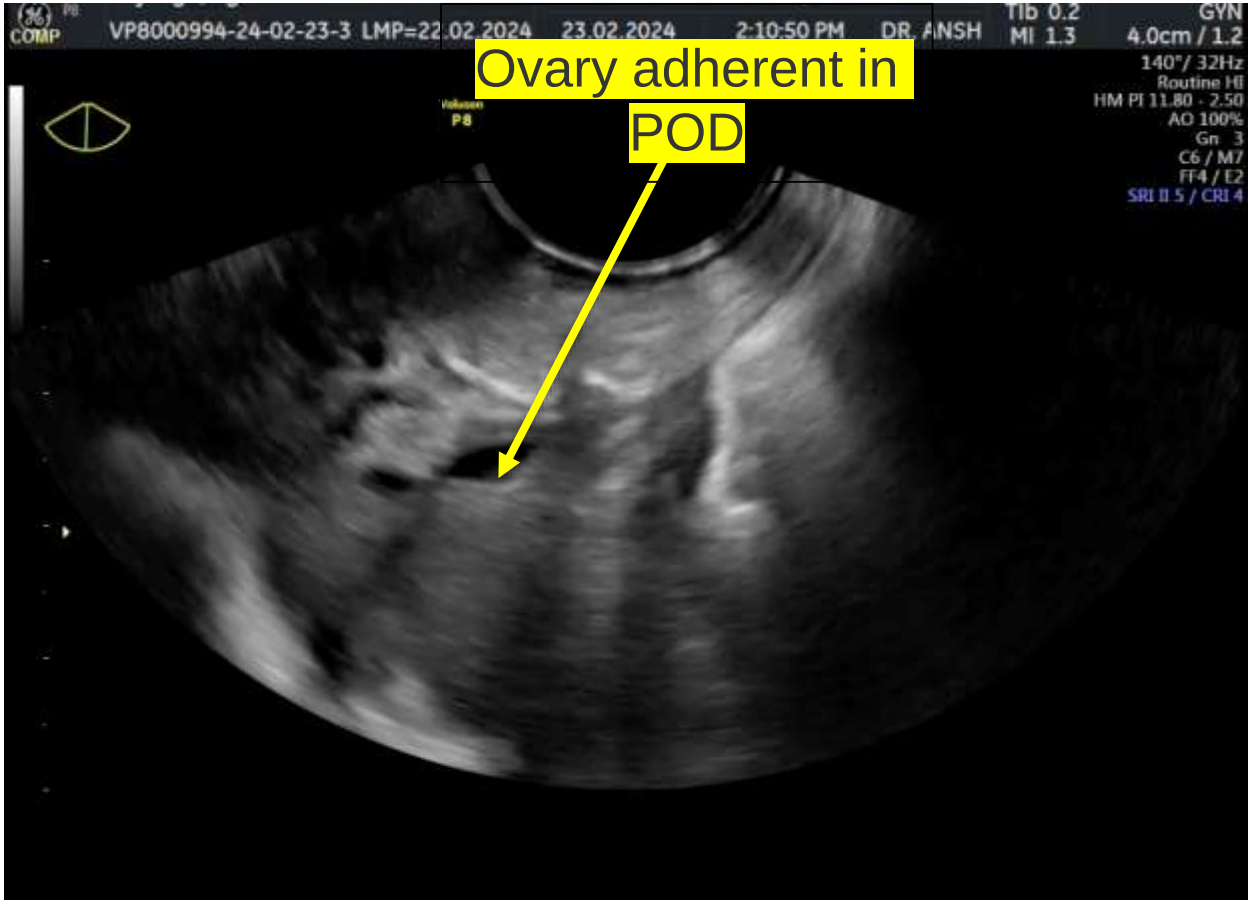
Endometriosis in myomectomy scar


H1016 LMP=07.11.2023
Dr. Anshu Baser
MI 1.1
Voluson
S8
Routine HI
1
3

Ovarian mobility

Apply pressure with trans-vaginal probe to assess whether ovary is fixed to the uterus medially or the pelvic side wall laterally

- Note any indication of site specific pain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MI 1.3
GYN
4.0cm / 1.2
140°/ 32Hz
Routine HI
HM PI 11.80 - 2.50
AO 100%
Gn 3
C6 / M7
FF4 / E2
SRI II 5 / CRI 4
P8
Ovary adherent in POD

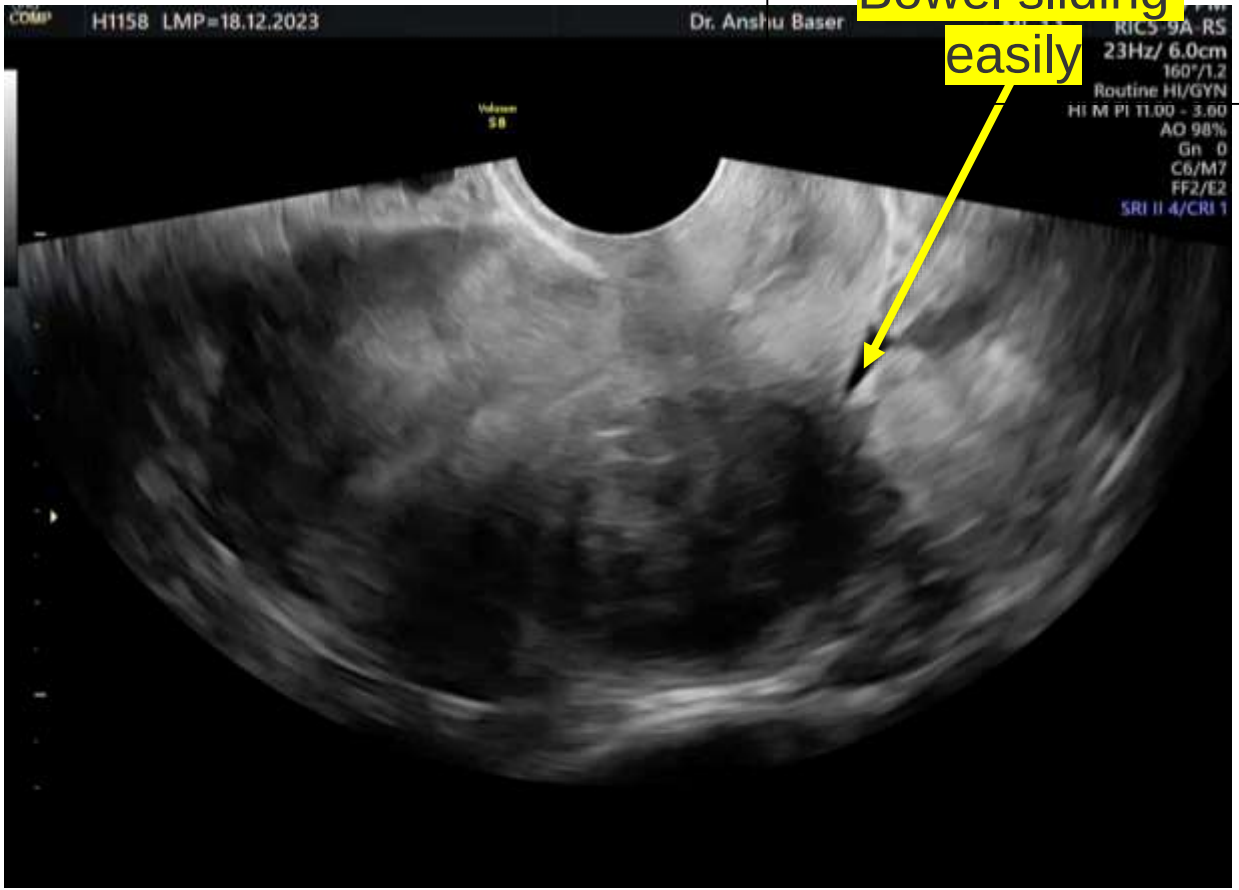
Assessment of POD mobility

Use a slight pressure with the probe

- Uterus should slide anterior rectum
- Then use free hand over abdominal wall to assess movement of the uterine fundus
- If no movement in either location POD is recorded as obliterated

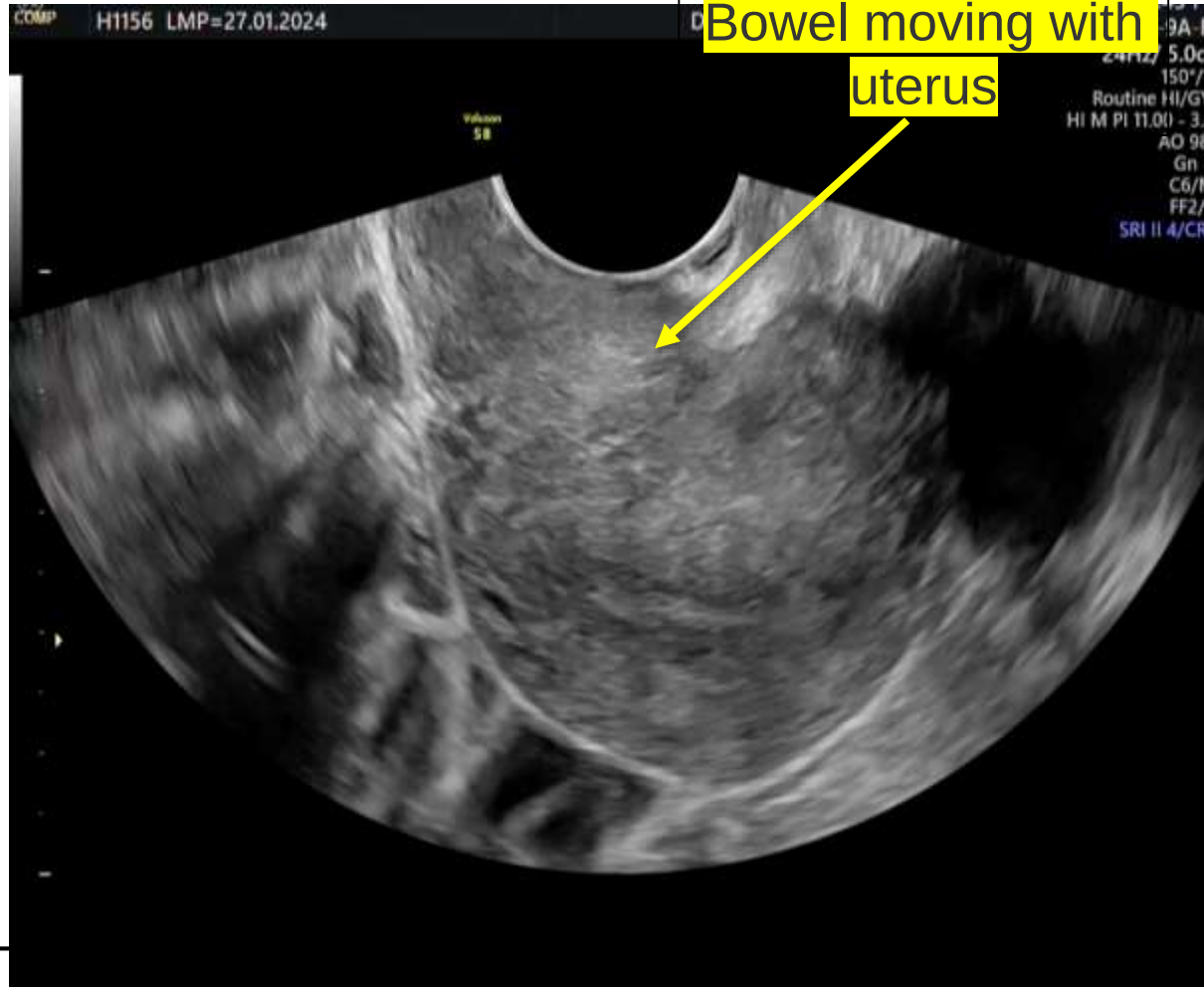
Sliding sign

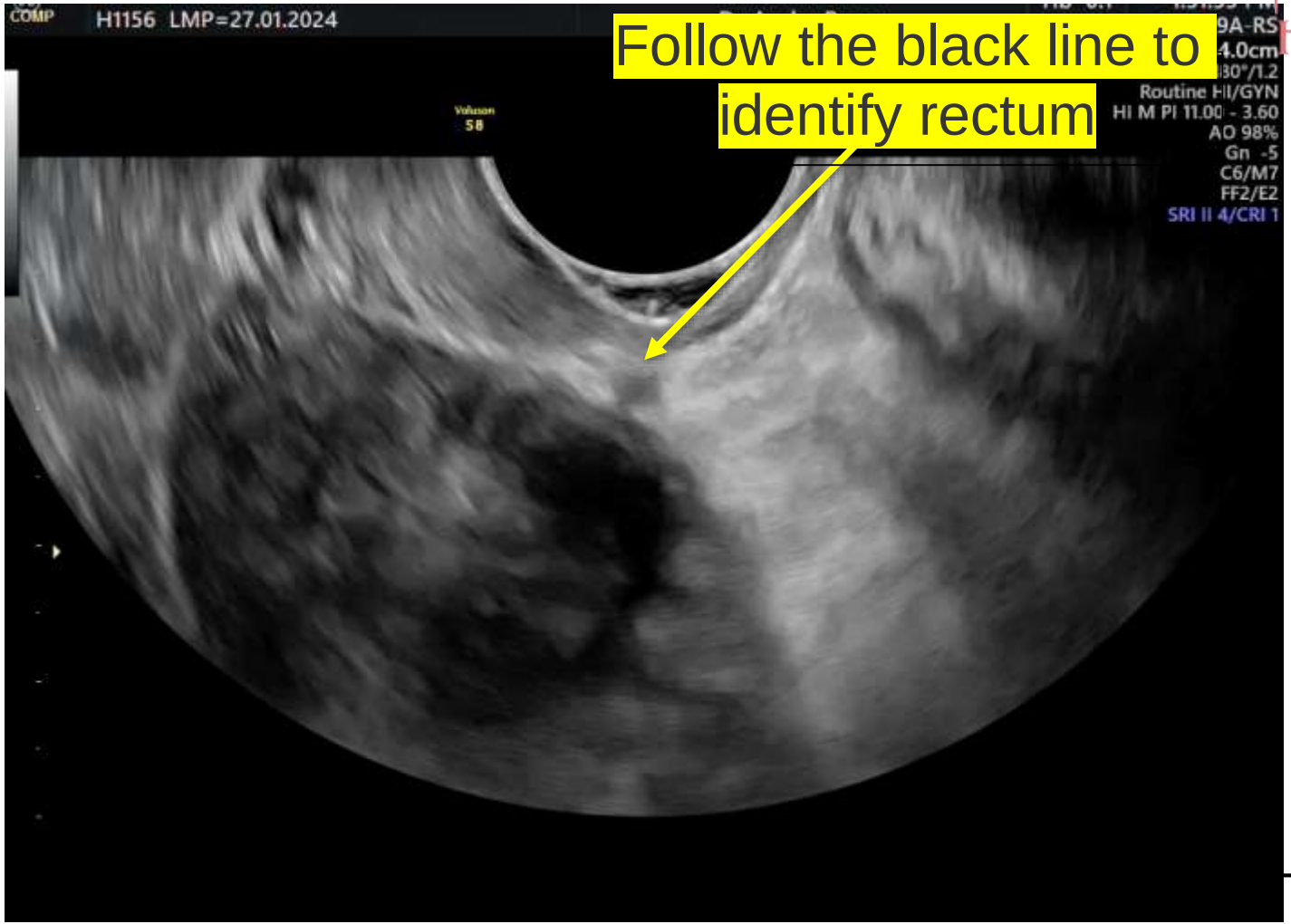
- A positive sliding sign indicates a POD free of adhesions as seen in the clip here.
- Follow the black line to assess the rectum



Absent sliding sign

- A negative sliding sign indicates adherent bowels.
- Note how the rectum and the uterus move together as opposed to separately in the previous clip.

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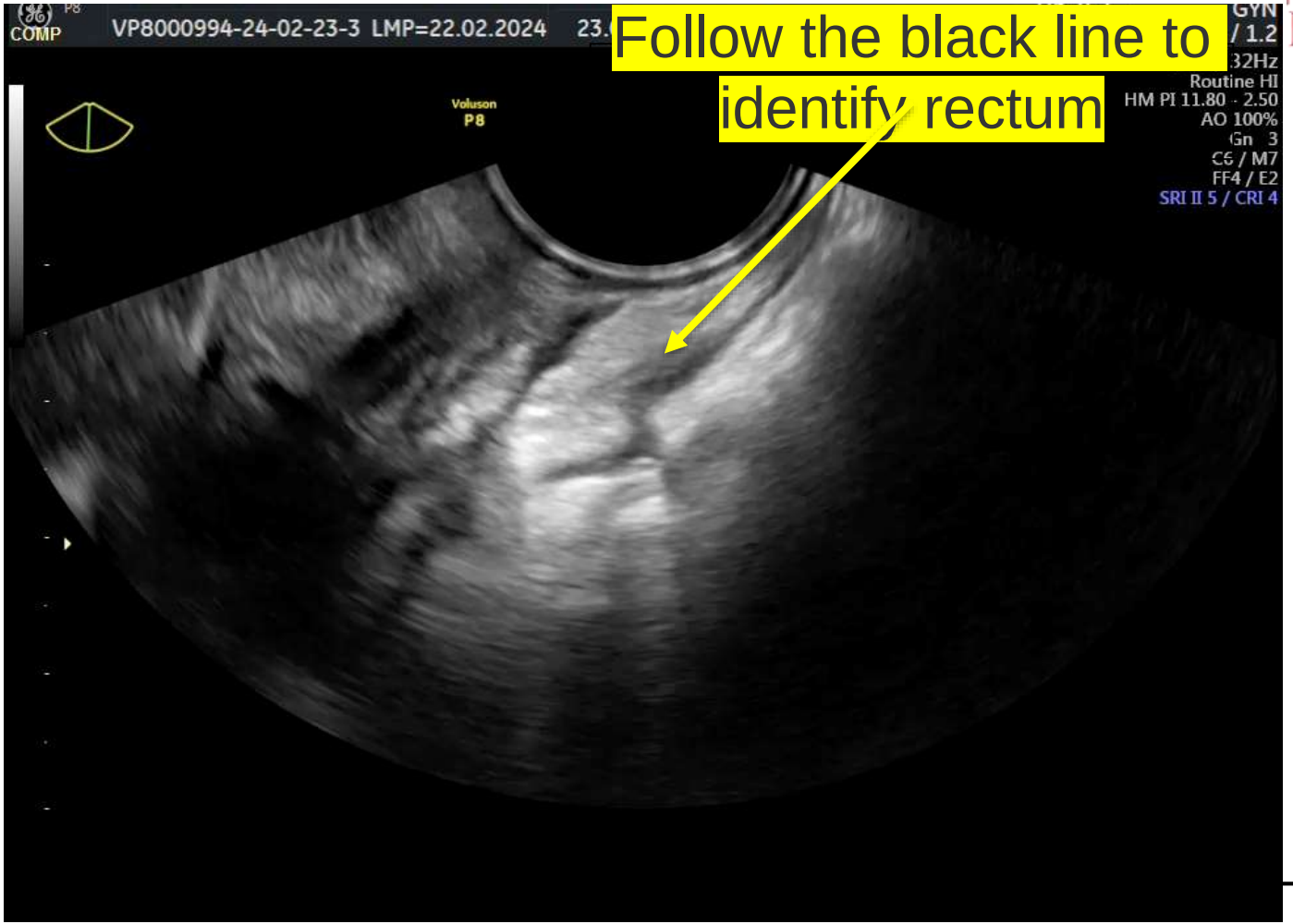
Follow the black line to identify rectum
Routine HI/GYN
AO 98%
Gn -5
C6/M7
FF2/E2


Follow the black line to identify rectum
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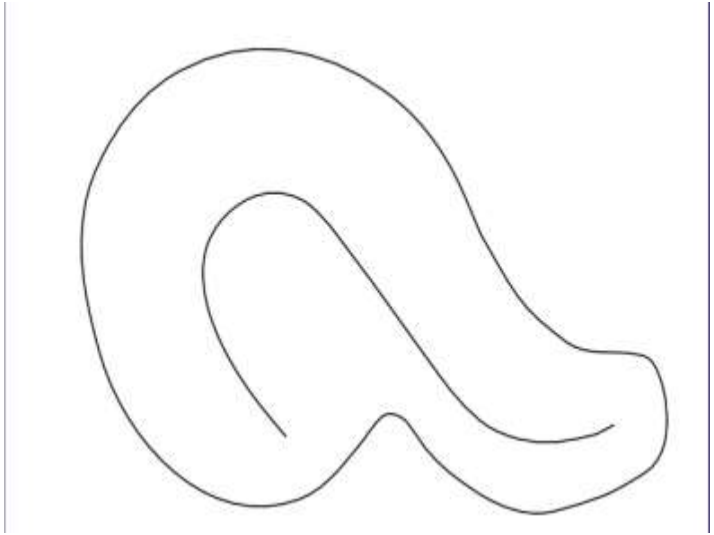
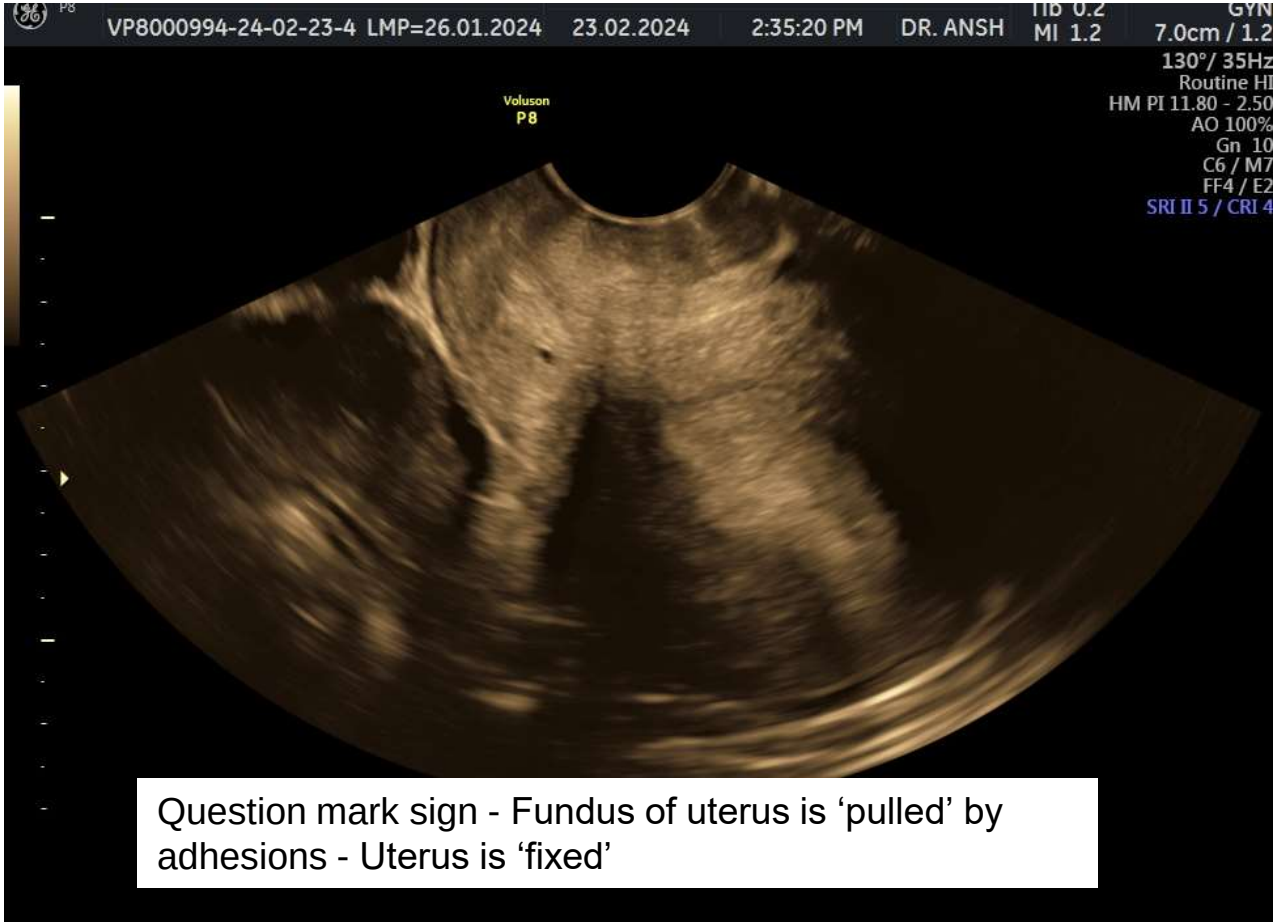
Voluson
P8
GYN
Routine HI
HM PI 11.80 · 2.50
AO 100%
FF4 / E2
SRI II 5 / CRI 4

Adhesions

Filmy adhesions have fluid entrapped within them. Known as the ‘flapping sail sign’

Question mark sign - Fundus of uterus is ‘pulled’ by adhesions - Uterus is ‘fixed’

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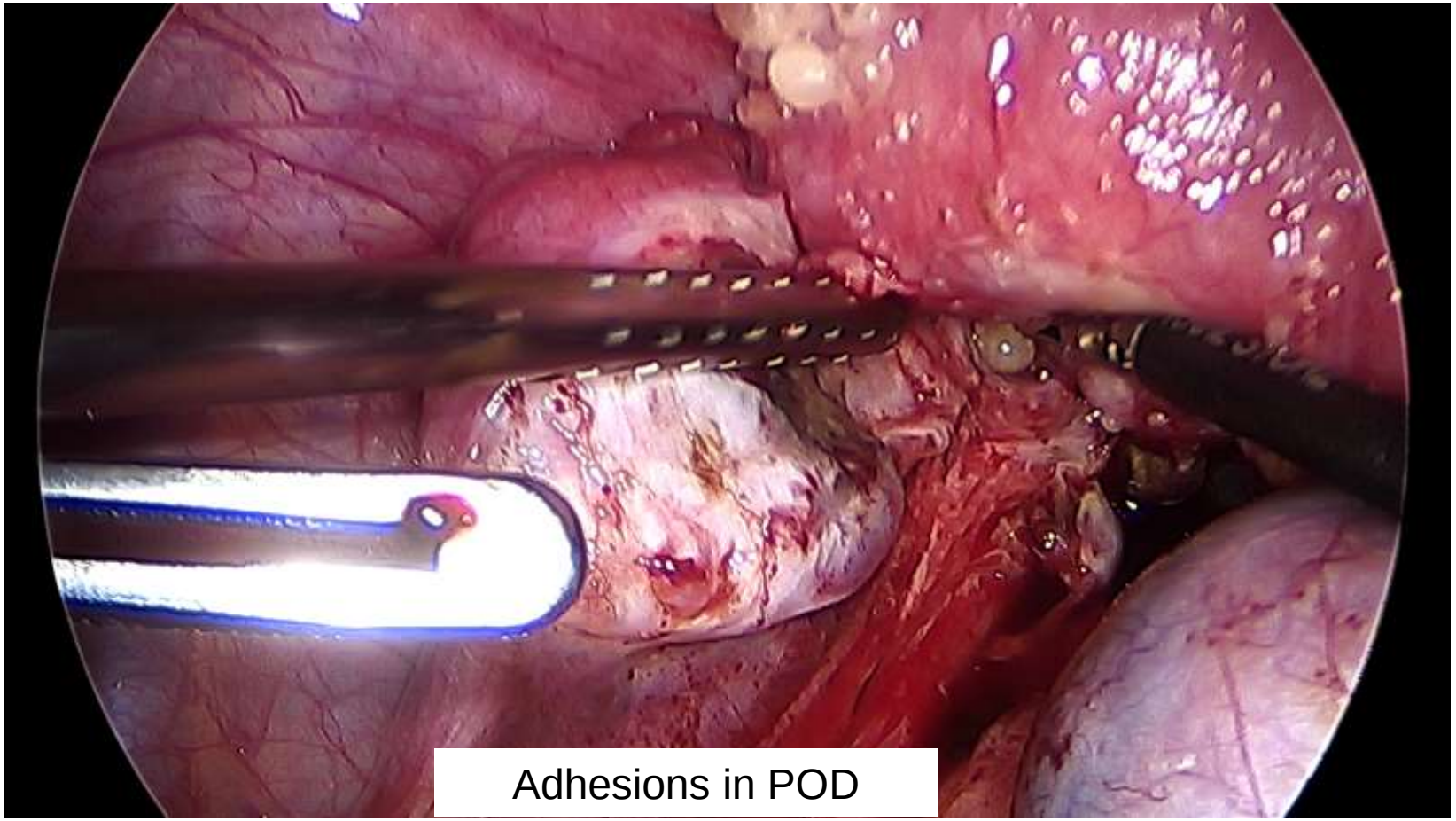
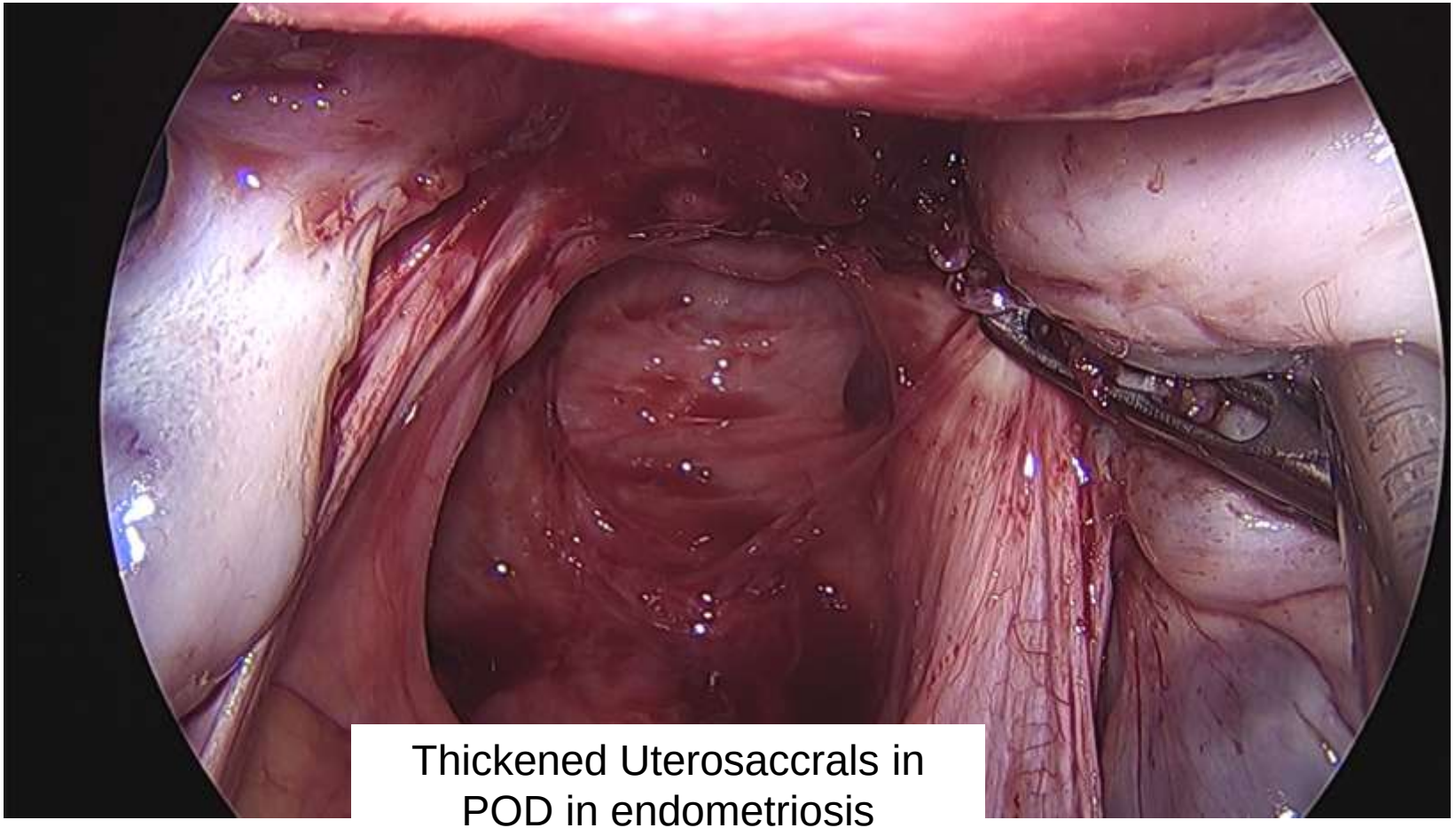
DR. ANSH
TIB 0.2
MI 1.2
GYN
7.0cm / 1.2
130°/ 35Hz
Routine HI
HM PI 11.80 - 2.50
AO 100%
Gn 10
C6 / M7
FF4 / E2
SRI II 5 / CRI 4
Voluson
P8
Question mark sign - Fundus of uterus is ‘pulled’ by adhesions - Uterus is ‘fixed’



Adhesions in POD



Thickened Uterosaccrals in POD in endometriosis

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USG Checklist in Endometriosis

- ❑ Uterus Mobility and Adenomyosis
- ❑ Ovaries -Endometrioma and Mobility
- ❑ Mobility of anterior compartment
- ❑ Mobility of Posterior compartment
- ❑ Bladder , Bowel endometriosis
- ❑ Hydronephrosis

Take to work message

ultrasound is a modality can be learnt by gynaecologists

we should have focused ultrasound specialists for endometriosis .

It is important in era of AI

MRI

Non invasive adjunctive test for diagnosis of endometriosis with ultrasound.

MRI help in assessing area inaccessible to laparoscopy

Lesions hidden by dense adhesions .

Diagnostic performance of TVS and MRI is similar for detecting DIE involving rectosigmoid, uterosacral ligament and rectovaginal septum

Operator dependent.

Ultrasound Obstet Gynecol 2016; 48: 318–332
Published online 28 June 2016 in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/uog.15955

Systematic approach to sonographic evaluation of the pelvis in women with suspected endometriosis, including terms, definitions and measurements: a consensus opinion from the International Deep Endometriosis Analysis (IDEA) group

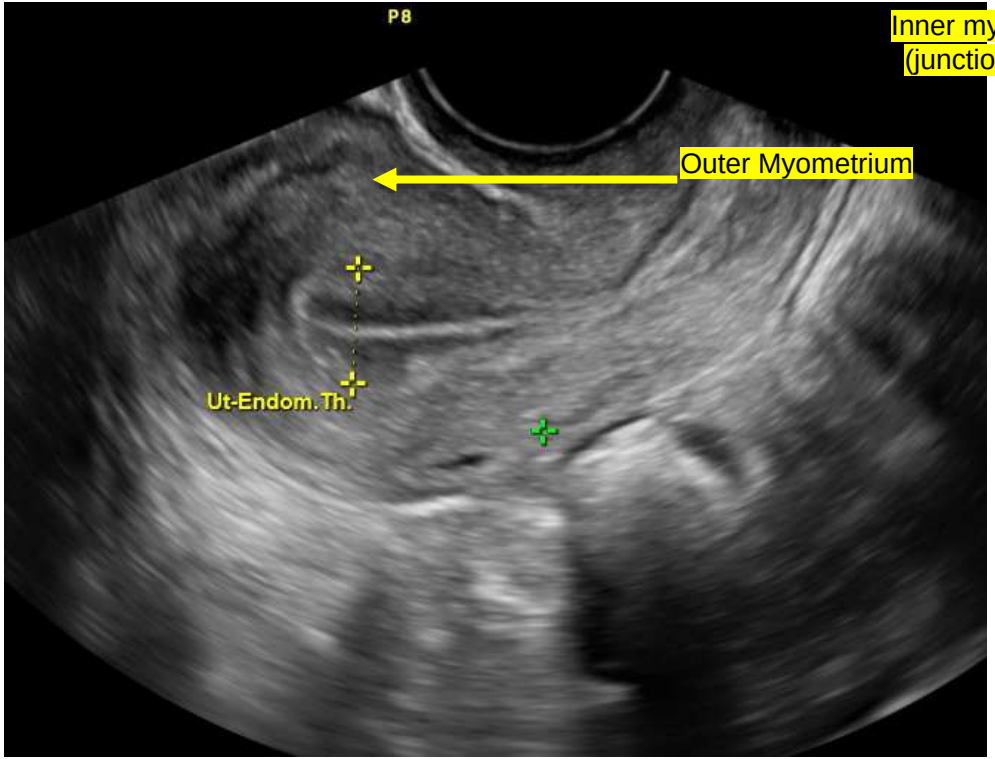
S. GUERRIERO[1]#, G. CONDOUS[2]#, T. VAN DEN BOSCH[3], L. VALENTIN[4], F. P. G. LEONE[5], D. VAN SCHOUBROECK[3], C. EXACOUSTOS[6], A. J. F. INSTALLÉ[7], W. P. MARTINS[8], M. S. ABRAO[9], G. HUDELIST[10], M. BAZOT[11], J. L. ALCAZAR[12], M. O. GONÇALVES[13], M. A. PASCUAL[14], S. AJOSSA[1], L. SAVELLI[15], R. DUNHAM[16], S. REID[17], U. MENAKAYA[18], T. BOURNE[19], S. FERRERO[20], M. LEON[21], T. BIGNARDI[22], T. HOLLAND[23], D. JURKOVIC[23], B. BENACERRAF[24], Y. OSUGA[25], E. SOMIGLIANA[26] and D. TIMMERMAN[3]

This a paper by Mathew Leonardi et al in which they have explained detailed analysis of endometriosis on ultrasound

Ultrasound features of Adenomyosis

- First clue to **adenomyosis** is often an ill-defined lesion within the myometrium.
- A lesion may have an irregular contour, no rim, no edge shadows or a fan-**shaped** shadow.
- Other features may include: Myometrial cysts.
- Hyperechoic islands.
- Sub endometrial lines and buds.
- Translesional flow.
- A thickened, irregular or ill-defined junctional zone.
- Myometrial anterior-posterior asymmetry.
- An enlarged uterus.
- Vascular arrangement is radial and penetrating .

Ultrasonographic Anatomy

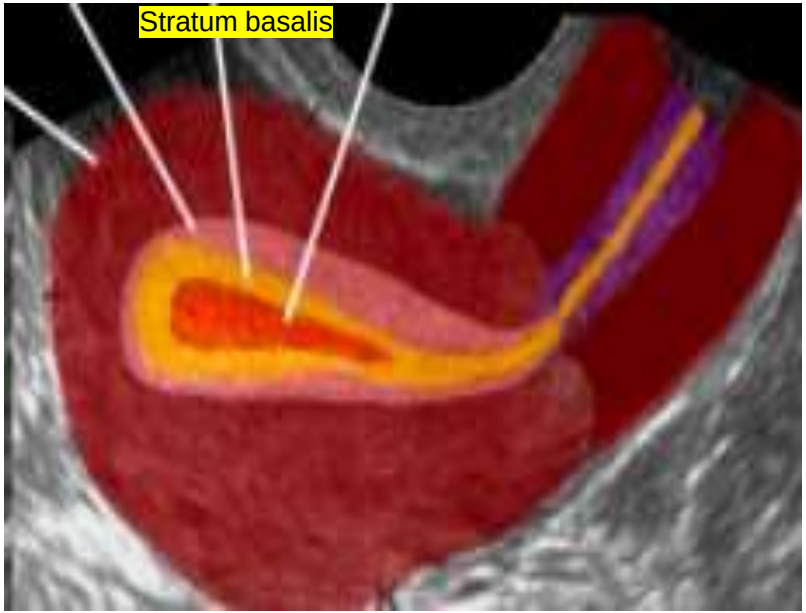


Inner myometrium (junctional Zone

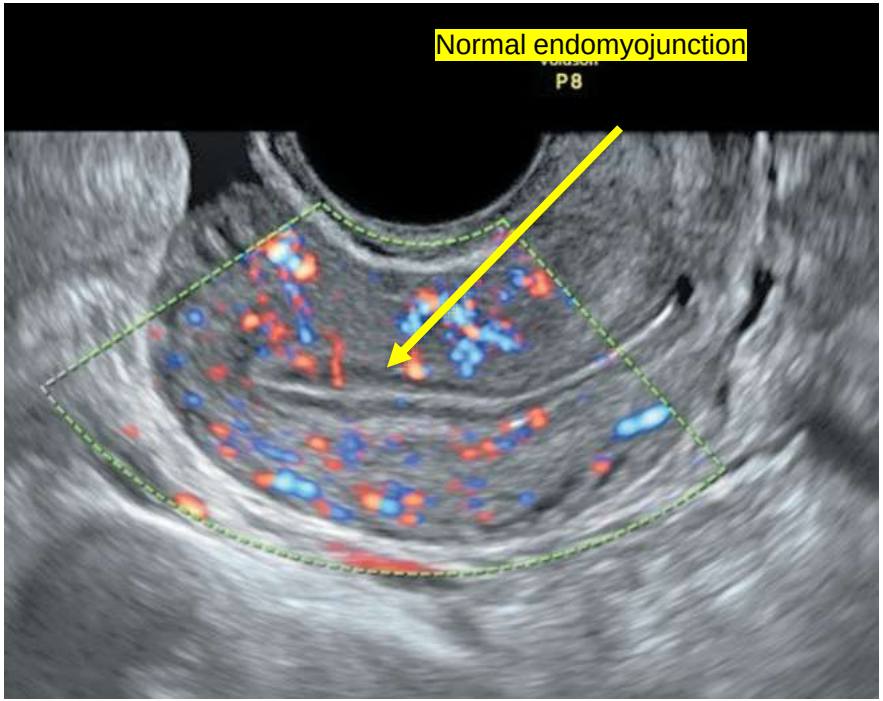
Outer Myometrium

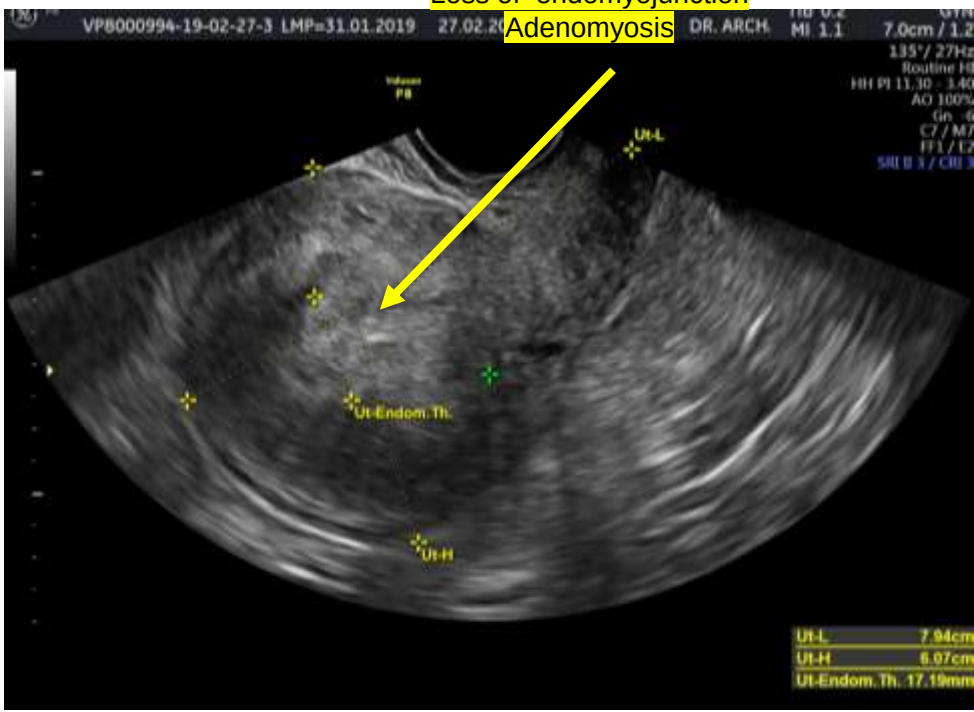
Stratum functionalis

Stratum basalis



Normal Anatomy:





Three Key signs on ultrasound -

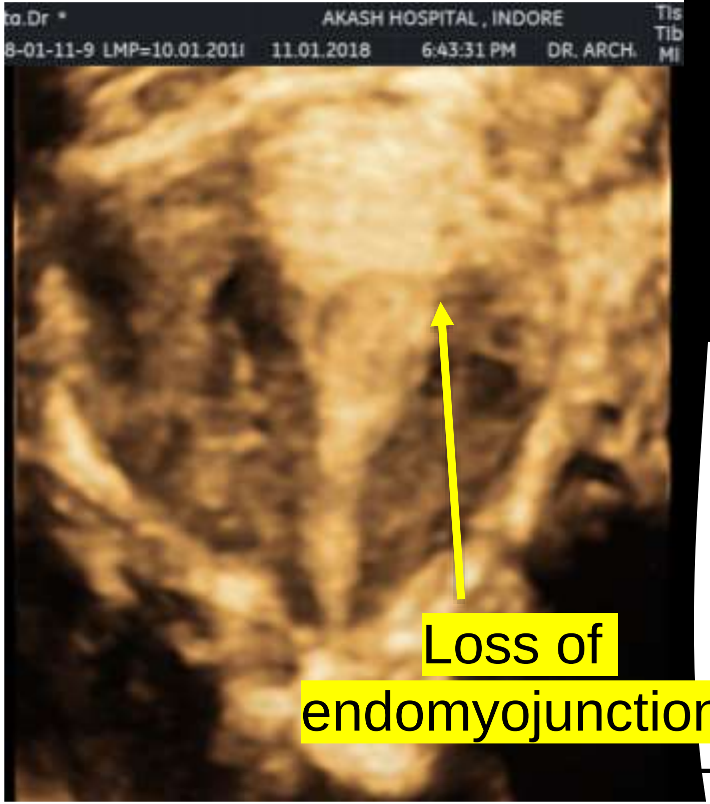
- **1. Ectopic endometrial glands** These manifest as echogenic nodules and striations radiating from the endometrium into the myometrium.

2. Muscular hyperplasia and hypertrophy This appears as globular uterine enlargement and asymmetric myometrial thickening, often with thin ventian blinds or streaky shadowing.

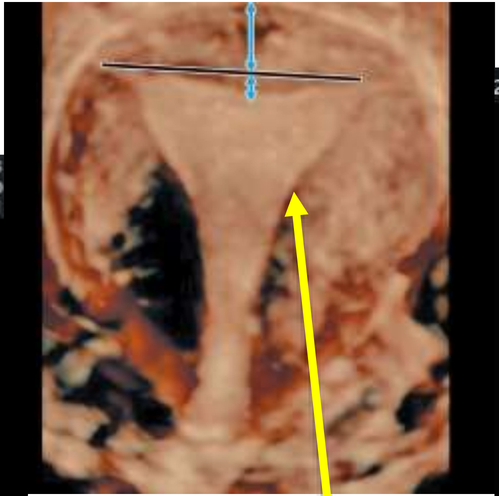
- **3. Hypervascularity** Adenomyosis increases uterine vascularity, which shows up on color Doppler as a pattern of penetrating vessels. It's important to distinguish these from peripheral vessels, which indicate the presence of fibroids.

Ultrasound features of Adenomyosis

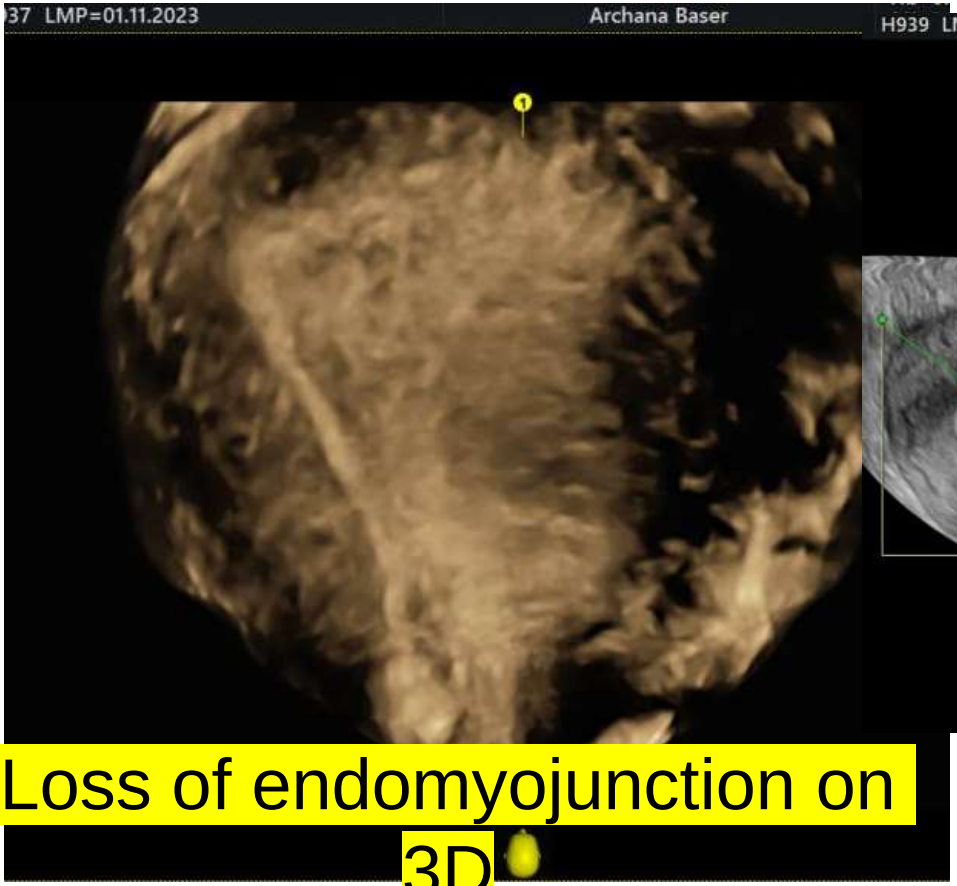
- Asymmetrical myometrial thickening
- Globular shape
- Ill defined endometrial/ myometrial interface
- Linear striations Myometrial cysts Hyperechoic nodules
- Increased junctional zone thickness on 3D >/= 8mm



Loss of endomyojunction

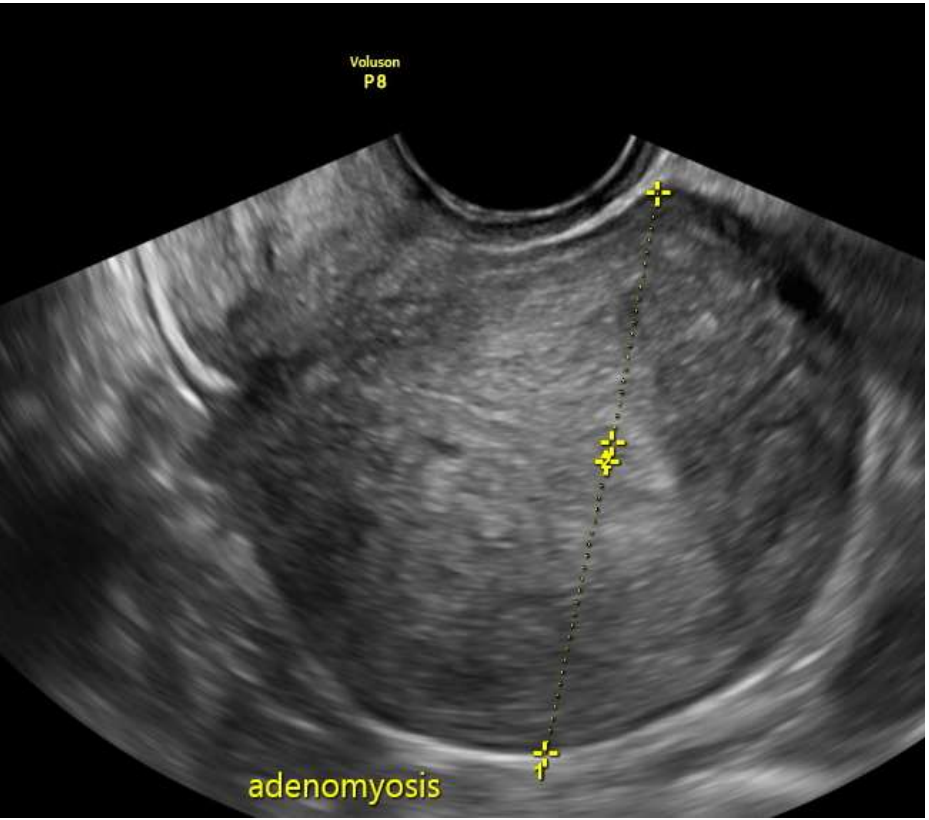


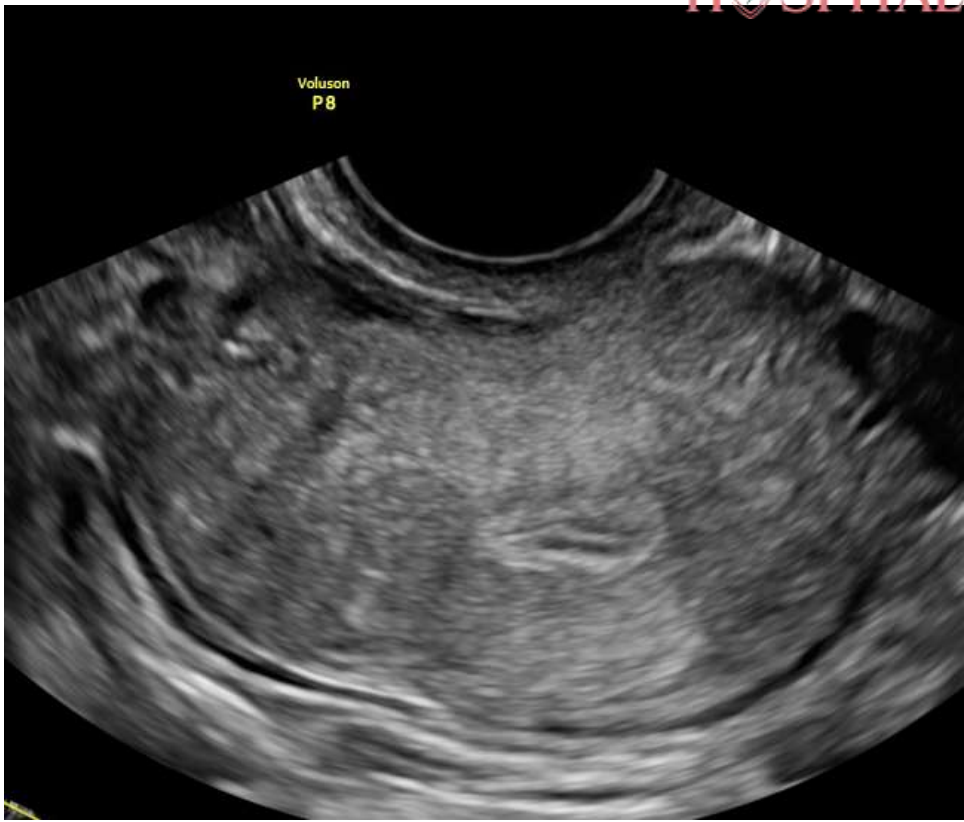
Normal endomyojunction



Loss of endomyojunction on 3D

Normal endomyojunction on 3D





Spectrum Of Adenomyosis

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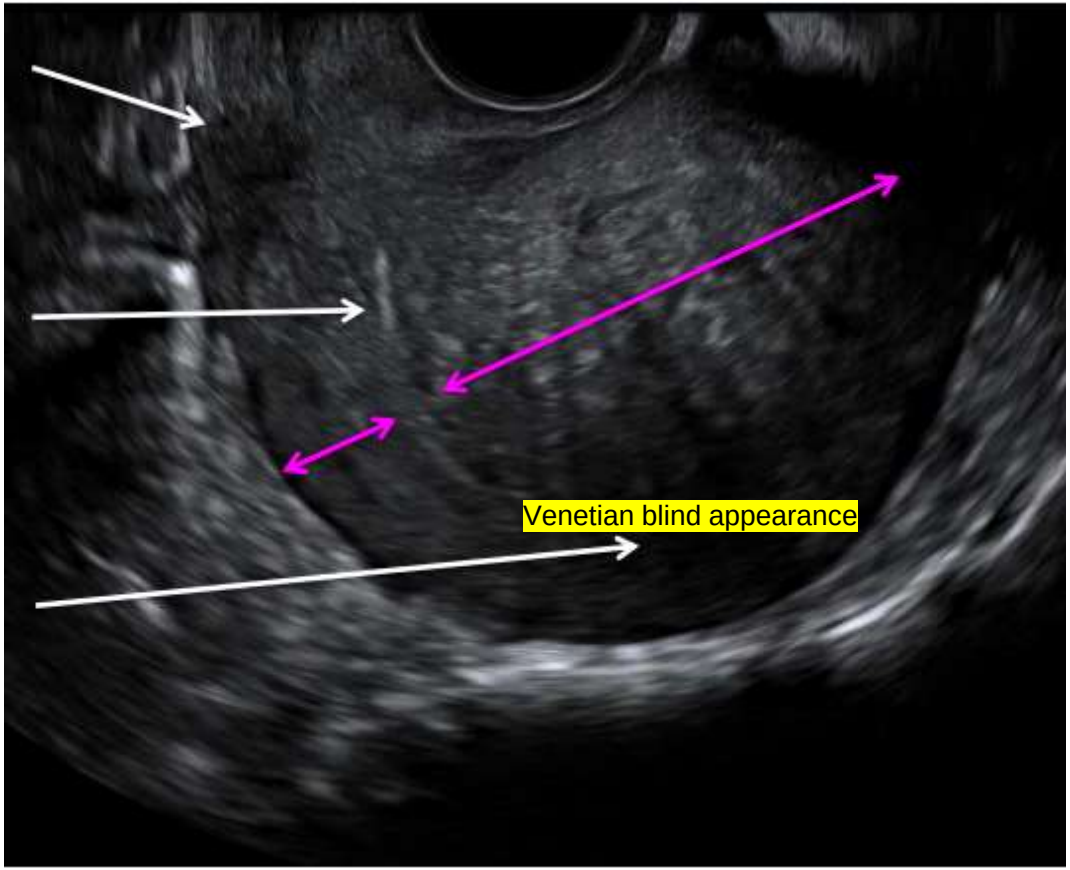
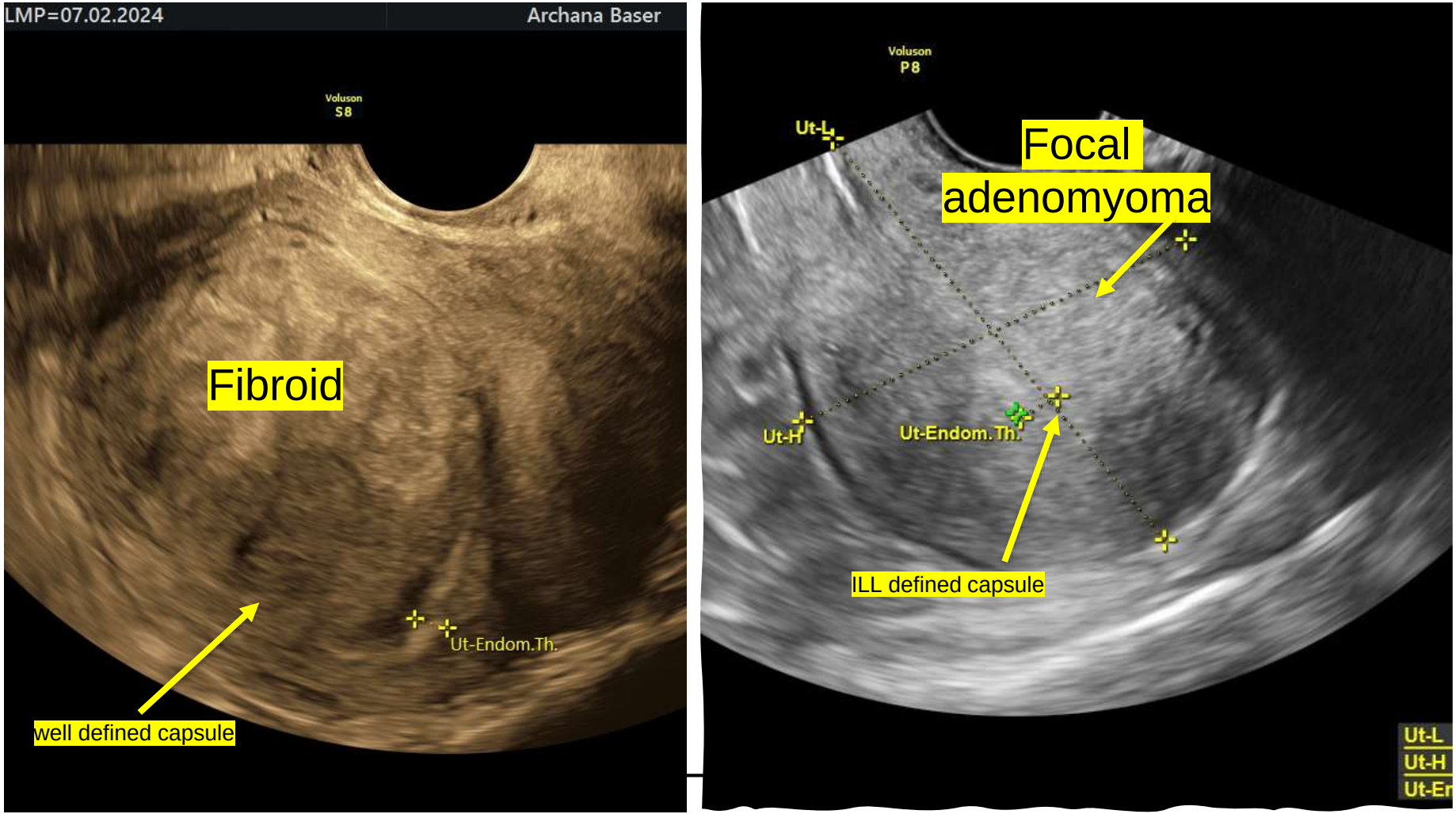
Adenomyosis

1) Globular Shape
2) Ill defined E-M junction
3) Linear striations
4) Myometrial asymmetry



Differentiating between fibroid and focal adenomyoma

- ILL defined
- Central vascularity
- Associated features of adenomyosis
- (cyst, indistinct myometrial-endometrial junction)
- No contour abnormality
- No edge shadow.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Archana Baser
Voluson
S8
Fibroid
Ut-Endom.Th.
well defined capsule
Voluson
P8
Ut-L
Focal
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ILL defined capsule
Ut-L
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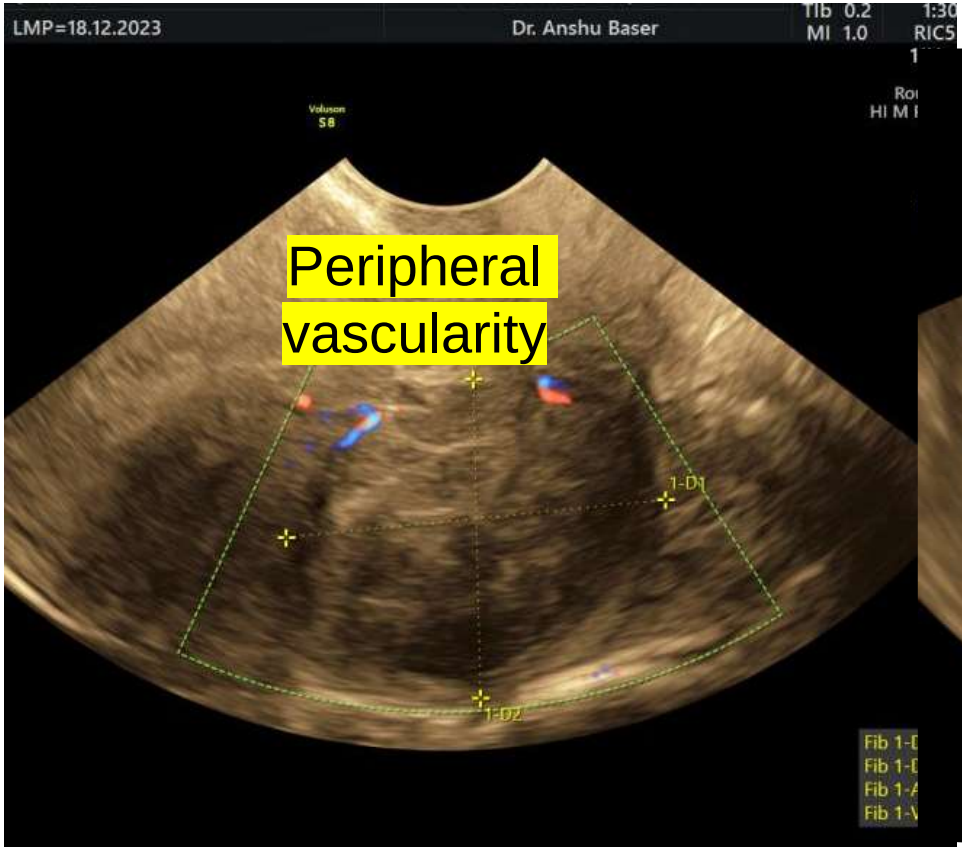
Ut-En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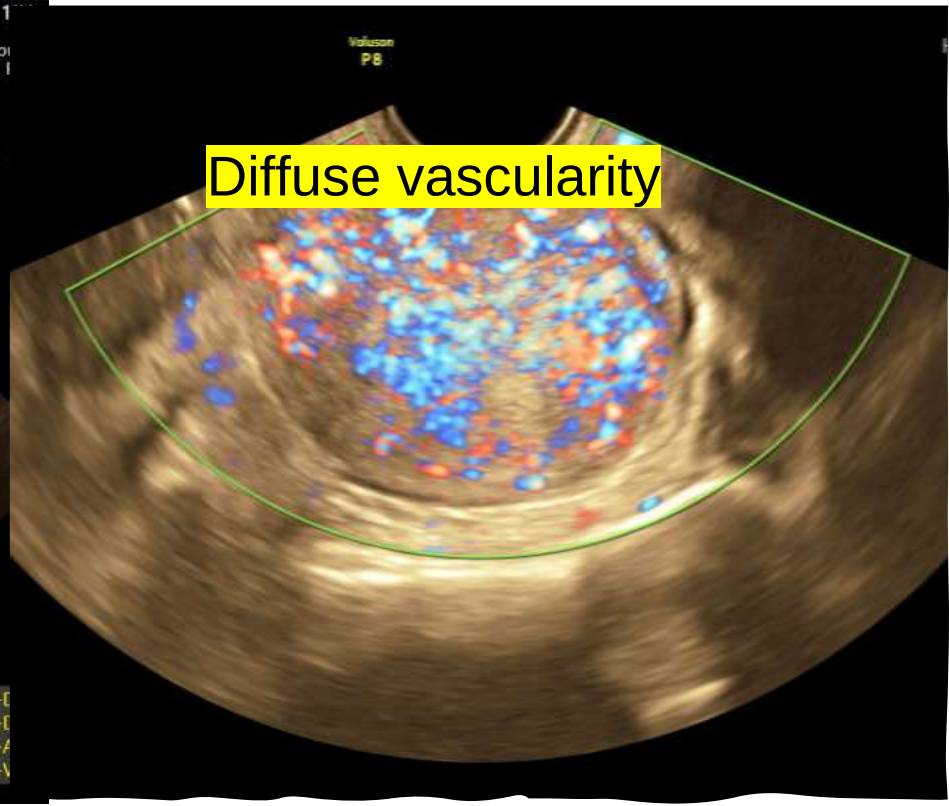
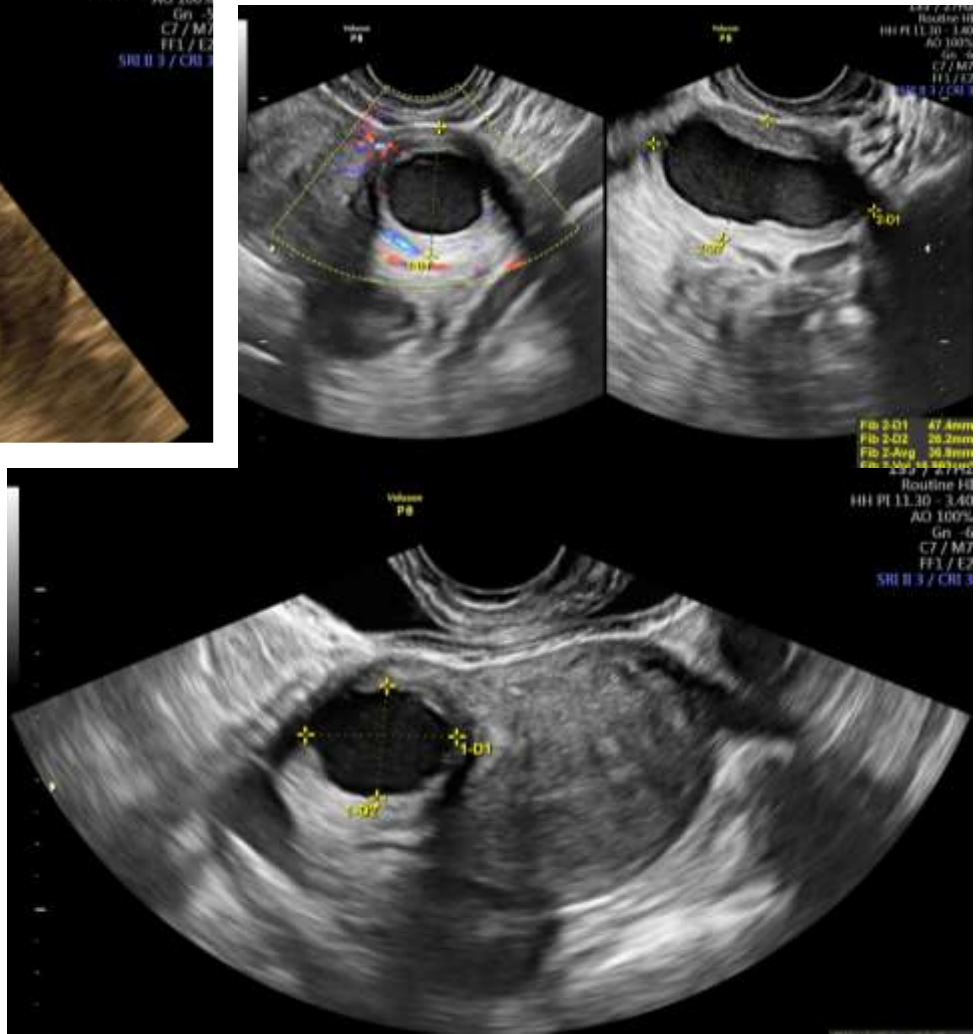
Dr. Anshu Baser
Peripheral vascularity


Diffuse vascularity



Challenging cases –Adenomyotic cysts

Learning points -

- *Adenomyosis is defined as the presence of ectopic endometrium within the myometrium.*
- *• MRI is an accurate tool for the diagnosis of adenomyosis and associated conditions.*
- *• Adenomyosis can be diffuse or focal.*
- *• The most established MRI finding is thickening of junctional zone exceeding 12 mm.*
- *• High-signal intensity myometrial foci on T2- or T1-weighted images are also characteristic.*

Obstetrics and Gynaecological Ultrasound for Beginners

Salient Features

- Selective core topics on obstetrics and gynecological ultrasound for the beginners
- Plenty of ultrasound images to ease-learning process
- Chapters written by national and international experts to make each chapter a guide for inexperienced ultrasound practitioners
- Reference book for ultrasound trainers as it is in question-answer format covering frequently-asked questions (FAQs) by the trainee
- A step by step guide to getting an optimum 3D/4D image and how to incorporate 3D/ 4D to improve your ultrasound assessment.

Archana Baser MS DNB FRCOG (London) FCOG is currently heading the Department of Obstetrics and Gynaecology at Akash Hospital, Indore, Madhya Pradesh, India. She is the past Vice President FOGSI, Organising secretary AICOG 2022. She has a keen interest in Ultrasound, she is Chairperson SAFOG Imaging Science Committee and MCM Imaging Science Committee AOFOG. She has trained at Harris Birthright Centre, London, UK and did overseas travelling fellowship in fetal medicine with Professor Charles Rodeck, University College Hospital, London. Ultrasound training is her passion. Her dream is to equip every gynaecologist with the power of ultrasound.

Anshu Baser MS DNB is a Consultant, Department of Obstetrics and Gynecology, Akash Hospital, Indore, Madhya Pradesh, India. She has keen interest in Obs/Gyne ultrasound. She has been involved in the FOGSI ultrasound training—the trainers program and organized many ultrasound workshops. She is the recipient of FOGSI Travelling Fellowship 2022 and FOGSI Movical Award (Junior 2022). She has also been a part of organizing team of AICOG 2022, ISAR 2016. She played an active role at Indian Society for Assisted Reproduction (ISAR), 2016 in organizing ultrasound workshops at Indore.

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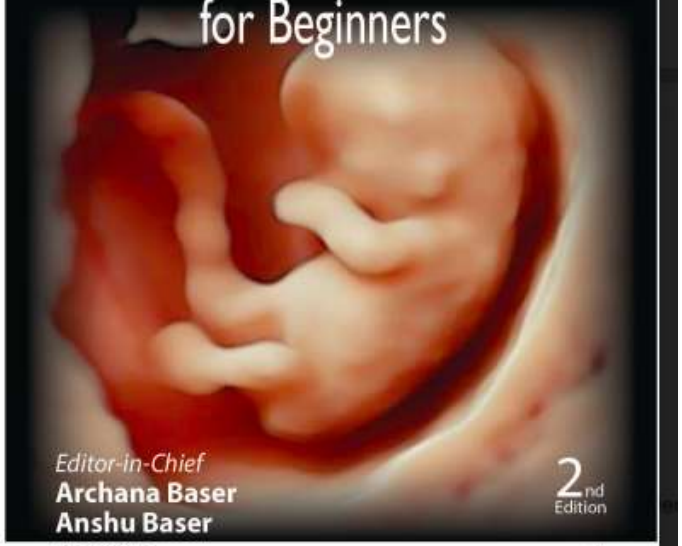

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Archana Baser
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Co-Editors
Alia K Zaidi
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JAYPEE

Take home message

TV U/S accurate at assessing endometriomas

- Severity of symptoms does not correlate with extent of disease
- Identifying an endometrioma – likely that there is further sites of pelvic endometriosis
- ‘Kissing ovaries’ associated with extensive pelvic adhesions
- Adenomyosis is usually under reported
- Assessment of pelvic mobility can indicate adhesions

To Summarize Imaging modalities

With current improved high resolution scanning it is now possible to diagnose most of endometriotic lesions.

Addition of colour doppler helps in scoring and detecting endometriosis and differentiate it from malignancy

Summary

TVS is accurate at assessing severe endometriosis (DIE) when performed by experienced operators

• More appropriate referral to a tertiary referral endometriosis centre will ensure safer management

THANKS.


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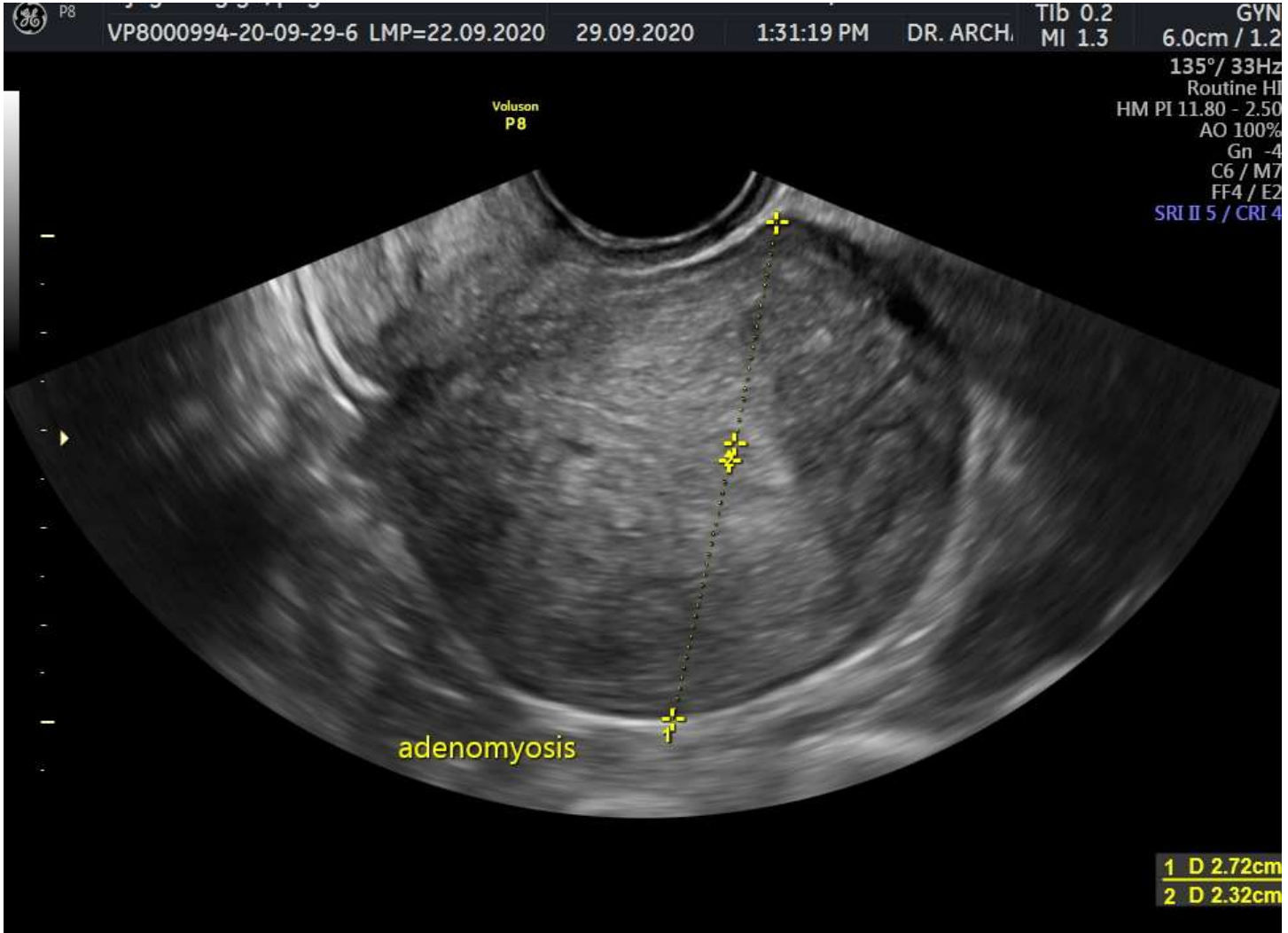
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Voluson
P8
adenomyosis
1 D 2.72cm
2 D 2.32cm


P8