How Useful is Ultrasound in the Assessment of Non-Pregnant Patients Presenting with Heavy Vaginal Bleeding ?

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Heavy…AUB

Pre and perimenopausal bleeding

Pre and perimenopausal bleeding problematic: to distinguish normal from abnormal uterine bleeding (AUB) during a time in life when a woman's menstrual cycles are dynamically changing is challenging

The prevalence of AUB is 3-30%, more common at the extremes of reproductive life: perimenarche and perimenopause.

Perimenopausal women

Menstrual irregularities consisting of short and long menstrual cycles and cycles with or without ovulation.

Anovulatory cycles are more likely to be associated with spotting but can have heavier bleeding

Some shortened menstrual cycles are the result of the so-called LOOP—luteal-out-of-phase phenomenon, in which folliculogenesis begins during the luteal phase preceding menses.

35% if IMB and PCB

4 parameters

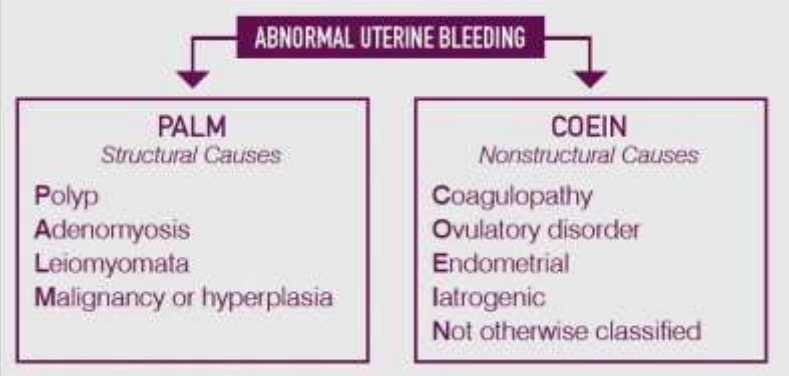
Aetiology of bleeding in the non pregnant patient

Pre menopausal

- Polyps IC
- Adenomyosis H mural
- Fibroids H IC
- Niche IC
- Cervical cancer
- Endometrial cancer IC
- Sarcoma…very rare
- Infection IC
- IUCD IC
- OCP
- AVM H IC

Post menopausal

- Endometrial cancer
- Cervical cancer
- Sarcoma..rare
- Polyps
- Adenomyosis
- Niche
- Fibroids



N….AV malformations Endometritis PID

Assessment of Non-Pregnant Patients Presenting with Heavy Vaginal Bleeding

TVU is the “primary imaging test of the uterus for the evaluation of abnormal uterine bleeding.’

- Polyps
- Adenomyosis
- Fibroids
- Niche
- Cervical cancer
- Endometrial cancer
- Sarcoma…very rare
- Infection
- IUCD
- OCP
- AVM

Endometrial polyps

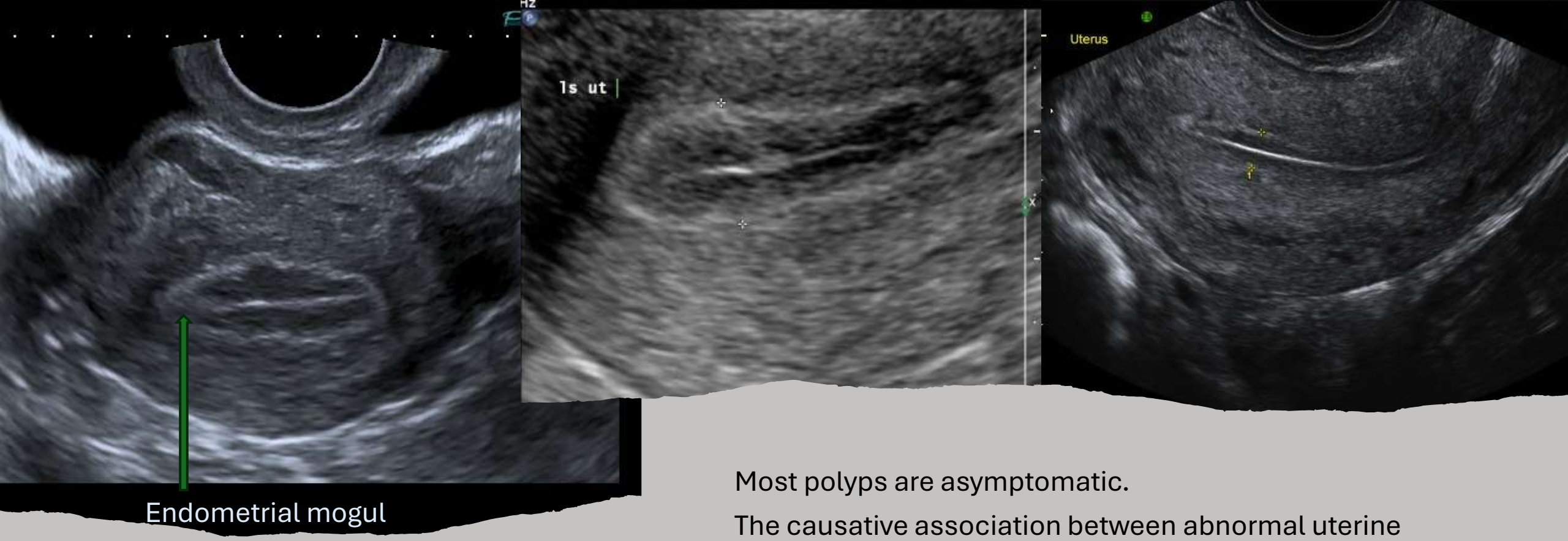
Incidence of endometrial polyps increases with age; polyps account for only about 1% of AUB in women younger than age 30 and up to 30% in postmenopausal women.

Increased incidence in women receiving tamoxifen.

Studies indicate the overall incidence of cancer in endometrial polyps ranges from 1% to 8%

- older women
- postmenopausal bleeding
- larger polyp size
- patients with medical comorbidities such as hypertension, diabetes, and obesity.

ONLY SONOGRAPHIC DIFFERENCES PRE AND POST Feeding vessel PRE Cystic (senile atrophic) POST



Endometrial polyps

Most polyps are asymptomatic.

The causative association between abnormal uterine bleeding and endometrial polyps is still a subject of controversy particularly in the pre menopausal populations

Early proliferative phase (cycle day 4–6) pre ovulatory, and in postmenopausal women on cyclic hormonal replacement therapy 5–10 days after the last progestin tablet.

Polyps: ultrasound characteristics

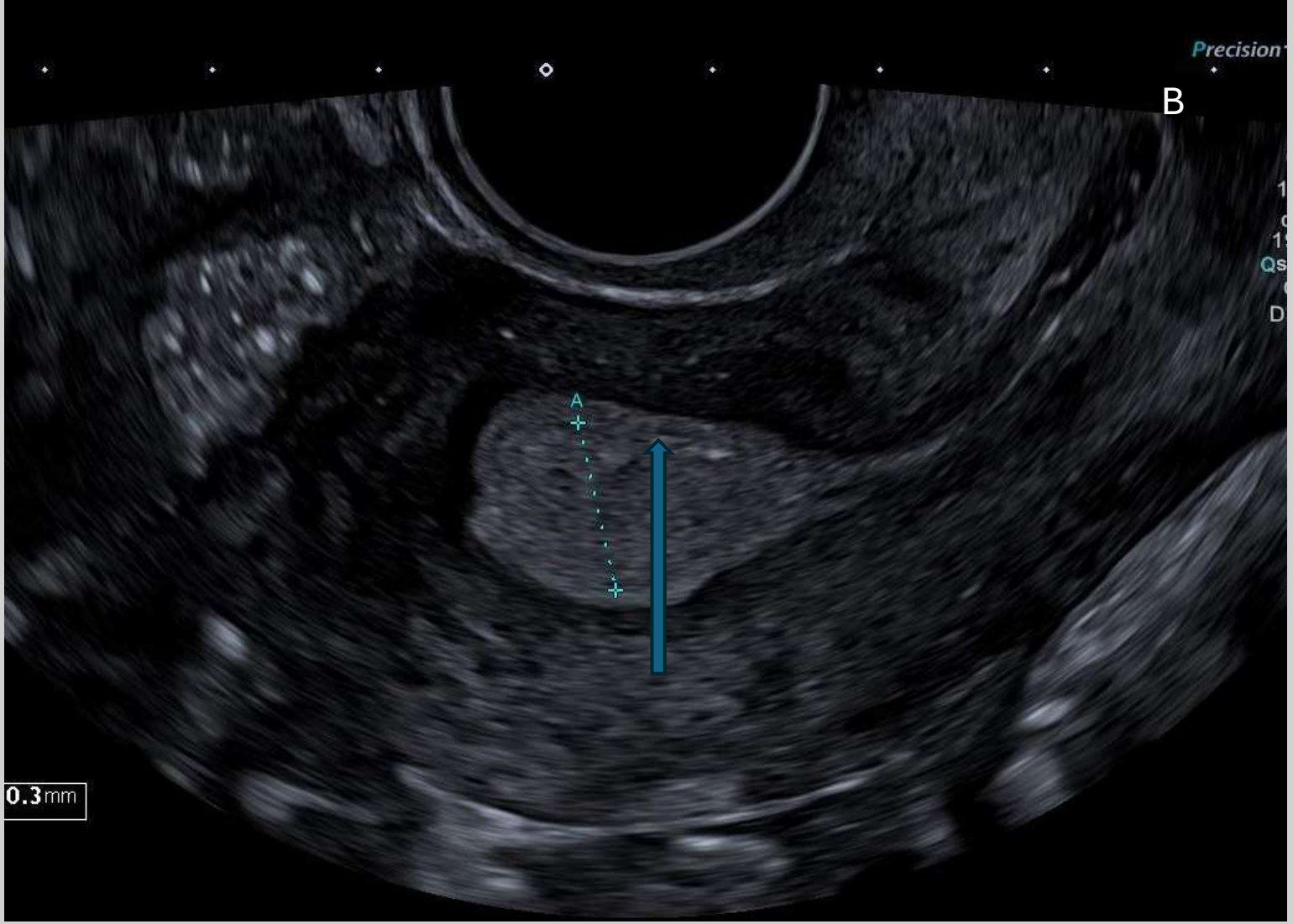
Thickening of the endometrium. A

- 1/3 homogenous 1/3 heterogenous 1/3 cystic

The “bright edge” sign, defined as a sharp and smooth echogenic line generated by the interface between the polyp and the juxtaposed endometrium. B

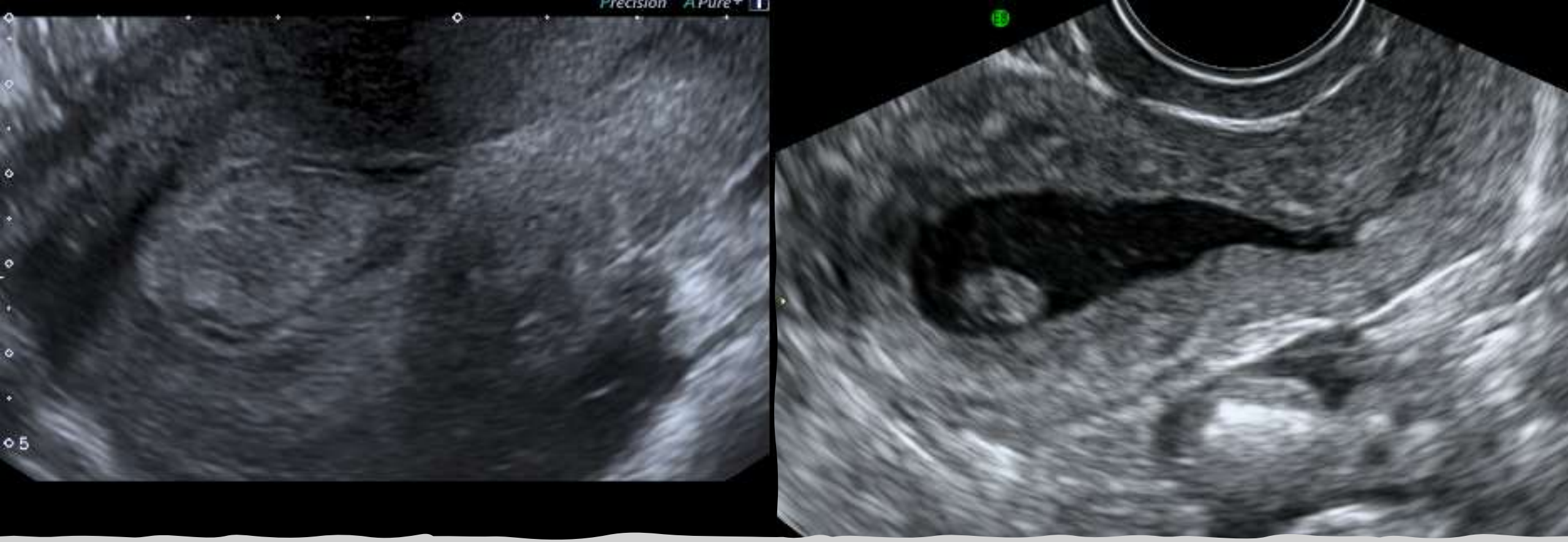
Applying gentle pressure with the probe can aid the detection of endometrial polyps as they flaccidly deform or slide upon targeted compression or reflectory uterine peristalsis.

A “pedicle artery” seen on colour imaging is a well-delineable “dominant vessel” originating from the myometrium and reaching into the central part of the endometrium. C


B
A
0.3mm

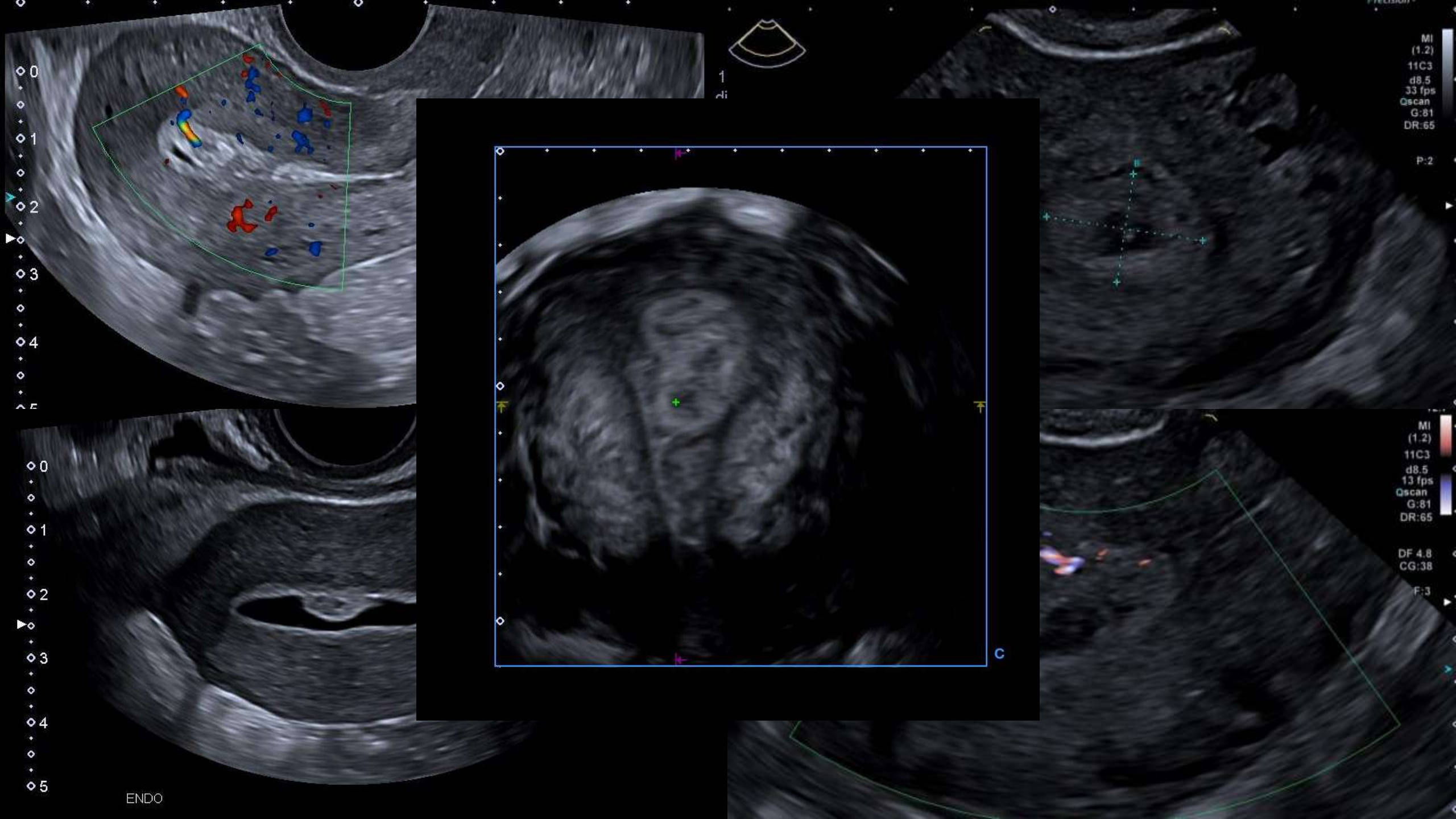

C


A



Endometrial polyps

- Echogenic or mixed echogenicity rule of 1/3
- Completely contained in the endometrial cavity with NO extension into the myometrium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DR:65
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MI
(1.2)
11C3
d8.5
13 fps
Qscan
G:81
DR:65
DF 4.8
CG:38
F:3
ENDO


MI
(1.5)
11C3
d7.0
14 fps
Qscan
G:85
DR:60
P:2


MI
(1.2)
11C3
d8.5
11 fps
Qscan
G:83
DR:65
DF:5.8
CG:38
F:3


MI
(1.2)
11C3
d8.5
19 fps
Qscan
G:83
DR:65
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Dist A 12.8mm


11C3
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Qscan
G:83
DR:65
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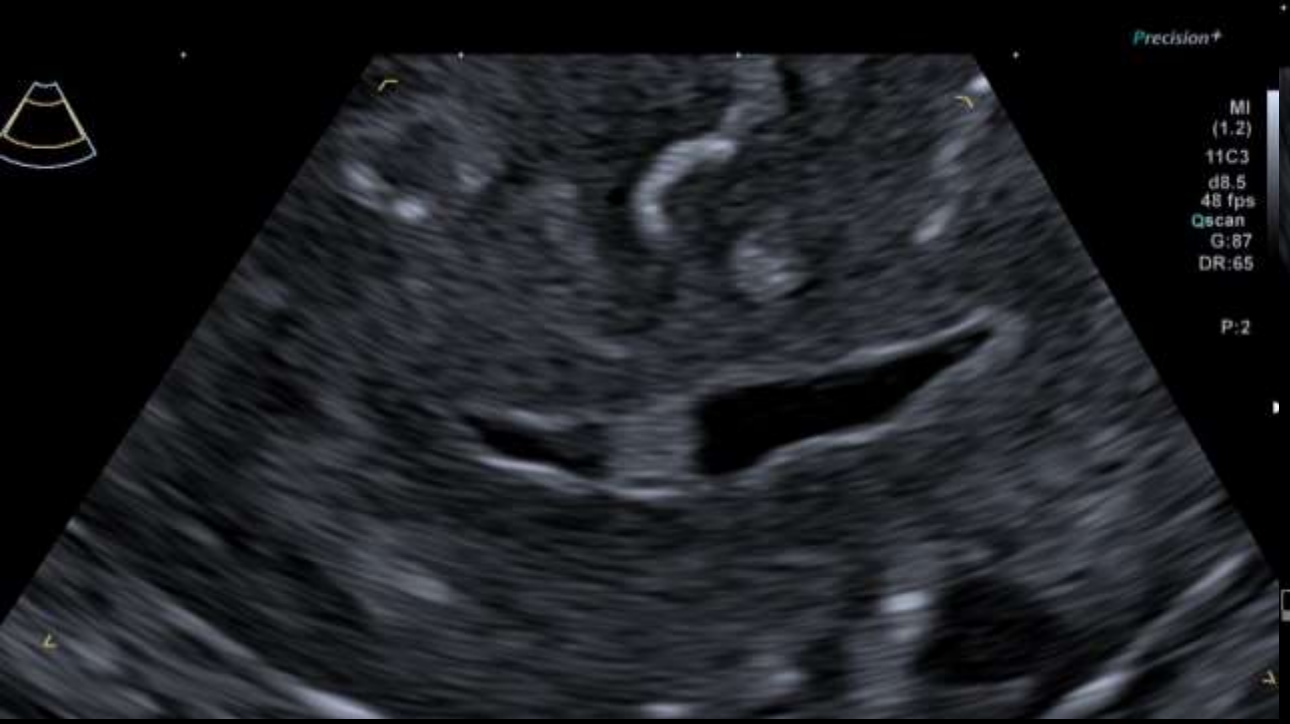
A
B


A


Precision+
MI
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48 fps
Qscan
G:87
DR:65
P:2


7.0
MI
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11C3
d8.5
12 fps
Qscan
G:87
DR:65
CF 4.8
CG:35
F:2
A
Dist A 8.9mm


Precision+
MI
(0.8)
11C3
d10.5
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UTERUS
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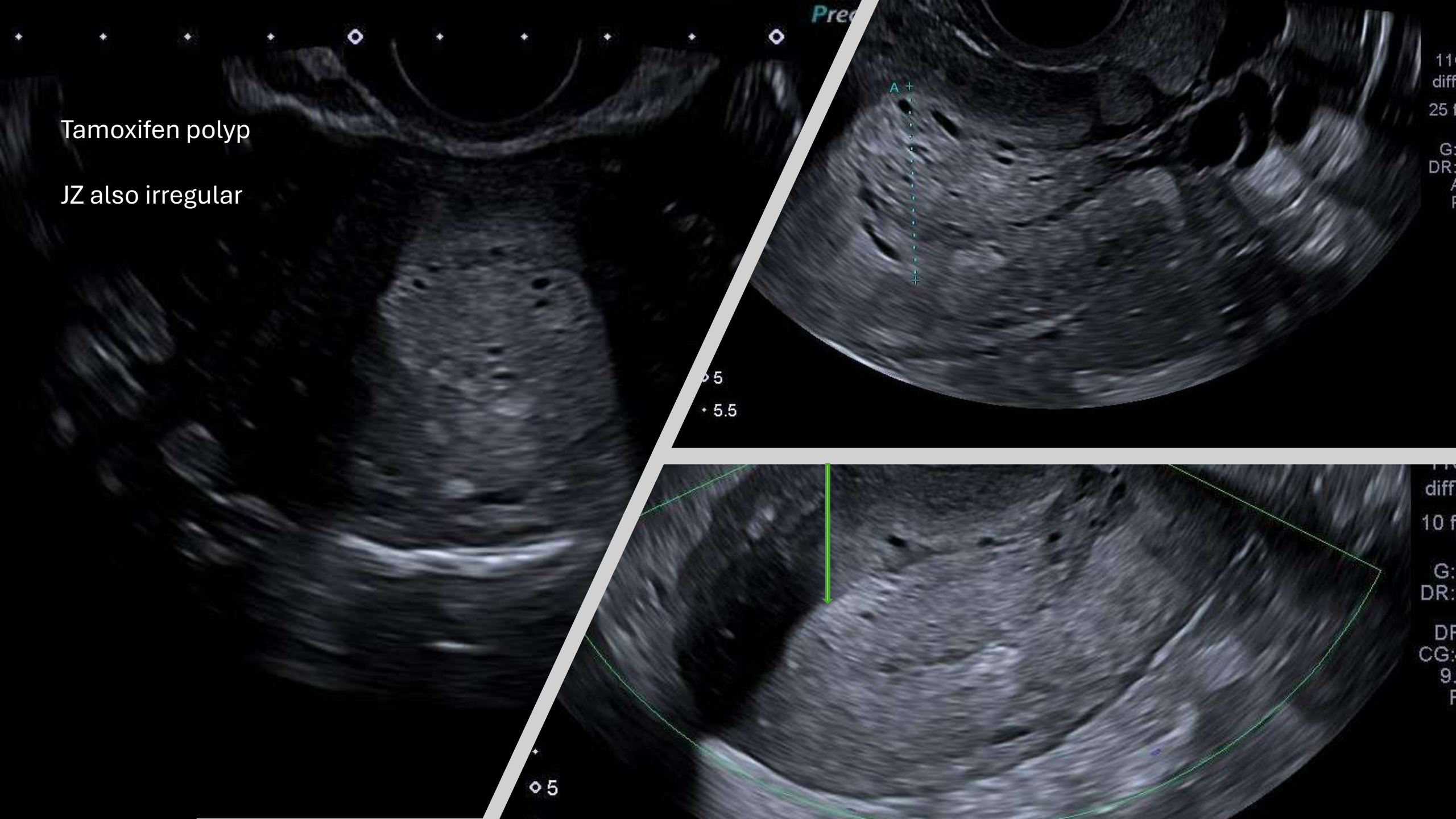

Tamoxifen polyp
JZ also irregular

Cervical polyps

Most common new growths of the uterine cervix occurring in 2– 5% of adult women

Most found during the 4th to 6th decades and in multigravidas

Benign, but malignancy can occur in 0.2-1.5% of cases

Single or multiple lesions, mostly pedunculated, rarely sessile and measure mms to 2–3 cm.

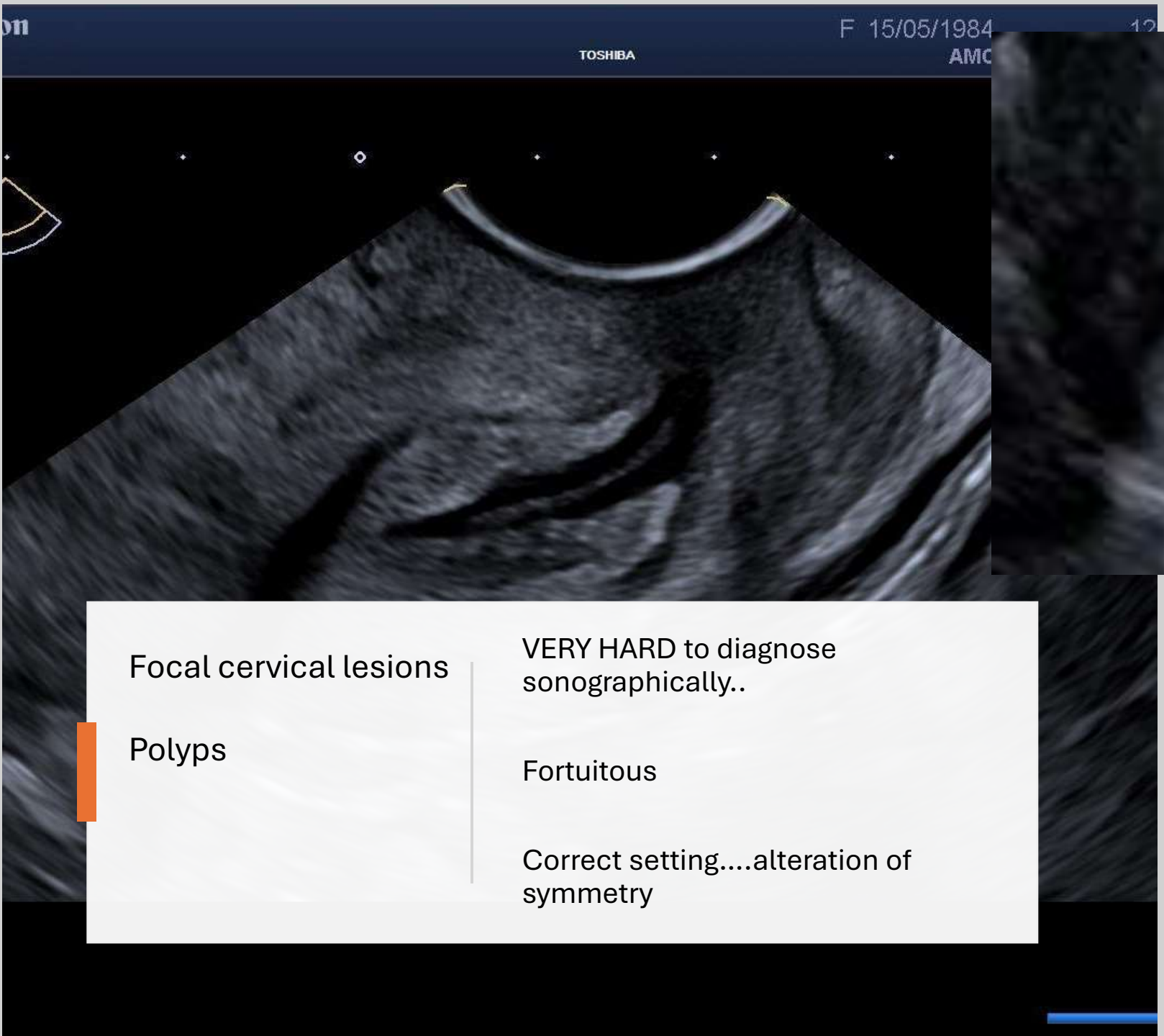
Most cervical polyps are asymptomatic but may cause IMB, PCB, heavy menses, postmenopausal bleeding and discharge

Description is based on the IETA terminology referable to endometrial polyps

At ultrasound examination, almost all cervical polyps appear as a solid hyperechoic lesion compared with the surrounding cervical stroma.

They sometimes appear as isoechoic or hypoechoic lesion with ‘non-uniform’ echogenicity because of cystic areas within the polyp.

Prolapsing endometrial polyps



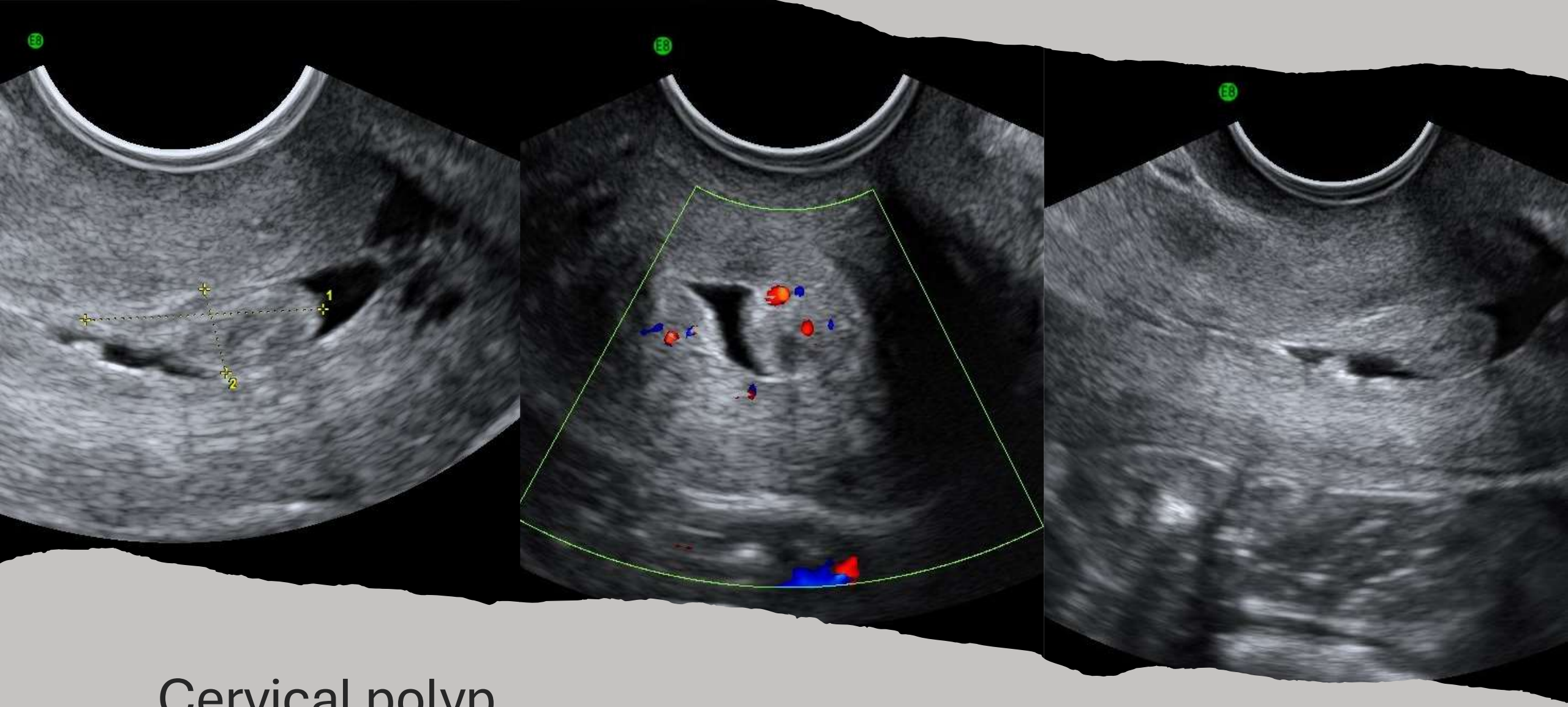
Focal cervical lesions

Polyps

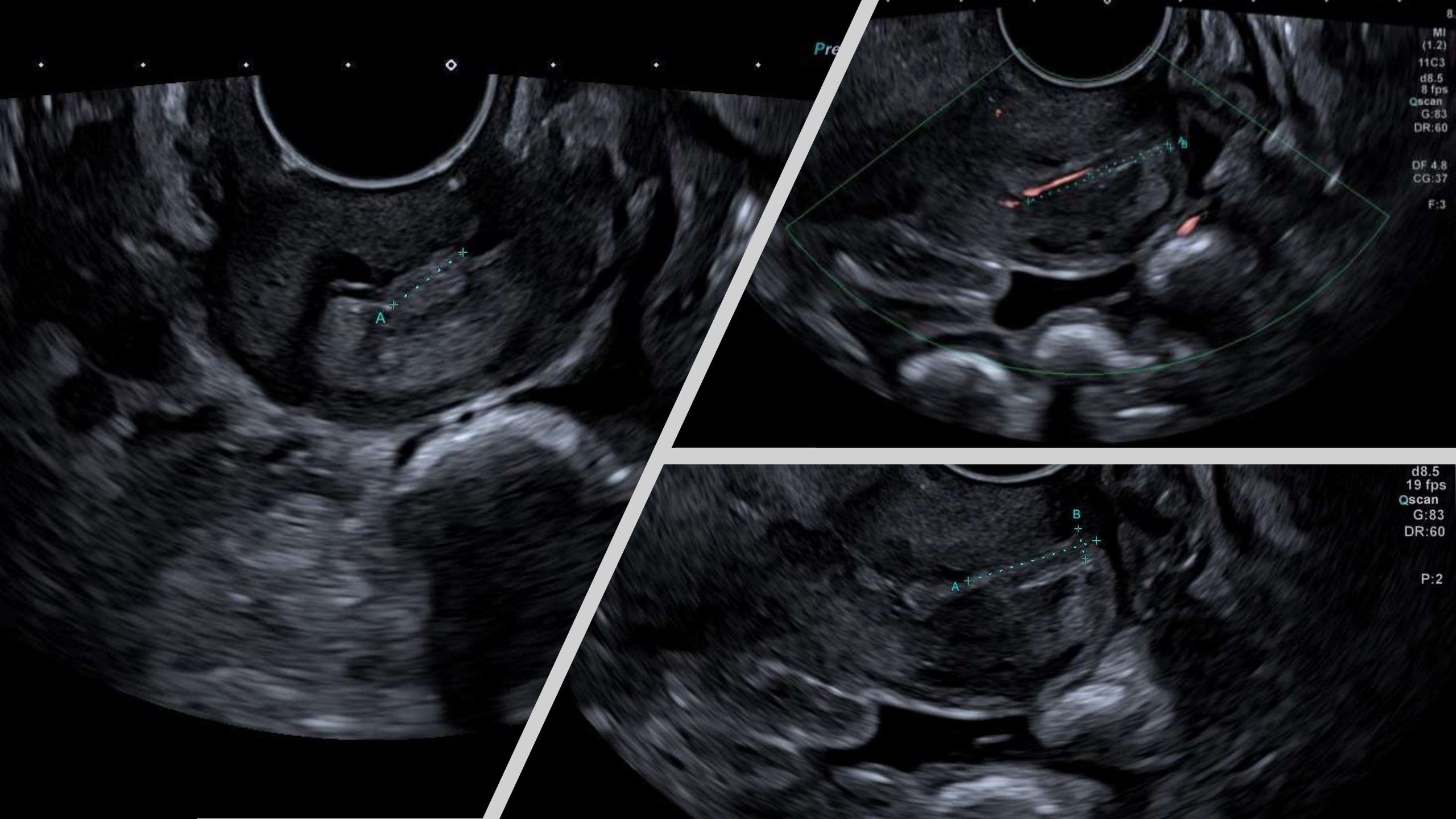
VERY HARD to diagnose sonographically..

Fortuitous

Correct setting....alteration of symmetry



Cervical polyp


A
MI
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11C3
d8.5
8 fps
Qscan
G:83
DR:60
DF:4.8
CG:37
F:3
B
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d8.5
19 fps
Qscan
G:83
DR:60
P:2
B
A


MI
(1.2)
11C3
d8.5
19 fps
Qscan
G:83
DR:60
P:2


MI
(1.2)
11C3
d8.5
8 fps
Qscan
G:83
DR:60
DF 4.8
CG:37
F:3


Precision+
Cervix
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11C3
d7.0
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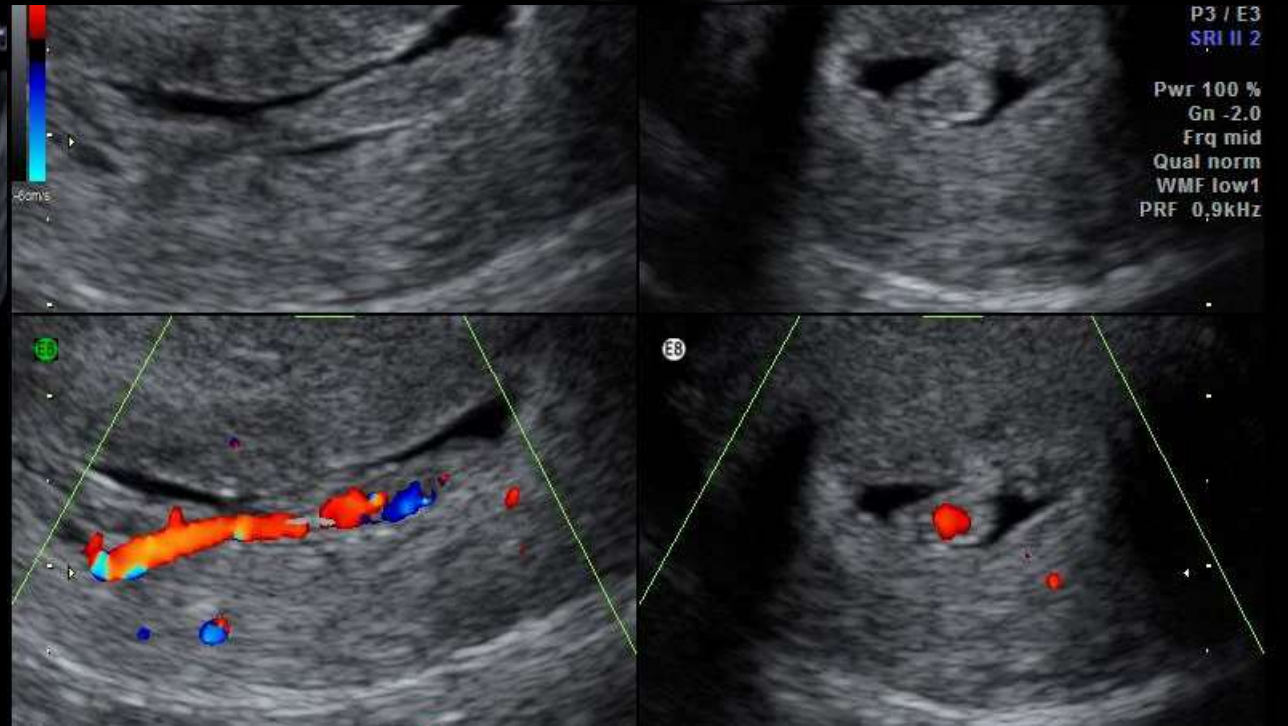
Qscan
G:91
DR:50
DF 4.8
CG:32
F:3


P3 / E3
SRI II 2
Pwr 100 %
Gn -2.0
Frq mid
Qual norm
WMF low1
PRF 0,9kHz


F 09/
TOSHIBA


(1:2)
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Qscan
G 87
DR 60
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(1:2)
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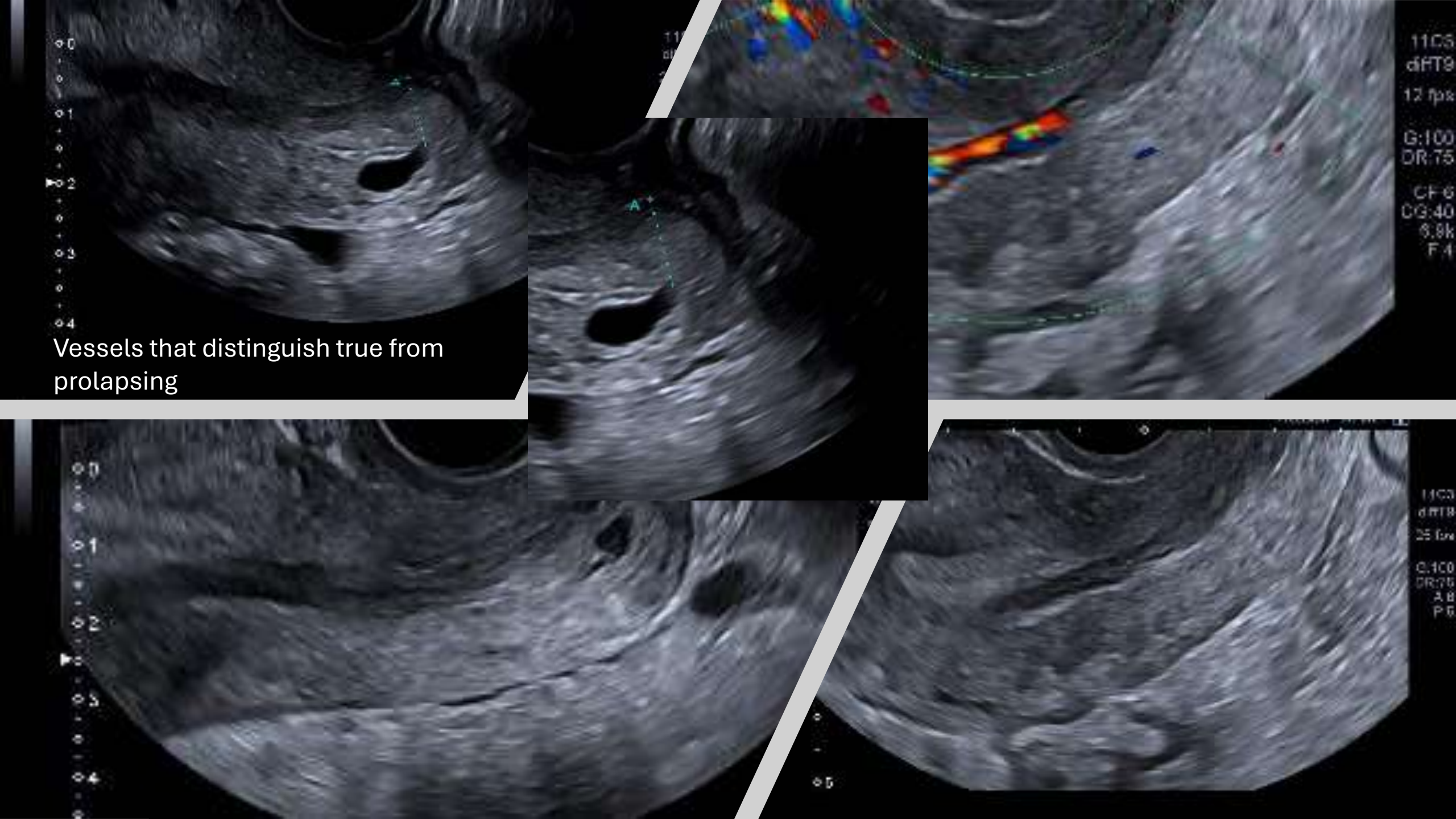
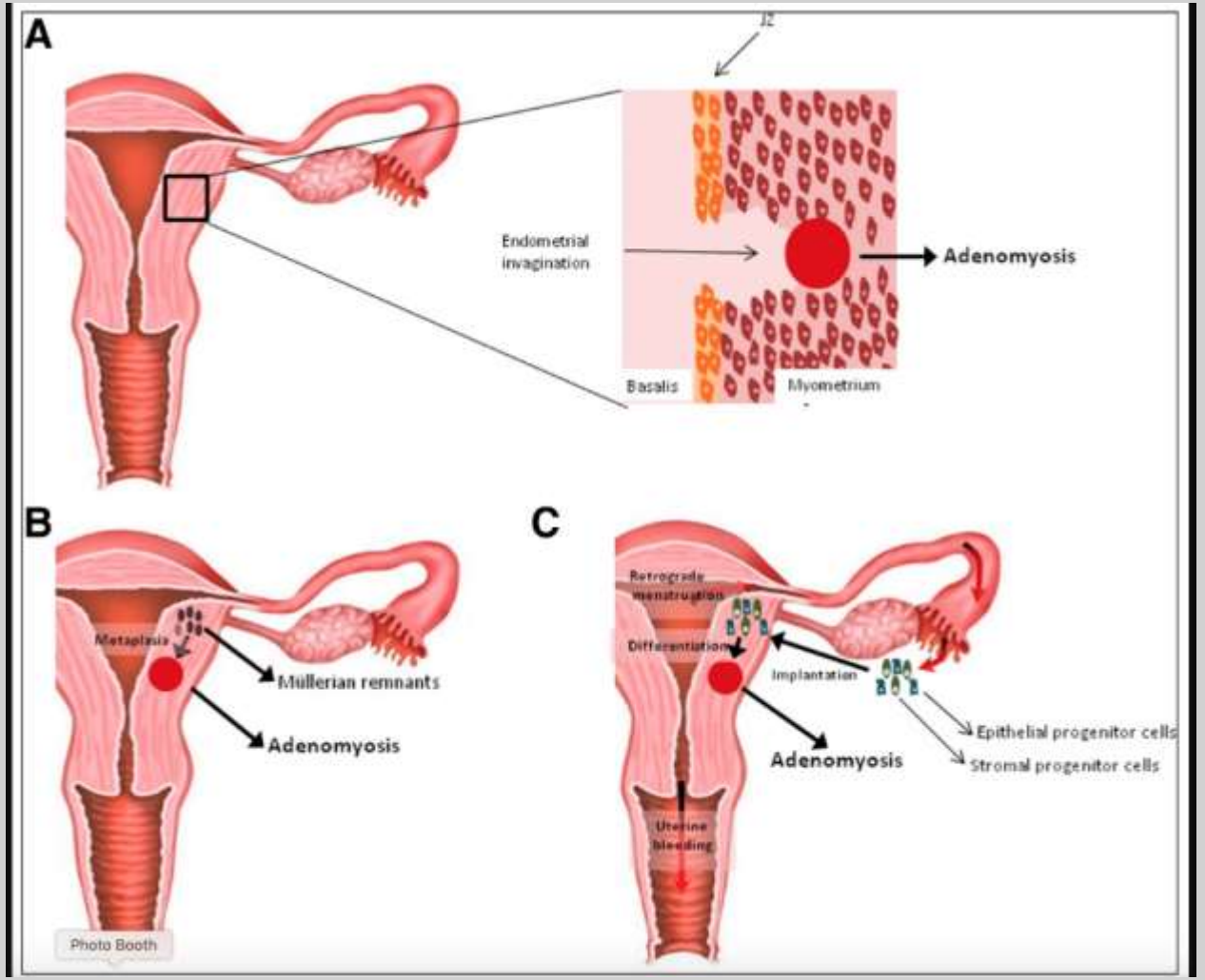

Vessels that distinguish true from prolapsing

Adenomyosis

2 suspected aetiologies

1. Invagination of the endometrial basalis
2. Metaplasia..of displaced embryonic pluripotent Mullerian remnants or differentiation of adult stem cells

Worse post surgery



Adenomyosis

Menorrhagia is the most common symptom and is likely caused by the increased total volume of endometrial glands in the uterus and/or the increased myometrial vascularity from the ectopic glands.

It is likely that the extent and depth of myometrial invasion is directly related to the degree of bleeding.

NICE 2018 – Heavy menstrual bleeding – assessment and management

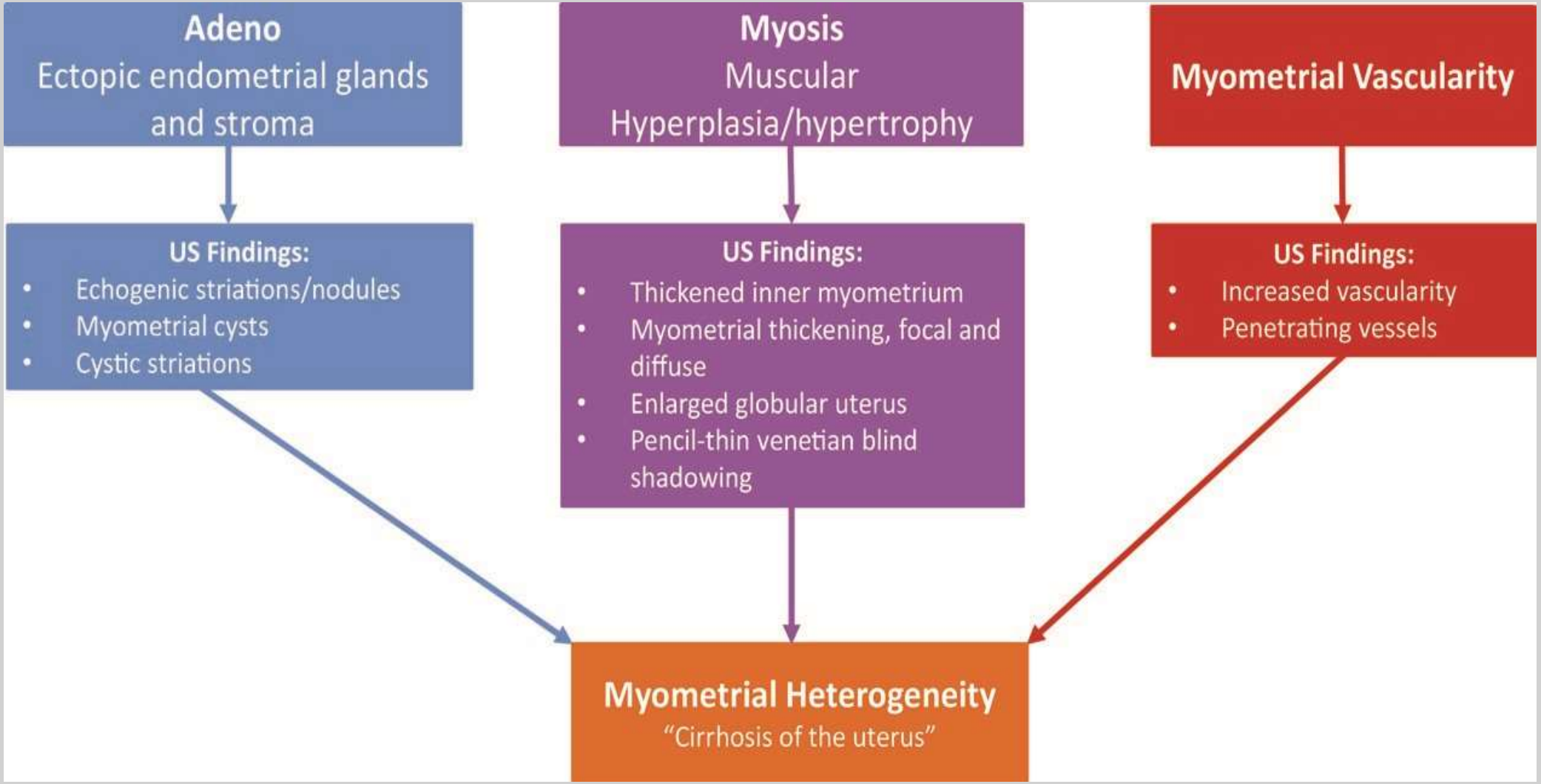
Women with suspected adenomyosis

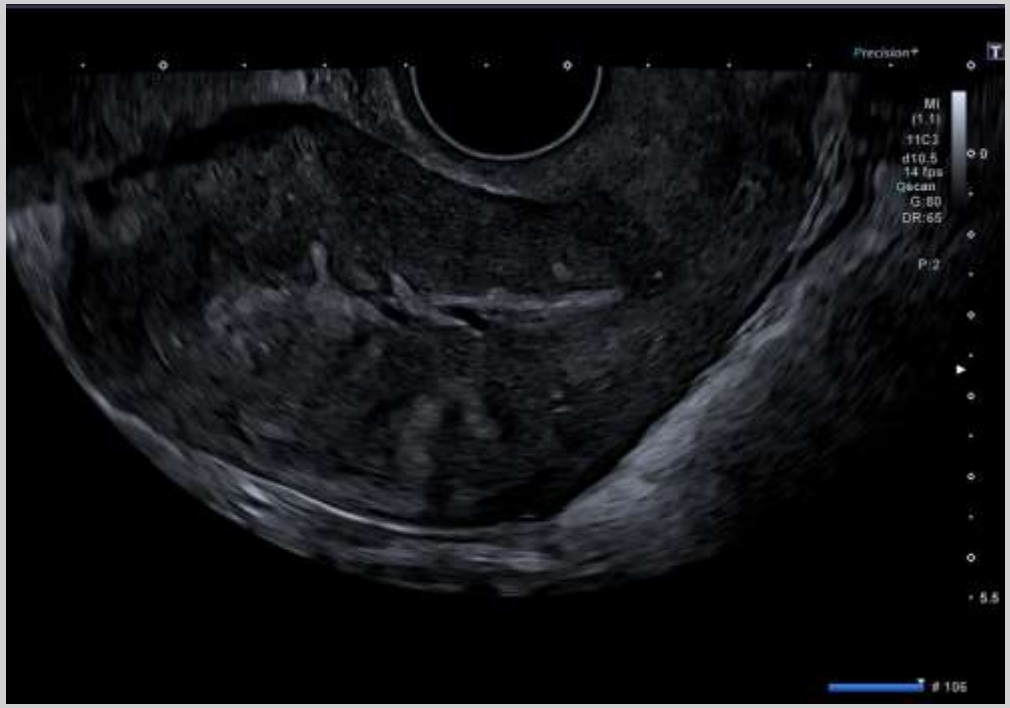
- offer transvaginal ultrasound to women with HMB who have significant dysmenorrhoea or a bulky tender uterus

Transvaginal ultrasound

First line imaging technique to diagnose adenomyosis

- sensitivity 65 to 81%
- specificity 65 to 100%

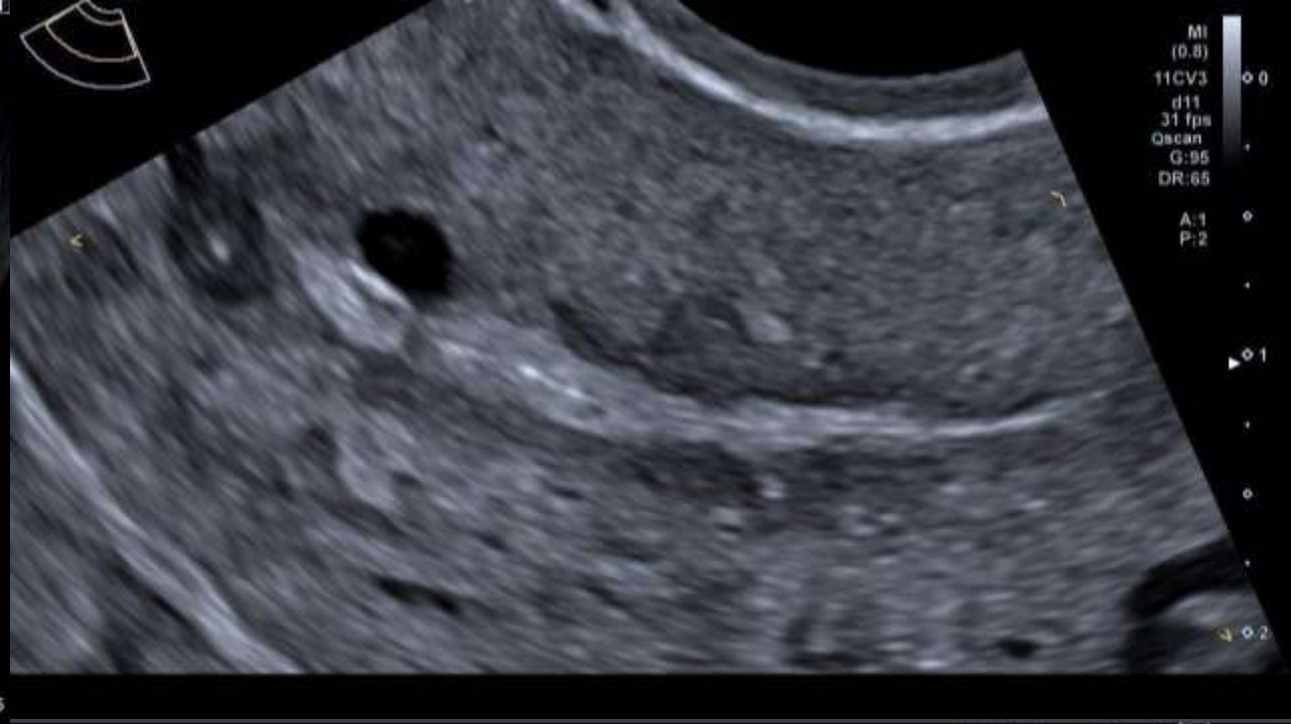

Adeno
Ectopic endometrial glands and stroma
Myosis
Muscular Hyperplasia/hypertrophy
Myometrial Vascularity
US Findings:
Echogenic striations/nodules
Myometrial cysts
Cystic striations
US Findings:
Thickened inner myometrium
Myometrial thickening, focal and diffuse
Enlarged globular uterus
Pencil-thin venetian blind shadowing
US Findings:
Increased vascularity
Penetrating vessels
Myometrial Heterogeneity
"Cirrhosis of the uterus"



"adeno": ectopic endometrial glands

- subendometrial echogenic linear striations and/or nodules (specific sign), extending from the endometrium and into the inner myometrium
- hyperechoic islands NOT in contact with the endometrium
- irregular endometrial–myometrial junction
- tiny (1-5 mm) anechoic myometrial and sub endometrial cysts (specific sign): reflecting glands filled with fluid
    - cystic striations CONSEQUENCE


Uterus Endometrium Uterus
MI
(0.7)
11C3
d7.0
14 fps
Qscan
G:87
DR:60
P:2


MI
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DR:65
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SRI II 2


Precision
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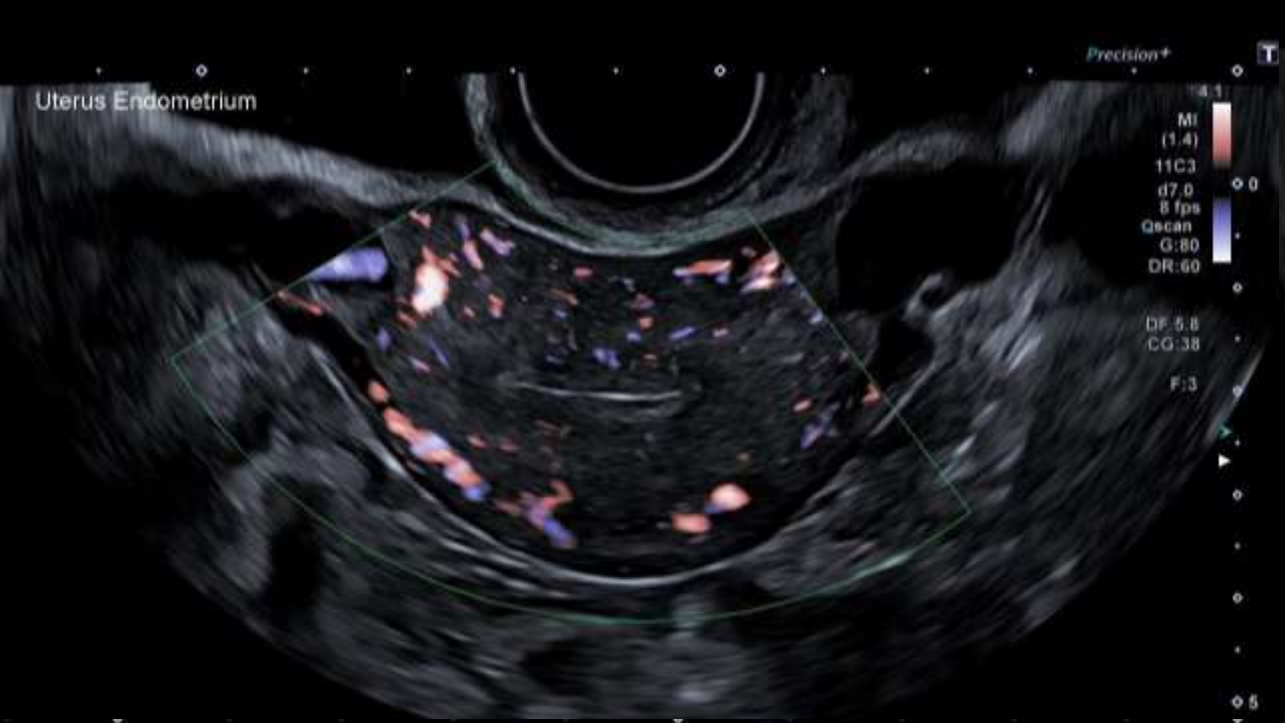
Precision+
Uterus Endometrium
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DF 5.8
CG:38
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Precision+
Uterus Endometrium Uterus
MI
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11C3
d7.0
14 fps
Qscan
G:87
DR:60
P:2


MI
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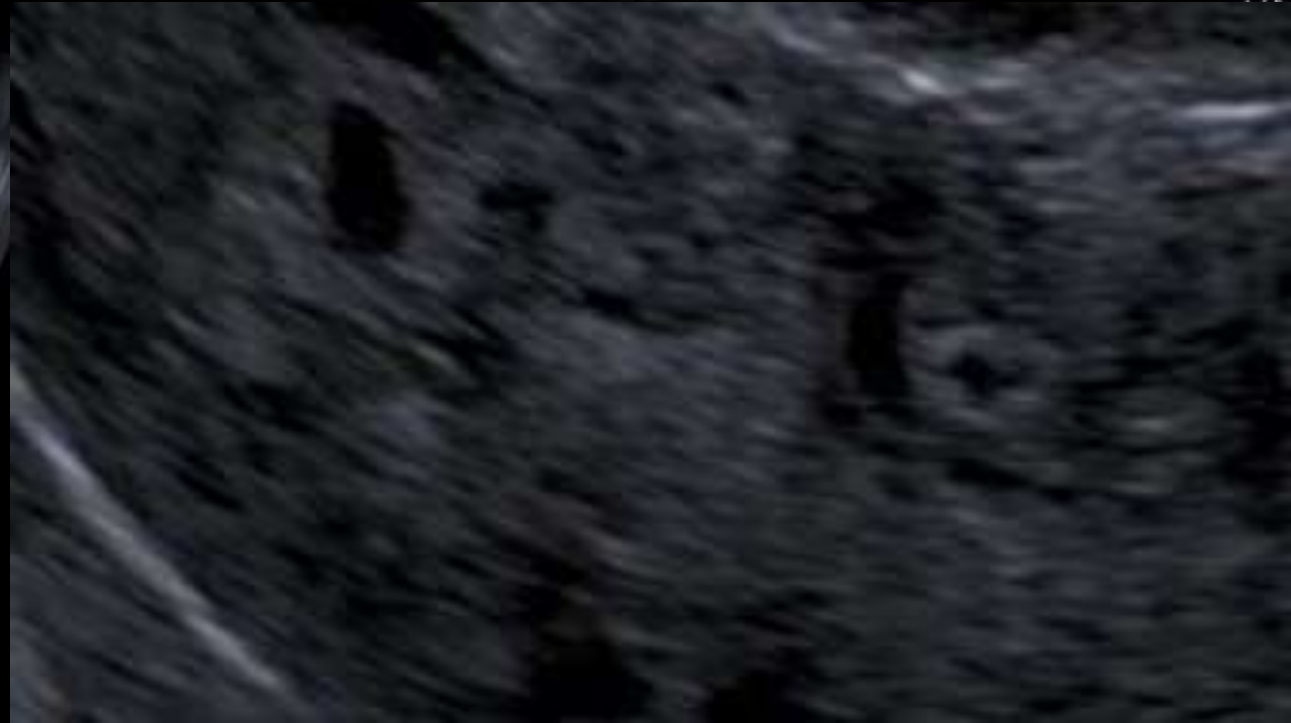
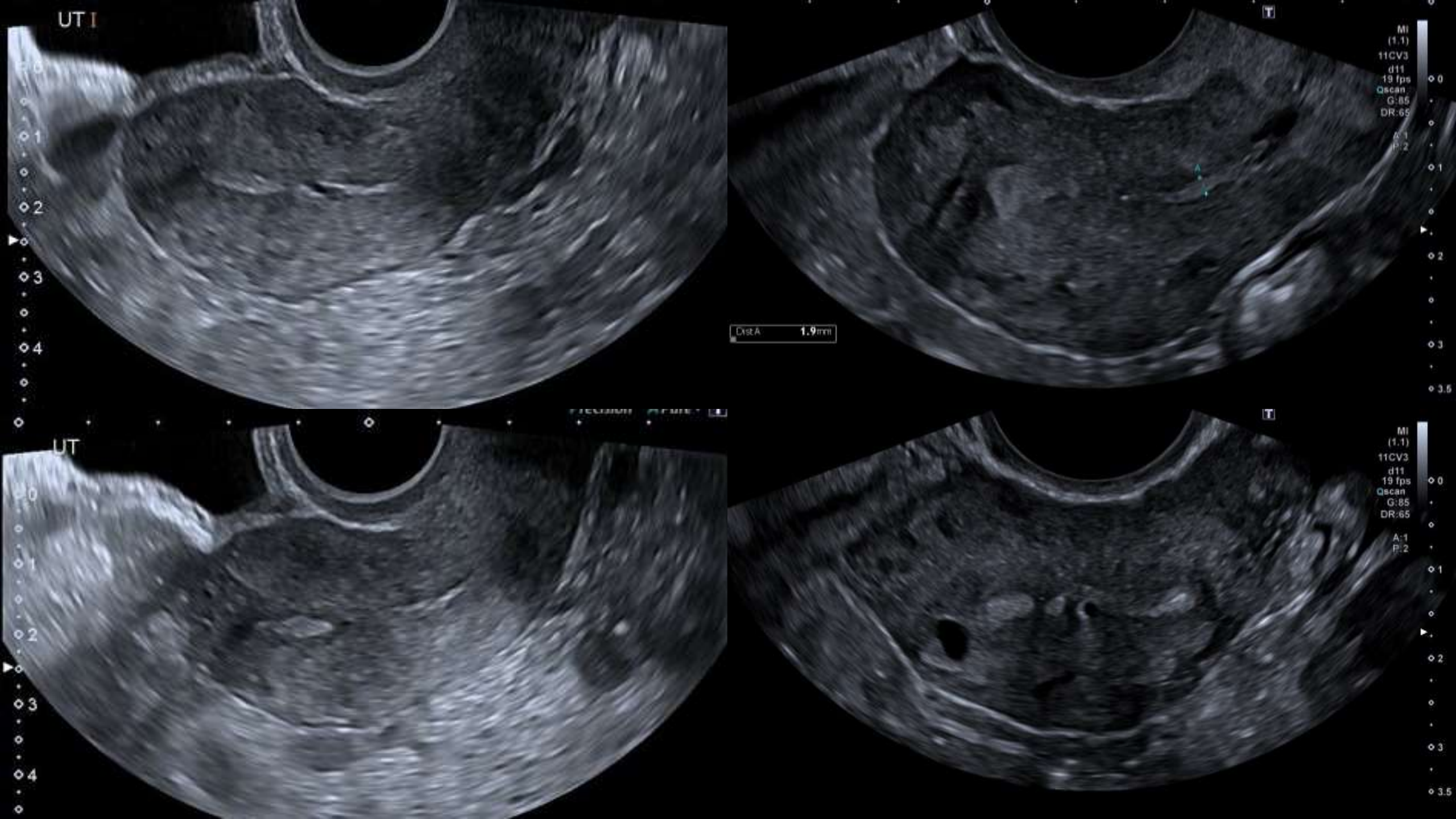
19 fps
Qscan
G:97
DR:65
P:2




UT
Dist A 1.9mm
MI
(1.1)
11CV3
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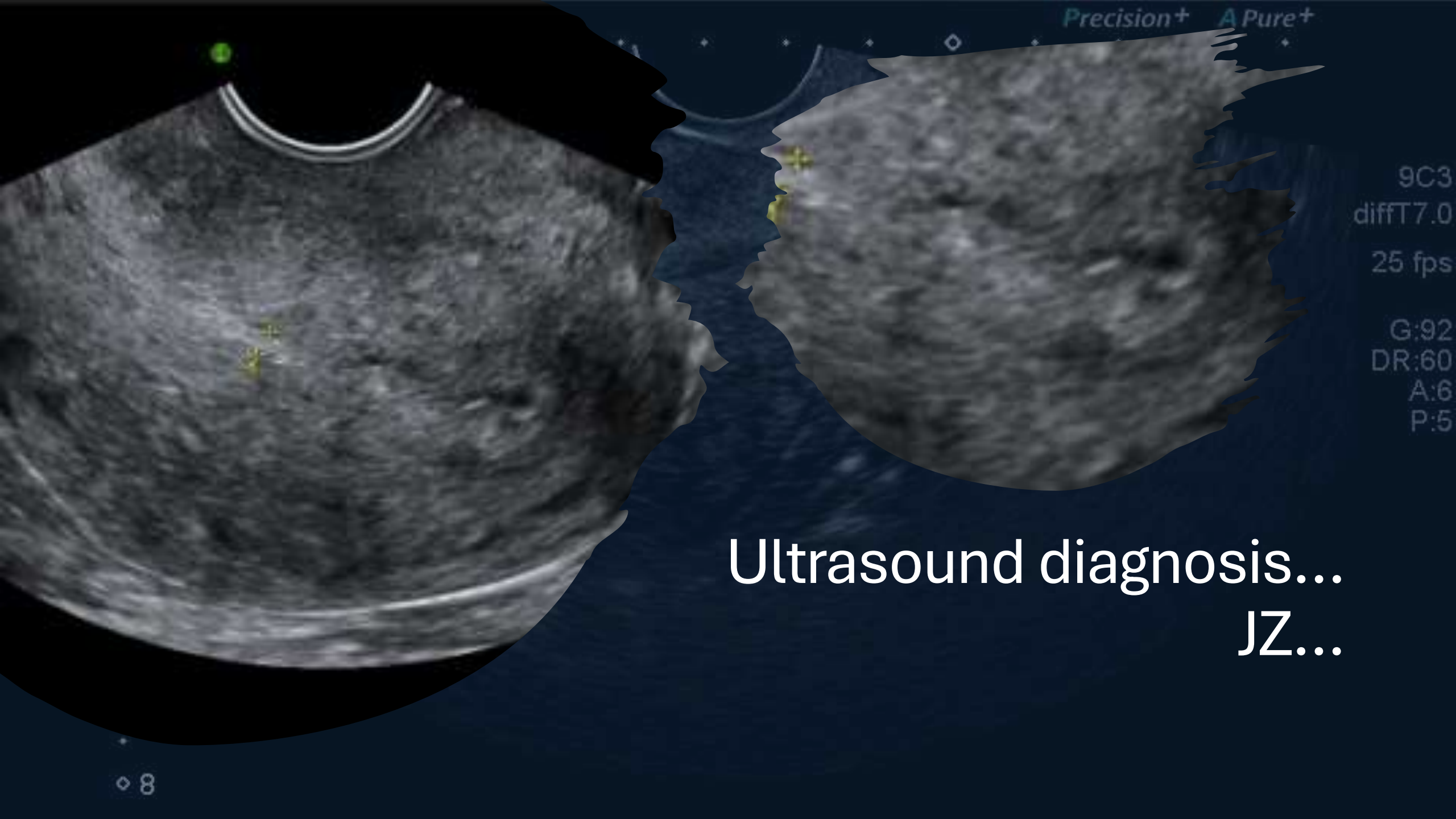
19 fps
Qscan
G:85
DR:65
A:1
P:2
UT

Differential



Ultrasound diagnosis...
JZ...

Normal JZ excludes..

"adeno": ectopic endometrial glands

cystic striations


Precision+
MI
(1.2)
11C3
d8.5
19 fps
Qscan
G:82
DR:65
P:2
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5


Uterus Endometrium Uterus
MI
(0.7)
11C3
d7.0
14 fps
Qscan
G:87
DR:60
P:2
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5
7.5


Precision+
MI
(0.7)
11C3
d8.5
18 fps
Qscan
G:80
DR:65
P:2
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A
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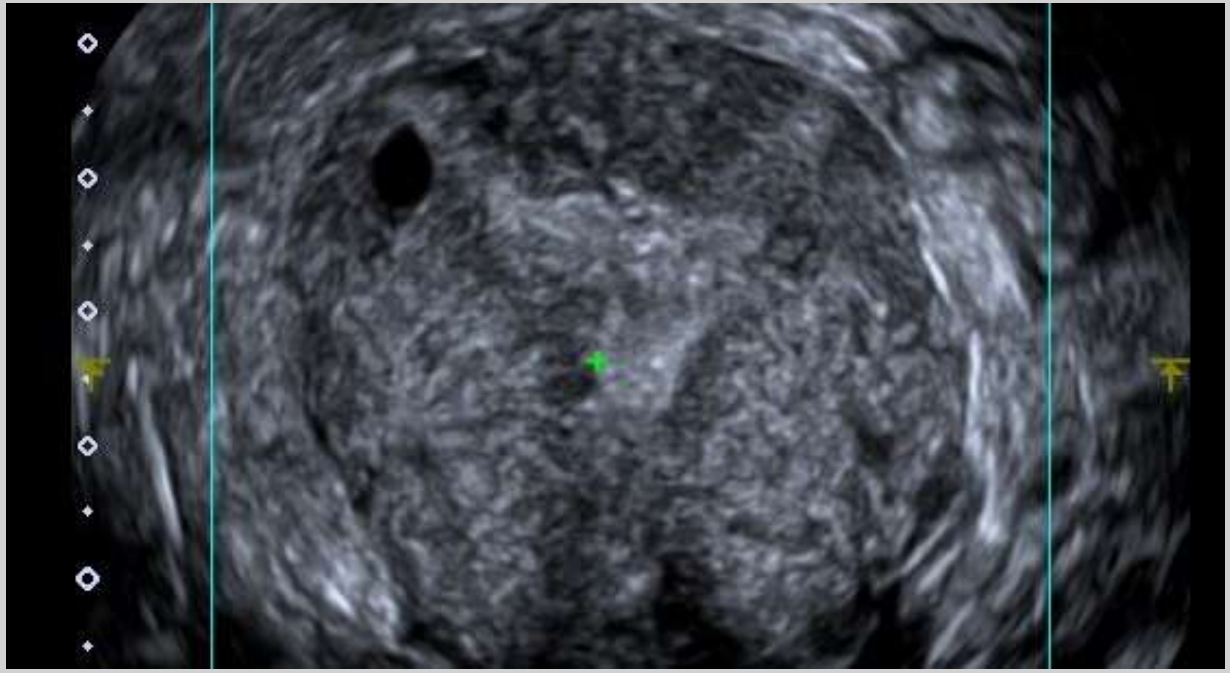
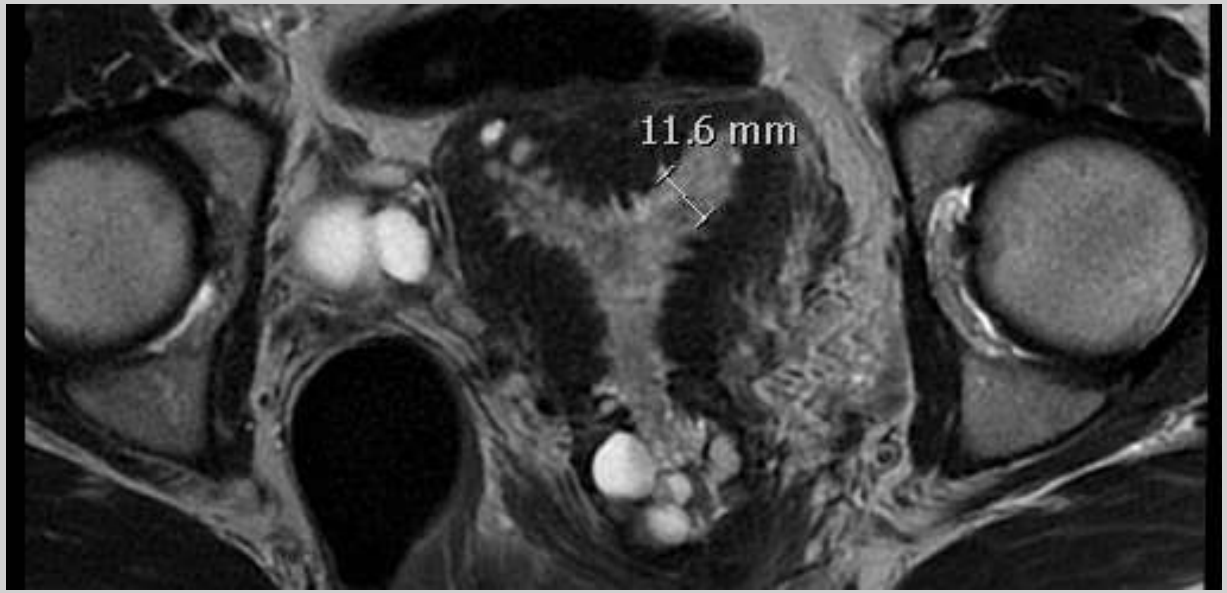



11.6 mm

Adenomyosis

Adenomyosis is a benign uterine pathology

In women attending a gynaecologic clinic for contraception counselling or for other reasons, an ultrasound diagnosis of adenomyosis was made in 34.5% and 20.9%, respectively

Transvaginal ultrasonography (TVS) is the first-line imaging method to diagnose adenomyosis.

MUSA

Fibroids

Fibroids

50% of all women older than age 35 years and in up to 80 percent of women by age 50.

Most common gynaecological and pelvic neoplasm

- commoner in black than white women,
- associated with obesity
- an apparent increased familial incidence.

The cause is unknown, they respond to hormones with the potential to grow during pregnancy, as well as to decrease in size and degenerate after menopause.

However, most leiomyomas are asymptomatic, likely noted on ultrasonography as an incidental finding.

Pseudocapsule....

Leiomyoma

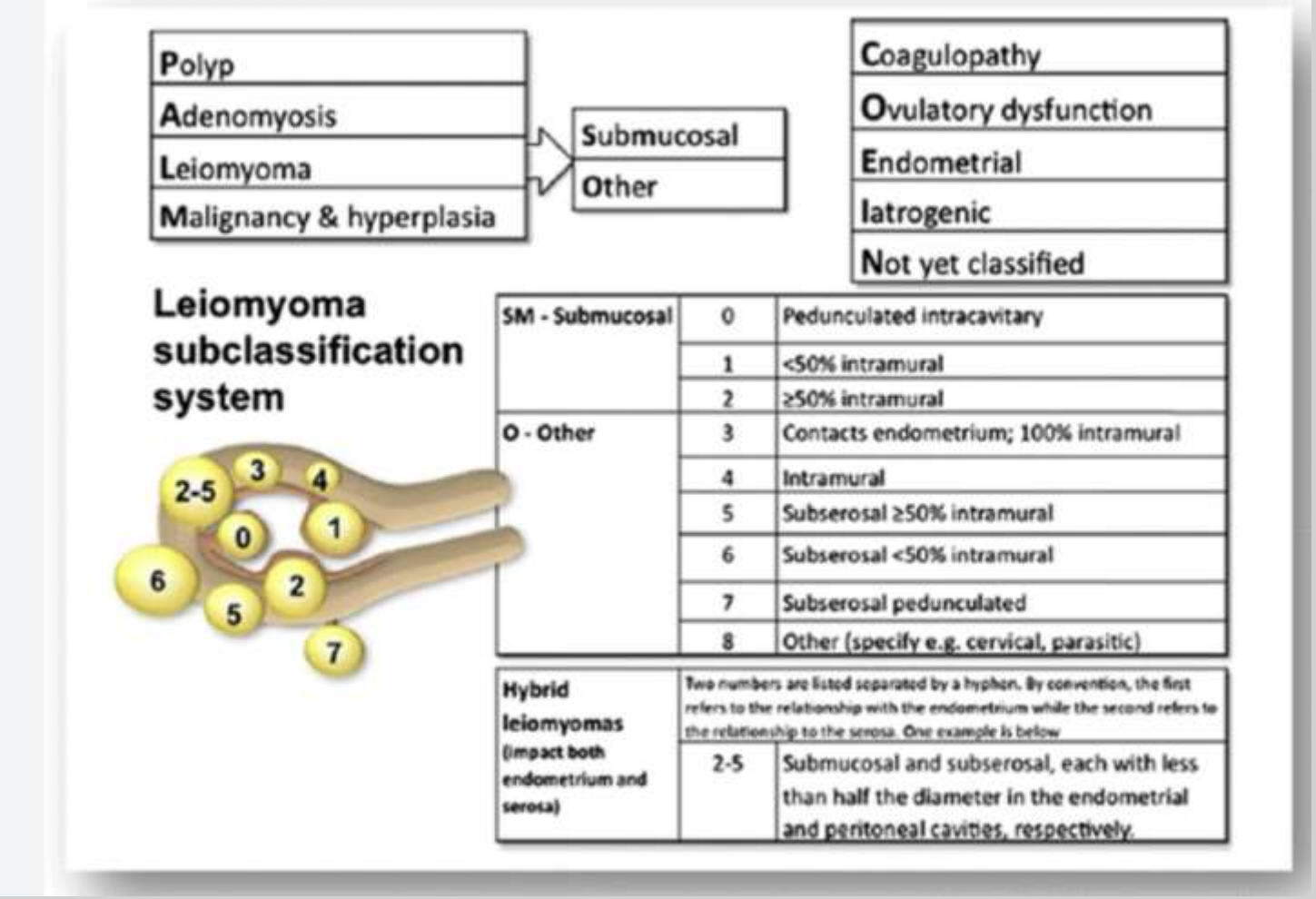
8 types based on their location within the uterine wall.

Type 0-2 fibroids are so-called “submucosal’’ fibroids because they bulge into and distort the uterine cavity.

Type 0 fibroids are contained within the uterine cavity attached by a stalk

Type 1 are <50% within the uterine wall

Type 2 protrude into the uterine cavity but are 50% within the uterine wall.



Fibroids: the fibroid map

Location is key to symptoms and management

- Intra mural
- Sub serosal
- Pedunculated
- Sub mucosal
- Intracavitary

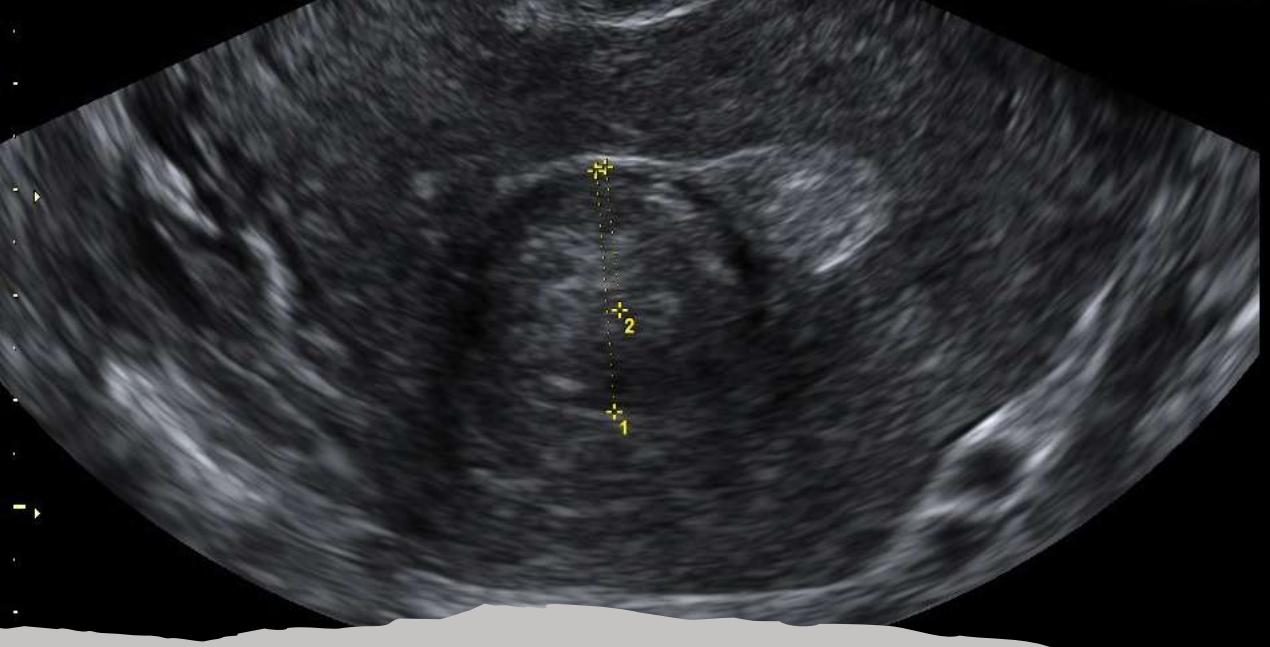
Intra mural: no bulging into the endometrium or the serosa

Sub serosal: a significant portion of the leiomyoma is bulging into the serosal surface

Pedunculated: the leiomyoma is exophytic and attached to the uterus by a pedicle

Sub mucosal: a significant portion is bulging into the endometrial cavity > < 50 % is important

Intracavitary: the leiomyoma is within the endometrial cavity and it is attached to the myometrium by a pedicle



Fibroids

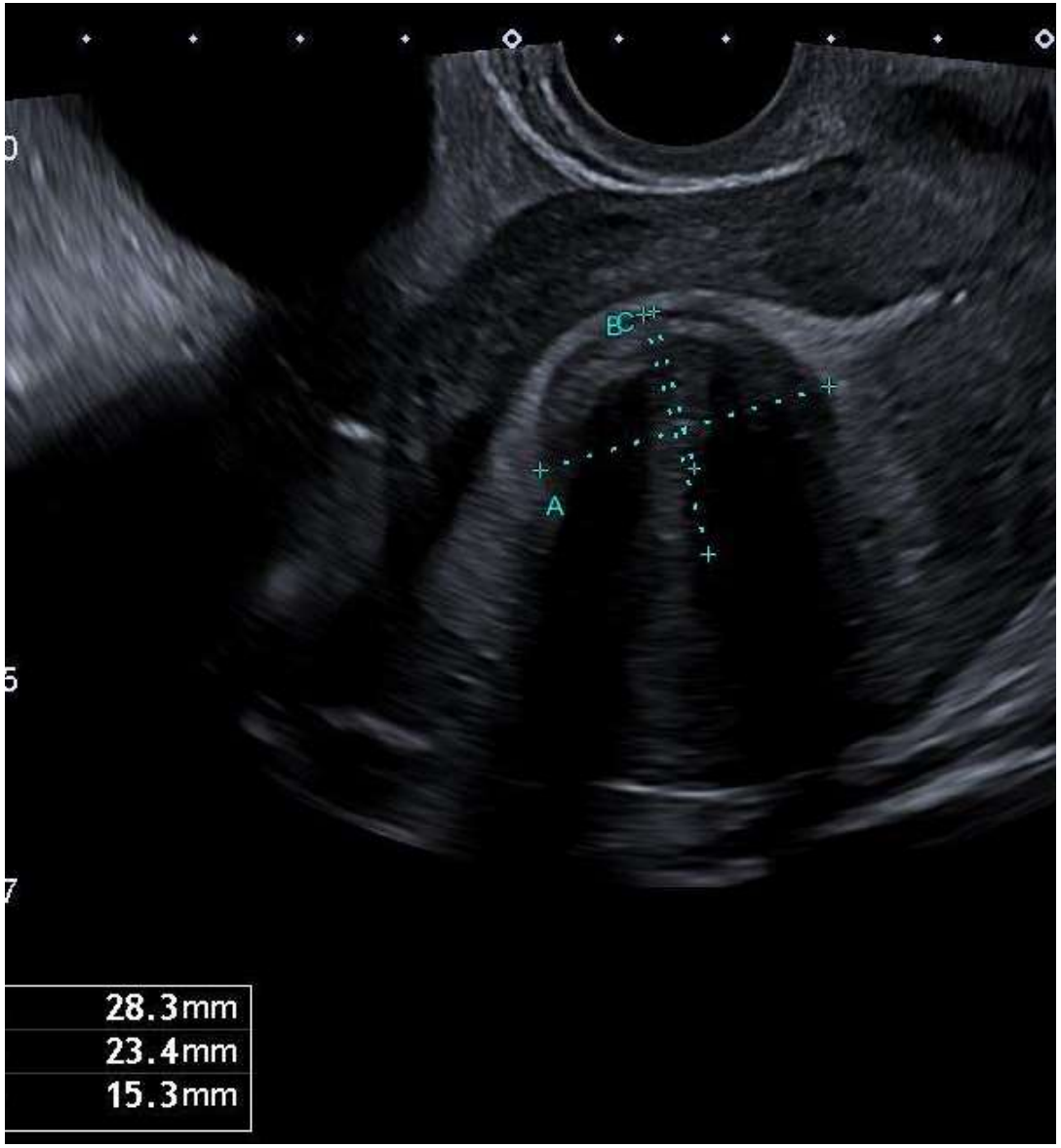
Submucosal leiomyomas are the most common type of leiomyoma to be associated with AUB.

The mechanism is thought to be due to increased vascularity and compression of uterine vein network as well as altered regulation of vascular growth factors.

Submucosal leiomyomas are most clearly visualized on SIS late proliferative phase of the cycle

Submucosal: a significant portion is bulging into the endometrial cavity > < 50 % is important

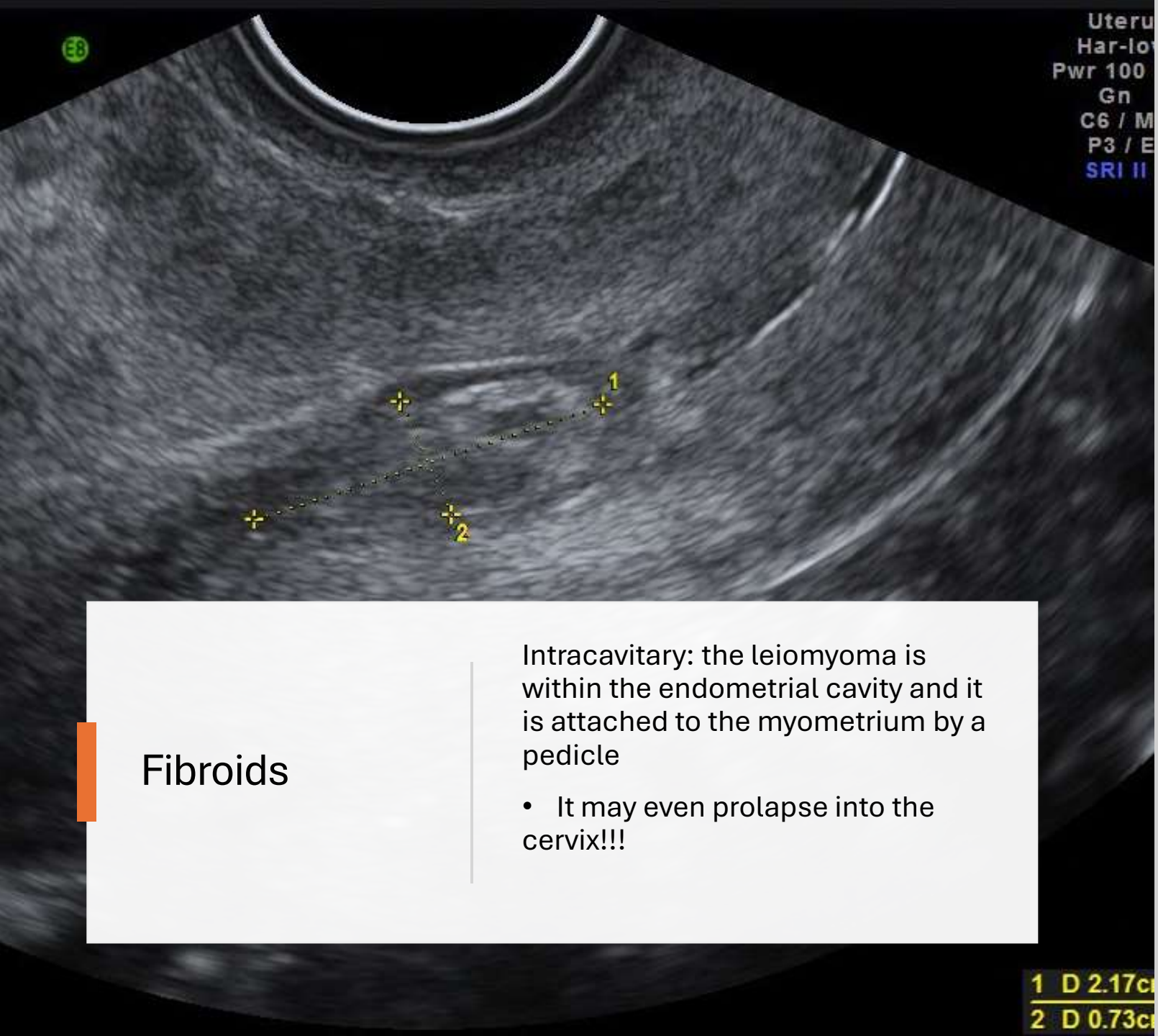

0
5
7
A
A 31.6mm

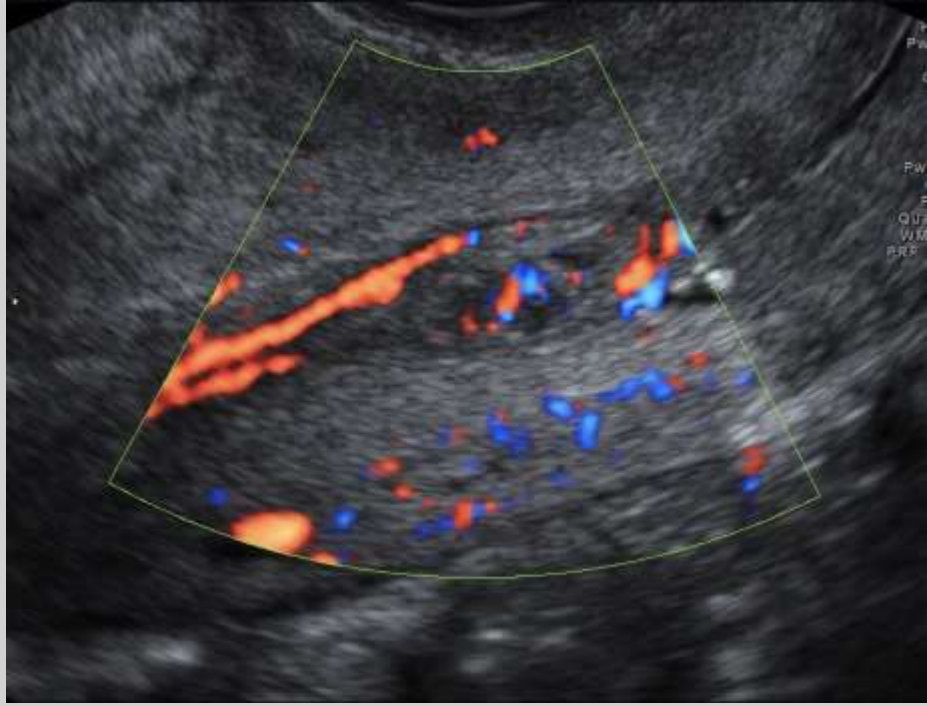

BC
A
28.3mm
23.4mm
15.3mm

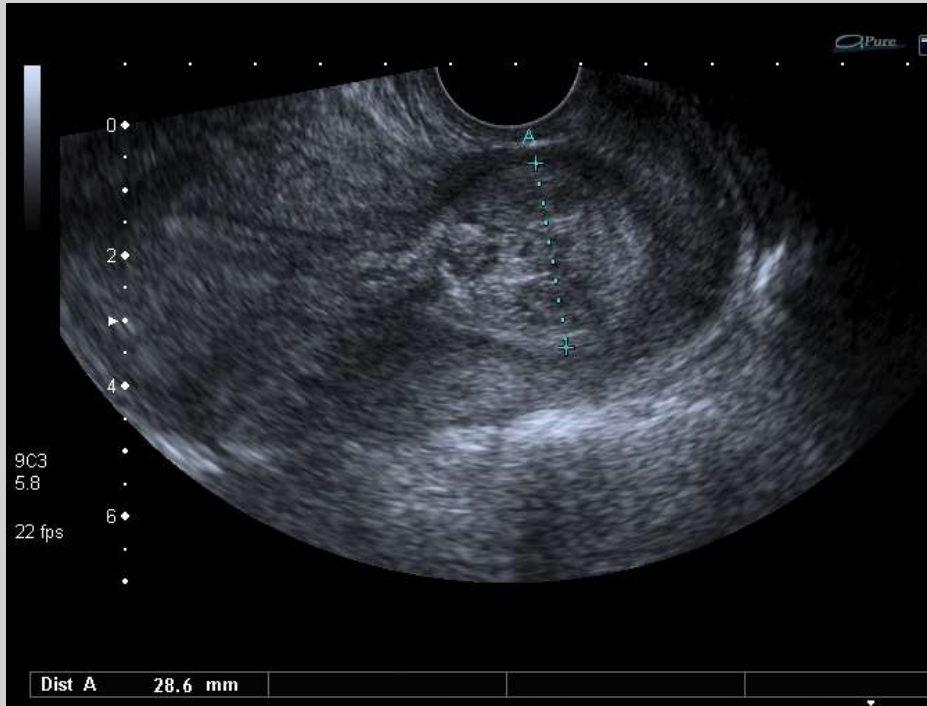
Fibroids

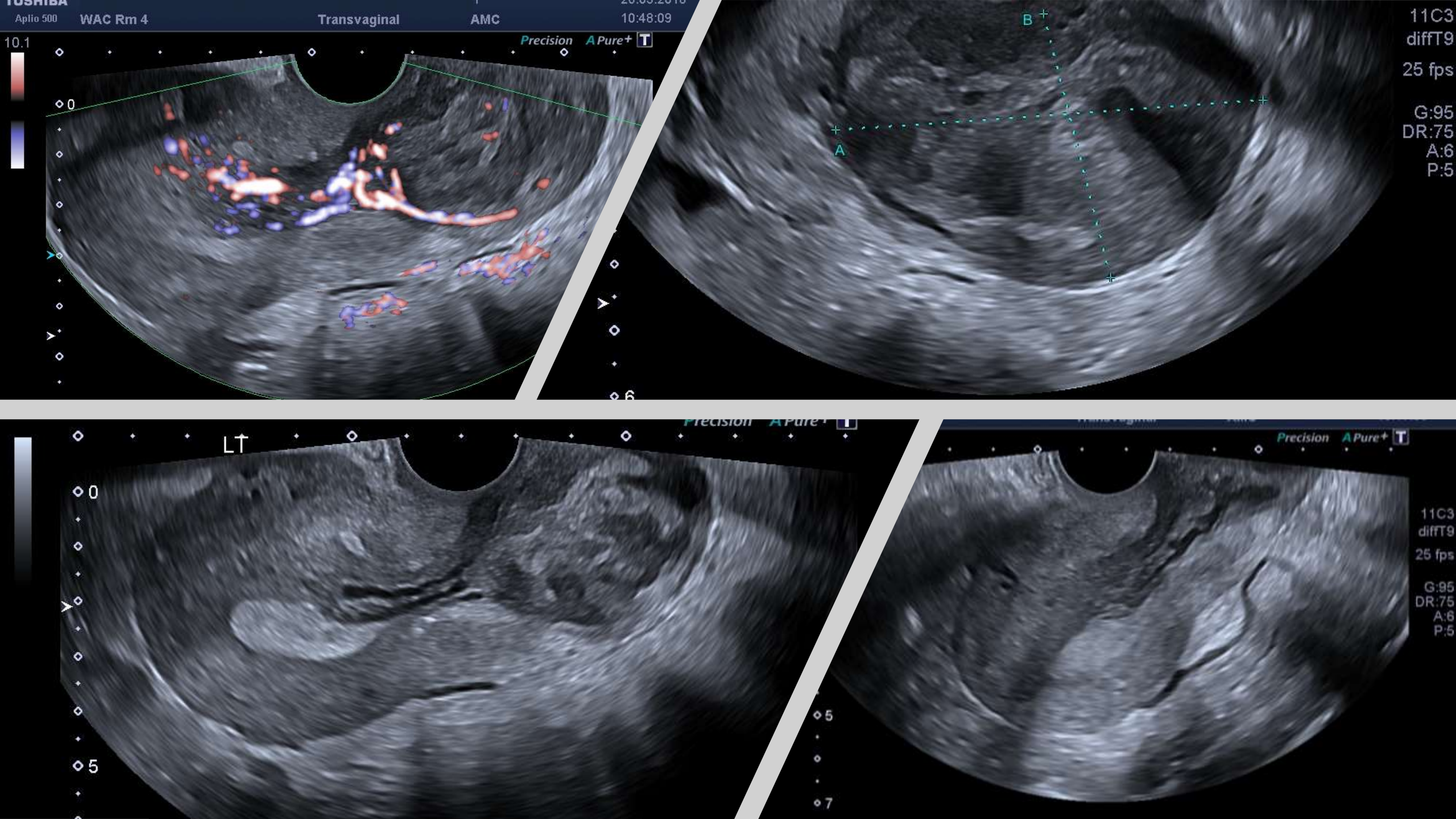
Intracavitary: the leiomyoma is within the endometrial cavity and it is attached to the myometrium by a pedicle

- It may even prolapse into the cervix!!!








TOSHIBA
Aplio 500
WAC Rm 4
Transvaginal
AMC
10:48:09
10.1
Precision
A Pure+
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B
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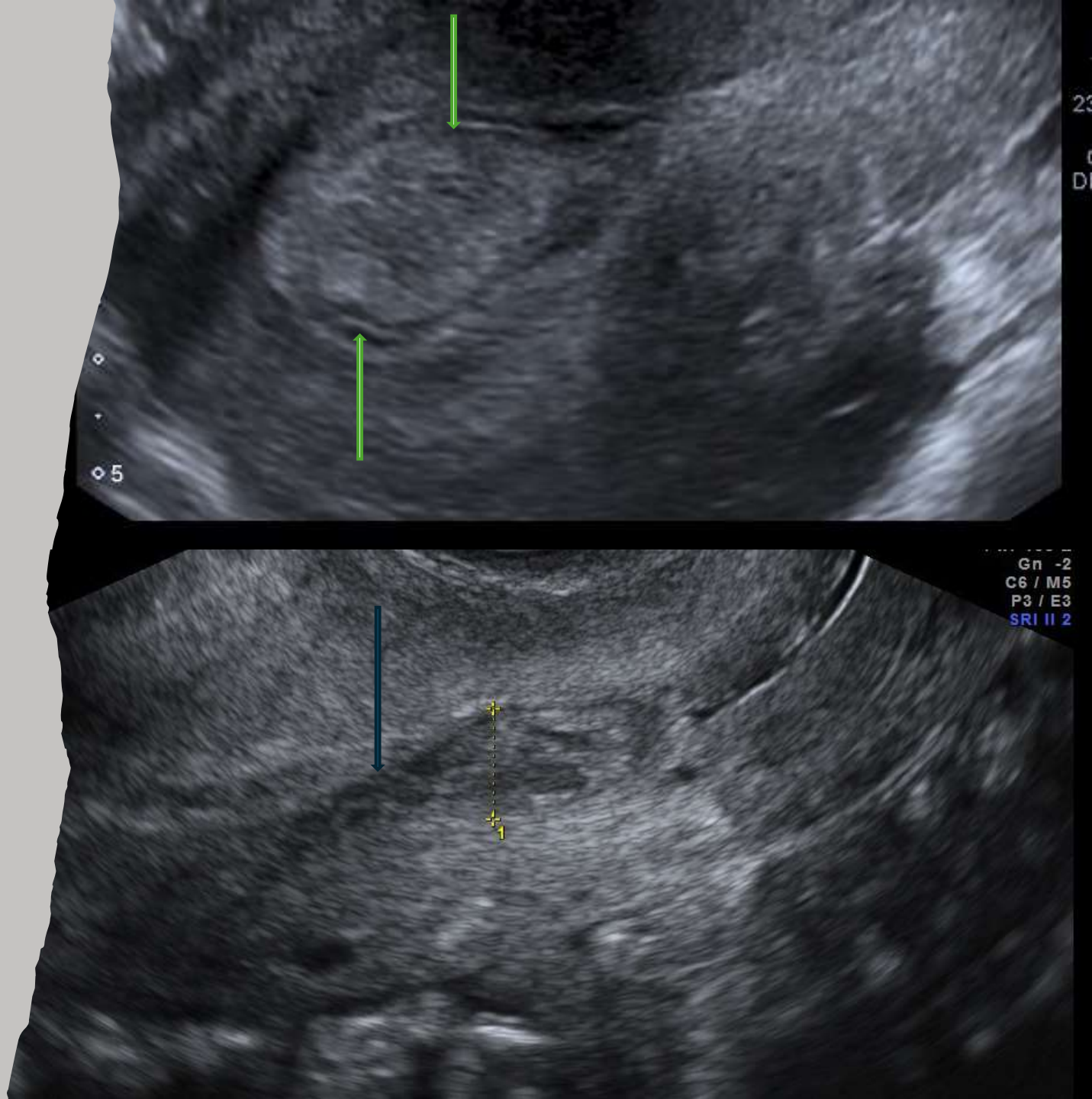
11C3
diffT9
25 fps
G:95
DR:75
A:6
P:5
6
LT
0
5
Precision
A Pure+
T
11C3
diffT9
25 fps
G:95
DR:75
A:6
P:5
5
7

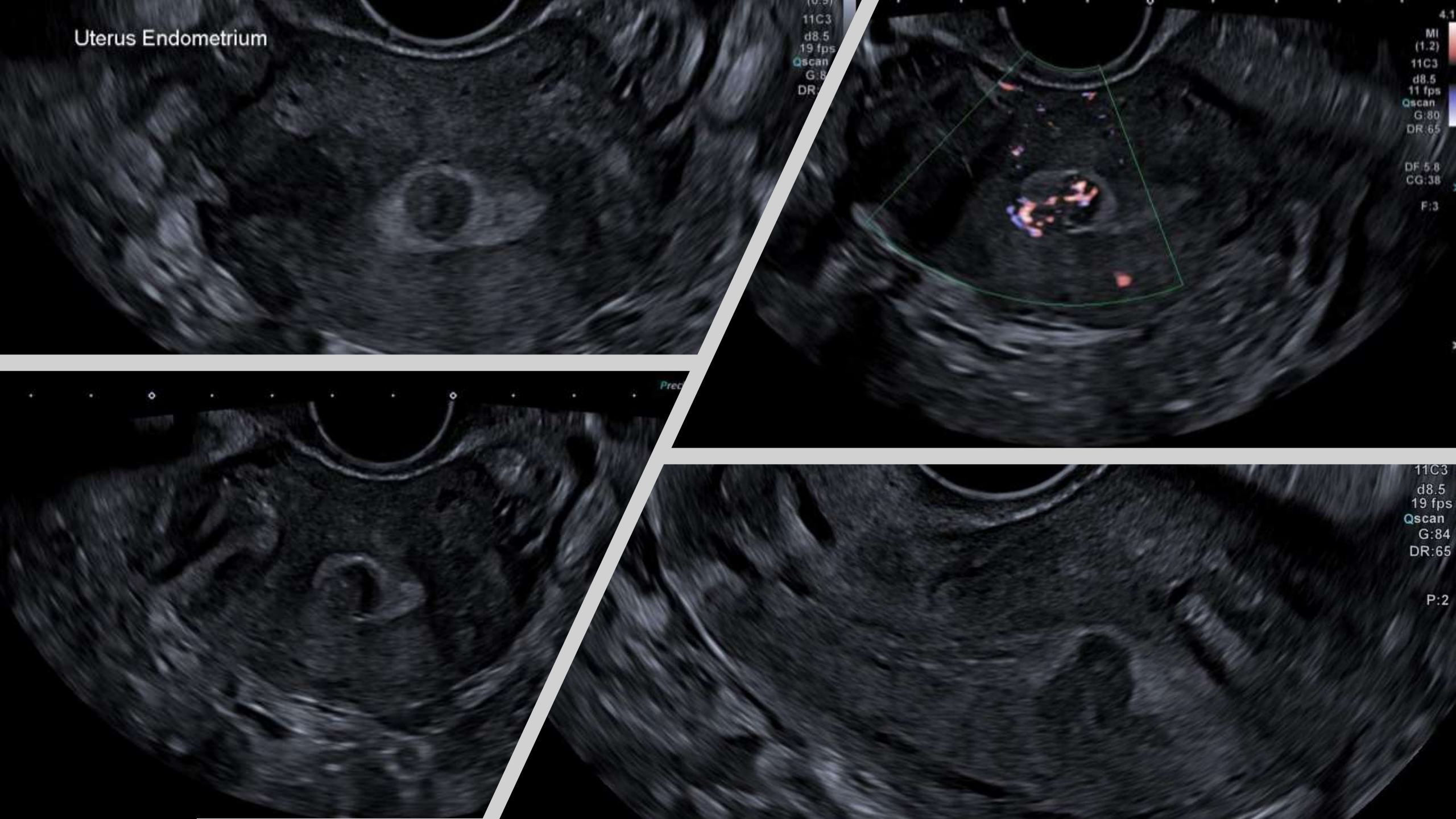
Polyps versus intra cavitary fibroid

Fibroids

Less echogenic than the endometrium with attenuation of the US beam

- Broad based
- Lift the surrounding endometrium
- Portion extends into the myometrium
- Vascularity
  - circular flow of vascularity
  - single vessel pattern found in endometrial polyps.




Uterus Endometrium
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d8.5
19 fps
Qscan
11C3
d8.5
11 fps
Qscan
G:80
DR:65
DF:5.8
CG:38
F:3
11C3
d8.5
19 fps
Qscan
G:84
DR:65
P:2

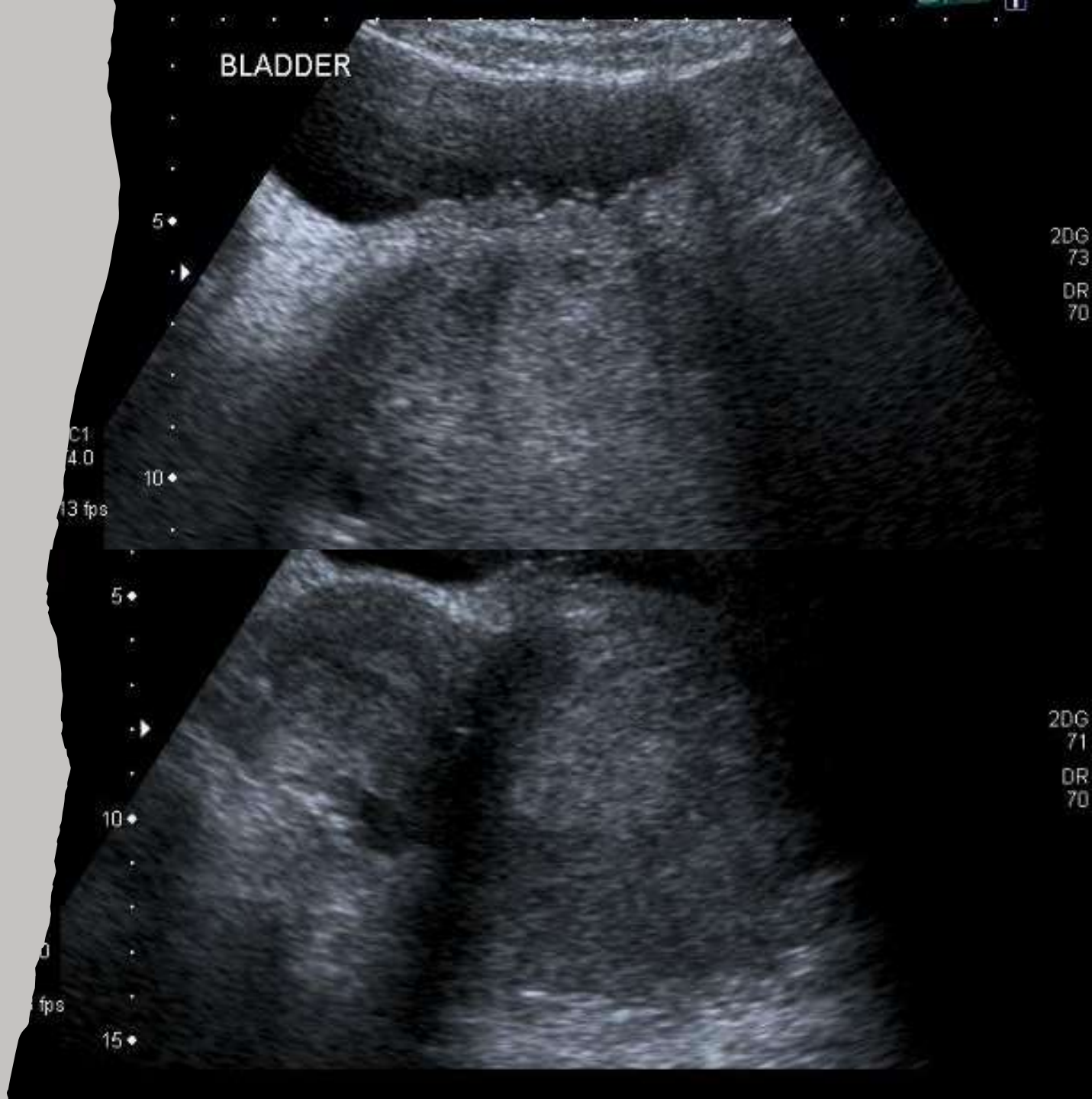
Cervical lesions

Cervical cancer

Dedication not inconsiderable

- Serendipitous
- Lazy ?????

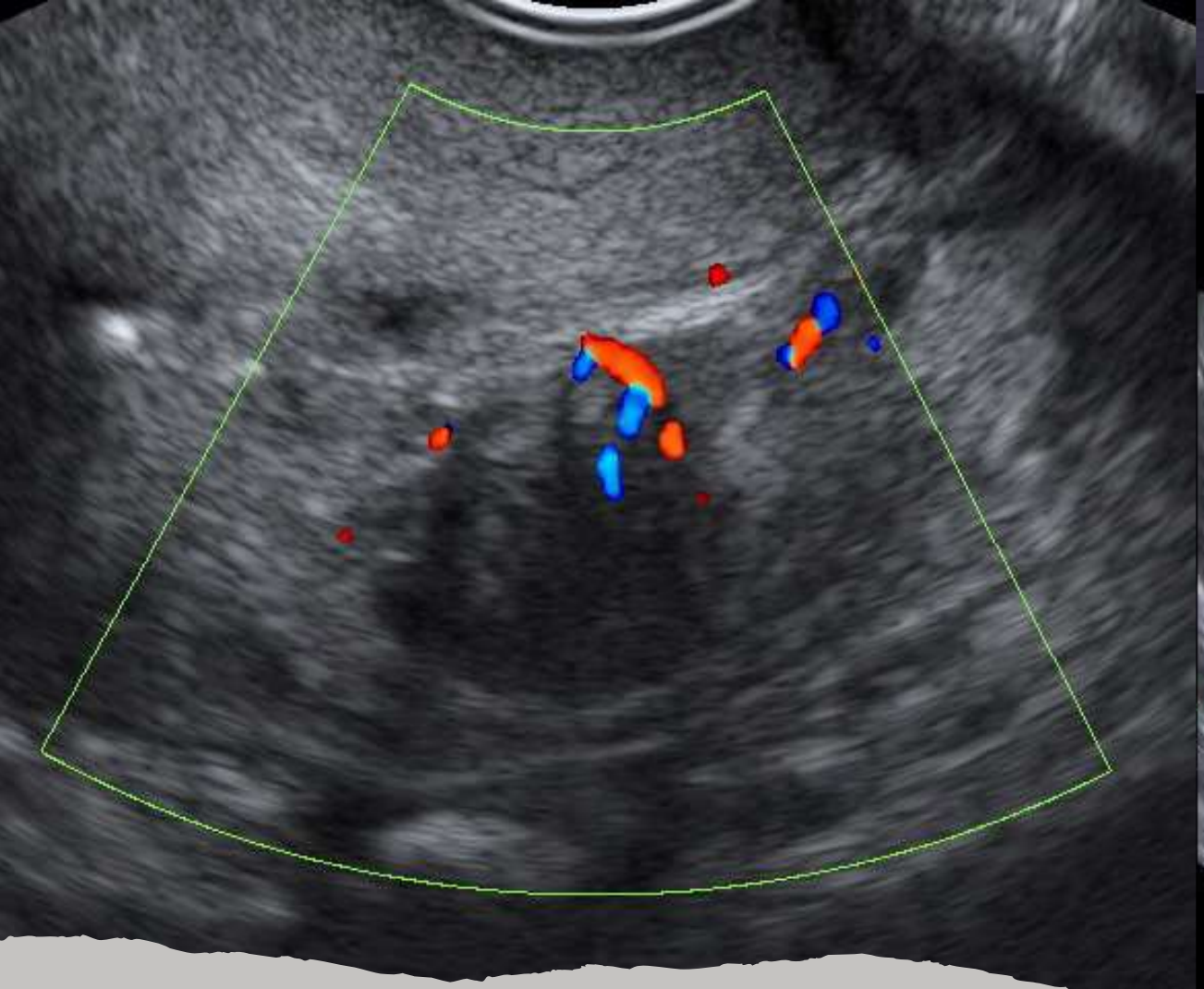
Normal cervix reported every time



Cervical cancer

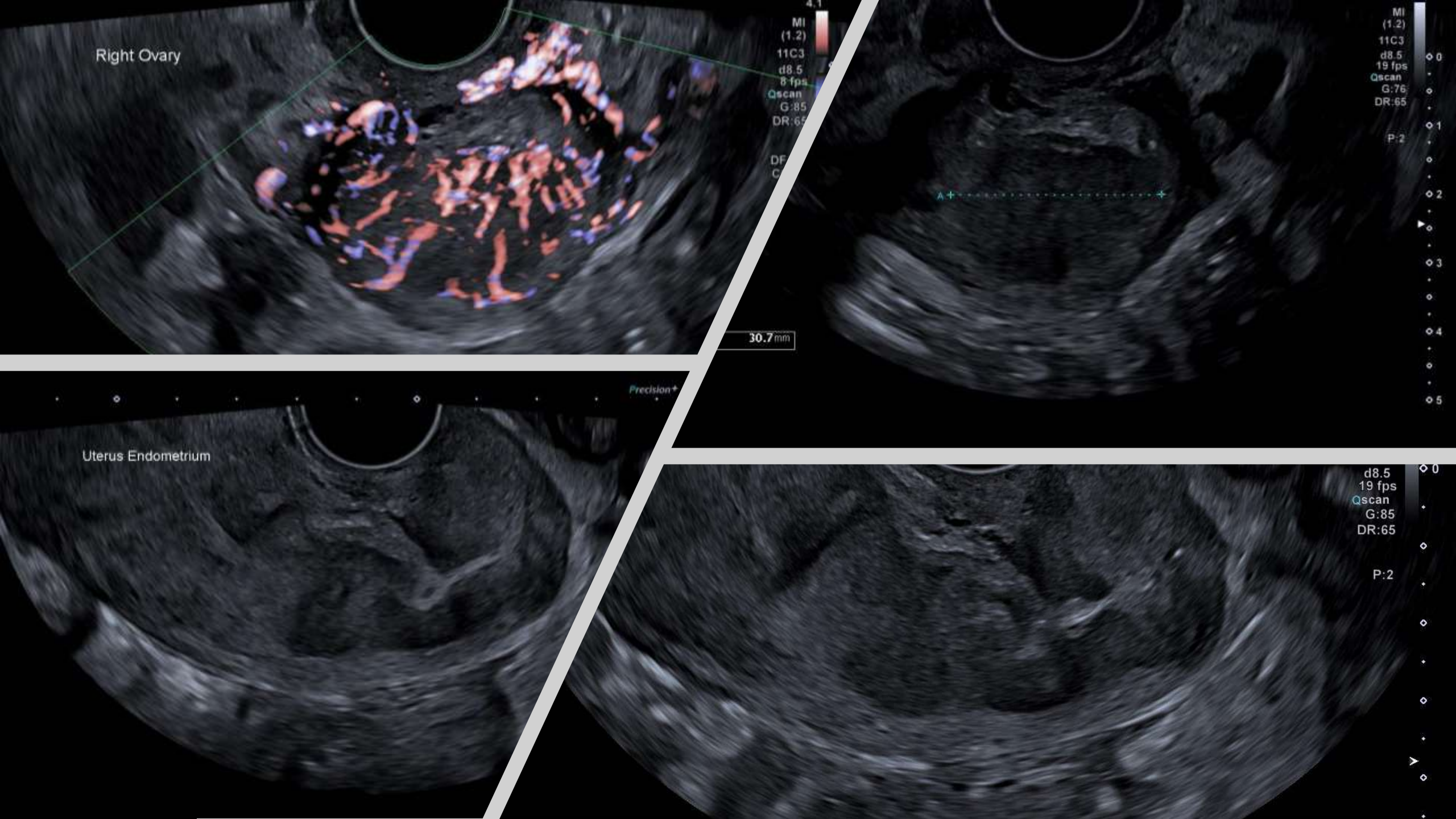
Hypo echoic SCC

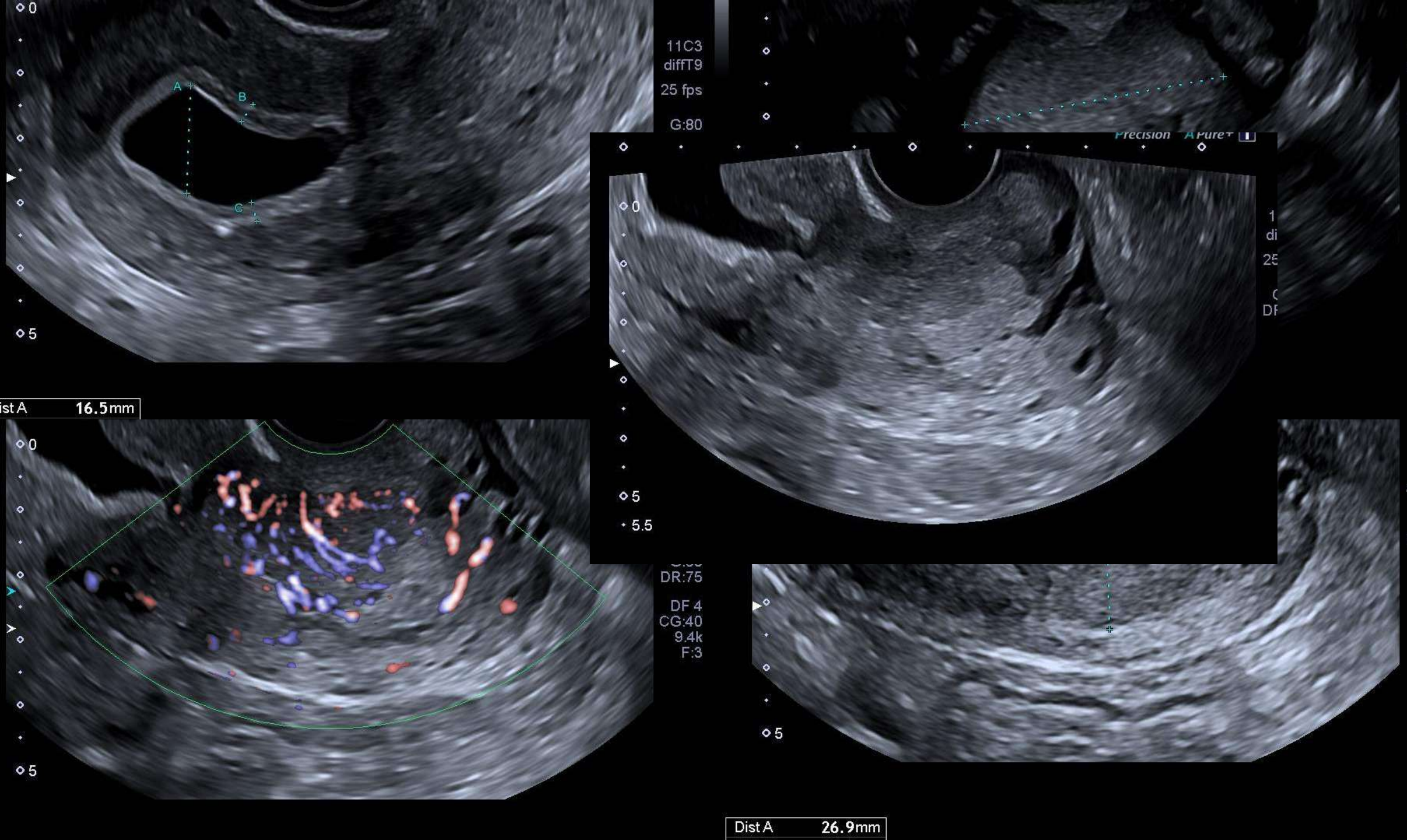
Echogenic Adenocarcinoma



Cervical cancer

Alteration in echogenicity
Alteration in size and symmetry
Failure to visualize MY favourite piece of anatomy…endocervical canal


Right Ovary
MI
(1.2)
11C3
d8.5
8 fps
Qscan
G:85
DR:65
30.7mm
MI
(1.2)
11C3
d8.5
19 fps
Qscan
G:76
DR:65
P:2
Uterus Endometrium
Precision+
d8.5
19 fps
Qscan
G:85
DR:65
P:2


A
B
C
11C3
diffT9
25 fps
G:80
DR:75
A:6
P:5
Precision
A Pure+
11C3
4
40 fps
G:80
DR:60
A:4
P:5
Dist A 16.5mm
DF 4
CG:40
9.4k
F:3
Dist A 26.9mm

Cervical cancer


F 42
TOSHIBA
Precision
F 42
TOSHIBA
Precis
A
F 42
TOSHIBA
Precision


Precision+
Cervix
MI
(1.2)
11C3
d8.5
20 fps
Qscan
G:82
DR:65
P:2


Precision+
Cervix
MI
(1.2)
11C3
d8.5
19 fps
Qscan
G:85
DR:65
P:2


Precision+
Uterus Endometrium
MI
(0.7)
11C3
d8.5
19 fps
Qscan
G:85
DR:65
P:2


Precision+
Cervix
MI
(1.2)
11C3
d8.5
19 fps
Qscan
G:85
DR:65
P:2

Niche

A ‘niche’ is defined by the European Niche Taskforce as an indentation of the uterine myometrium at the site of the Caesarean section (CS) scar with a depth of at least 2mm and is preferably assessed by transvaginal ultrasonography (TVS) using gel or saline.

The prevalence of a uterine niche after CS as assessed by sonohysterography ranges from 56% to 84%.

A niche is associated with gynaecological complaints, such as spotting and dysmenorrhea.

Recently, it has also been identified as a possible risk factor for secondary infertility and complications in subsequent pregnancies.

It has been acknowledged that niche characteristics, such as size and thickness of the residual myometrium, are associated with the severity of postmenstrual spotting and the risk of uterine rupture in a subsequent pregnancy.


MI
(1.2)
11C3
d8.5
19 fps
Qscan
G:82
DR:65
P:2


MI
(1.2)
11C3
d8.5
19 fps
Qscan
G:82
DR:65
P:2
Dist A 14.1mm


MI
11C3
d8.5
19 fps
Qscan
G:82
DR:65
P:2
Dist A 20.0mm


MI
(1.2)
11C3
d8.5
19 fps
Qscan
G:82
DR:65
P:2


Precision


A

Additional endometrial anomalies

Endometritis Myometritis

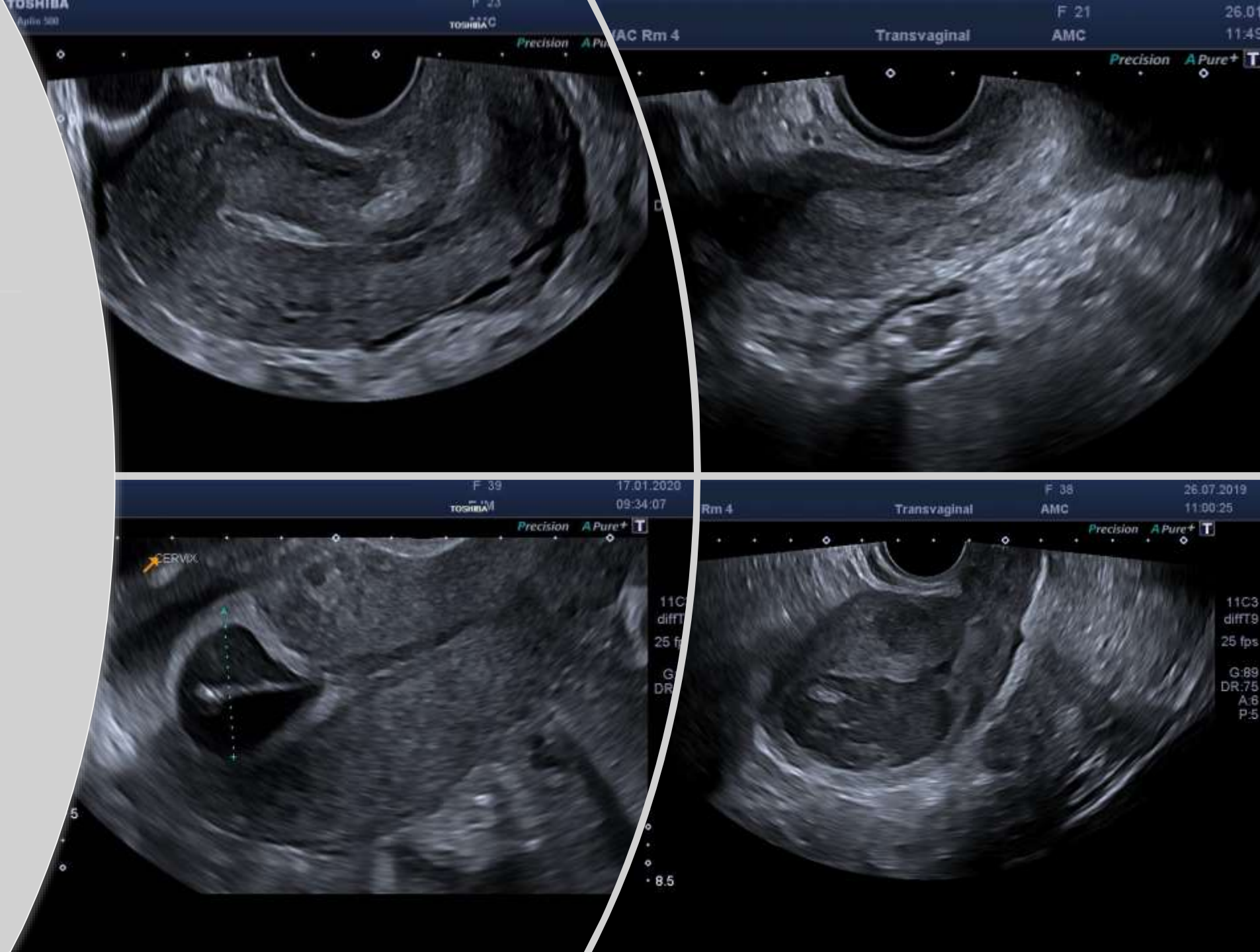
Normal

Out of phase endometrium: thickened and heterogenous

Increased myometrial vascularity

Intracavitary fluid with echoes

Gas



Post menopausal PV loss

Hyperplasia and malignancy are more common in perimenopausal and postmenopausal women but can also occur in young women, especially in those with comorbidities such as obesity and chronic anovulation.

Postmenopausal bleeding should be considered malignancy until proven otherwise.

90% of women with EC will present with PMB BUT > 90% of women with PMB will have a benign cause for their PV loss

Age and obesity:” oestrogen triggered endometrial proliferation

50% increase in risk with an increase of 5kg/m2 in BMI with a 5% increase in risk with BMI > 30kg/m2

Anovulatory cycles PCOS

LYNCH AD 25_60% increased lifetime risk

Post menopausal PV loss

Although the most common cause of postmenopausal bleeding is atrophy, endometrial cancer must be ruled out before proceeding with treatment of vaginal atrophy or watchful waiting.

TVUS evaluation of endometrial thickness has a high negative predictive value, even better than that of blind endometrial biopsy, and is an evidence-based method of excluding endometrial cancer in the post-menopausal woman.

An endometrial lining of < 4 mm can be used to rule out endometrial cancer and avoid tissue sampling.

The issue arises, however, when the endometrial lining cannot be adequately visualized by TVU or if it is > 4mm.

In these situations, SIS can be used to determine if the thickening is due to a global process or a focal lesion.

A global process can be evaluated by endometrial biopsy but blind biopsy can miss a focal lesion. Focal lesions are best evaluated either by hysteroscopy or ultrasound-guided biopsy.

Endometrial hyperplasia

Endometrial hyperplasia is an abnormal proliferation of endometrial stroma and glands

A definitive diagnosis can be made only with biopsy

Up to one-third of endometrial carcinoma is believed to be preceded by hyperplasia. AH

- 1. diffusely smooth endometrial thickening

- 2. focal hypo echoic endometrial thickening

Non Atypical Hyperplasia NAT

Atypical Hyperplasia AT

Hyperplasia

Non atypical
Atypical

Thickening of the endometrium

NO bright edge

No midline echo

Heterogenous …more likely in pre menopausal patients NAT

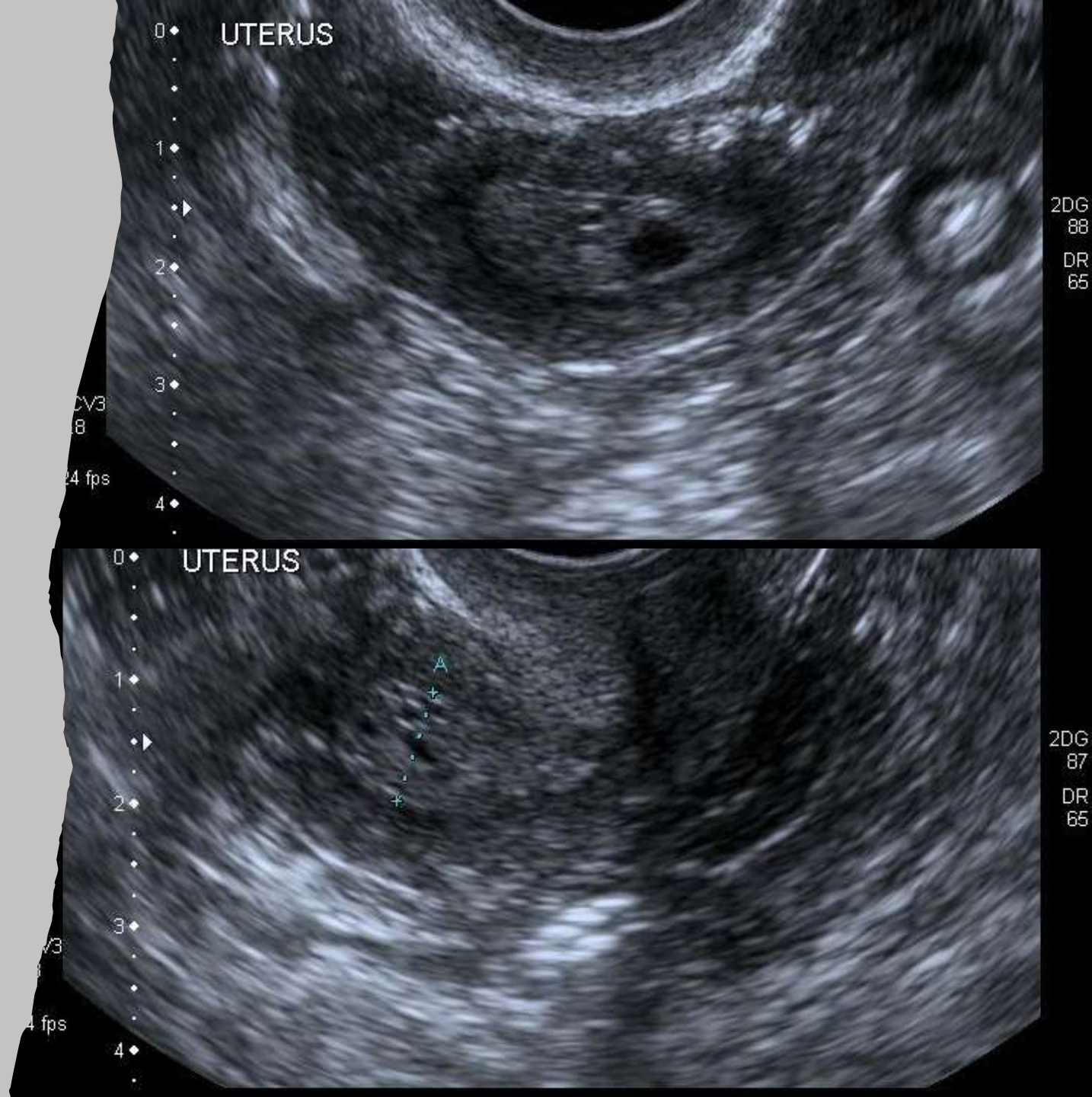
No pedicle vessel NAT

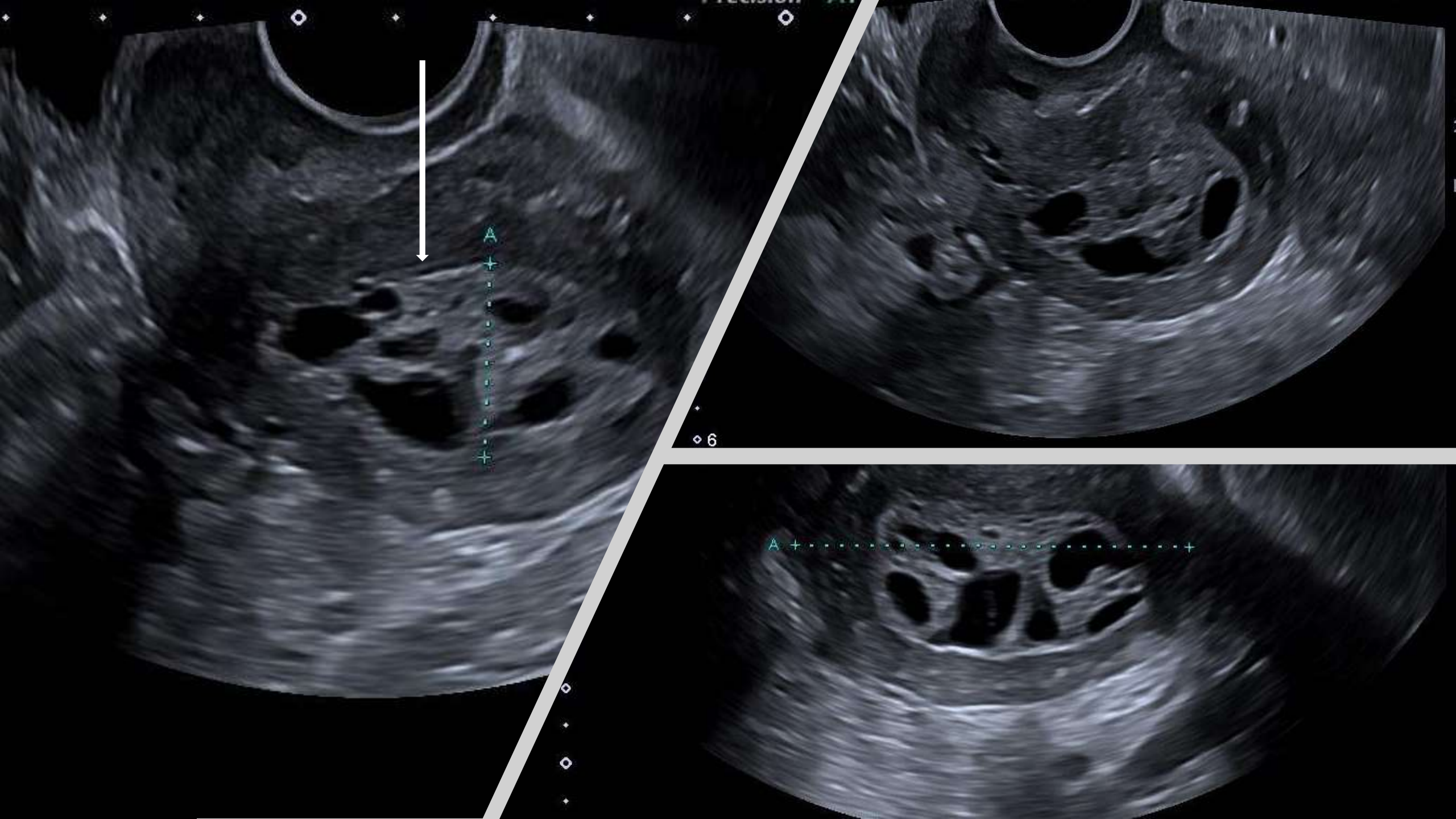
Richly vascularized AH

Endometrial cancer

Endometrial cancer has similar sonographic characteristics to hyperplasia or an enlarged polyp with of course the exception of myometrial invasion

- 5mm endometrial pathology
- 25% PMB have EC
- No focal lesion risk of
  - Any pathology reduced by a factor of 5
  - Endometrial cancer reduced by a factor of 20
- Focal abnormality 98% pathology
- Irregular surface in a focal lesion




A
6
A

Heterogeneity

NO endometrial lesion…look at the CERVIX

Endometrial carcinoma

US signs of endometrial carcinoma include heterogeneity and irregular endometrial thickening.

Polypoid tumours tend to cause more diffuse and irregular thickening than a polyp and more heterogeneity than endometrial hyperplasia.

Irregularity of the surface of a focal lesion 89% risk of cancer

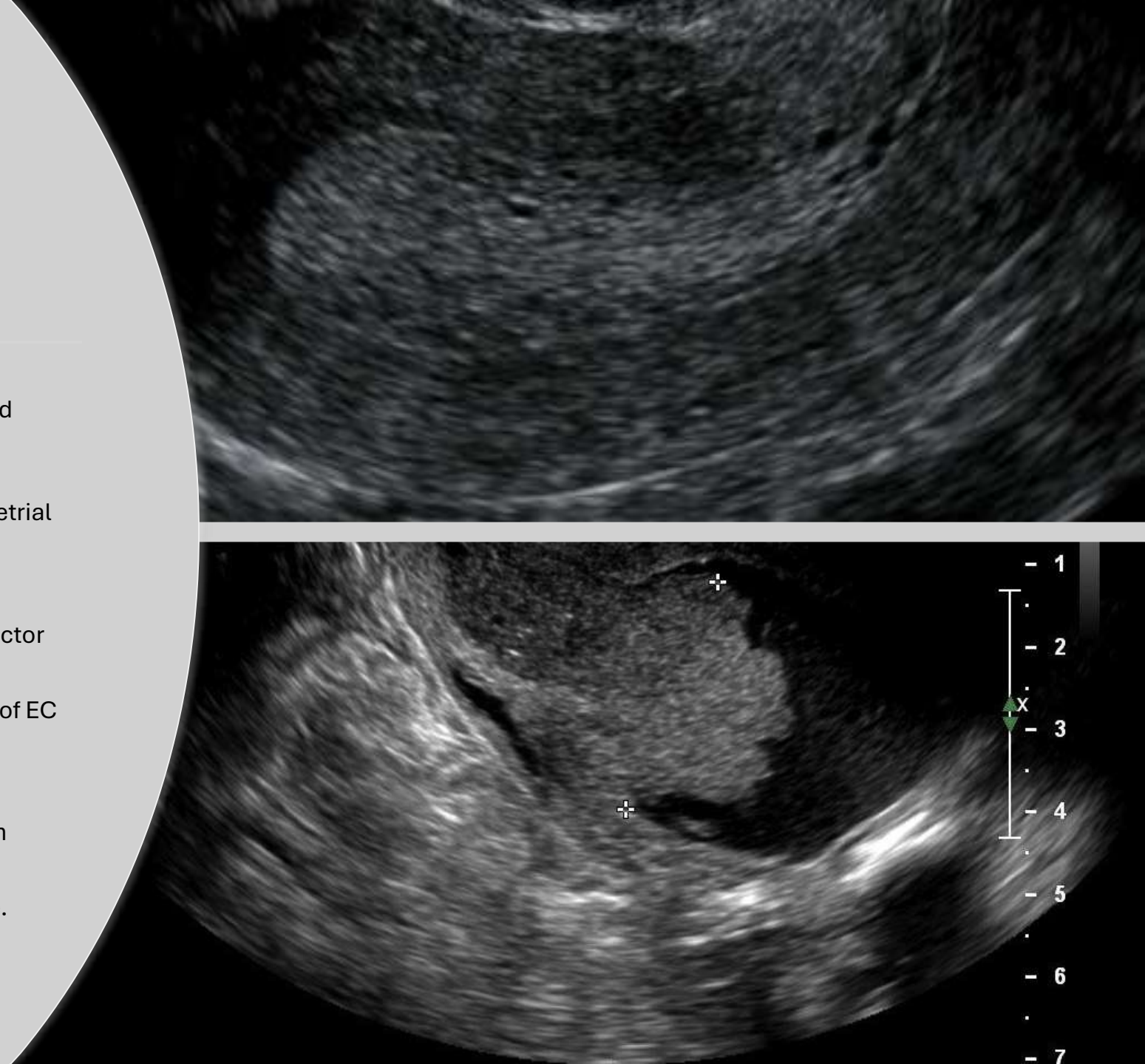
A. Heterogeneity in a focal lesion increased risk of EC by a factor of 10

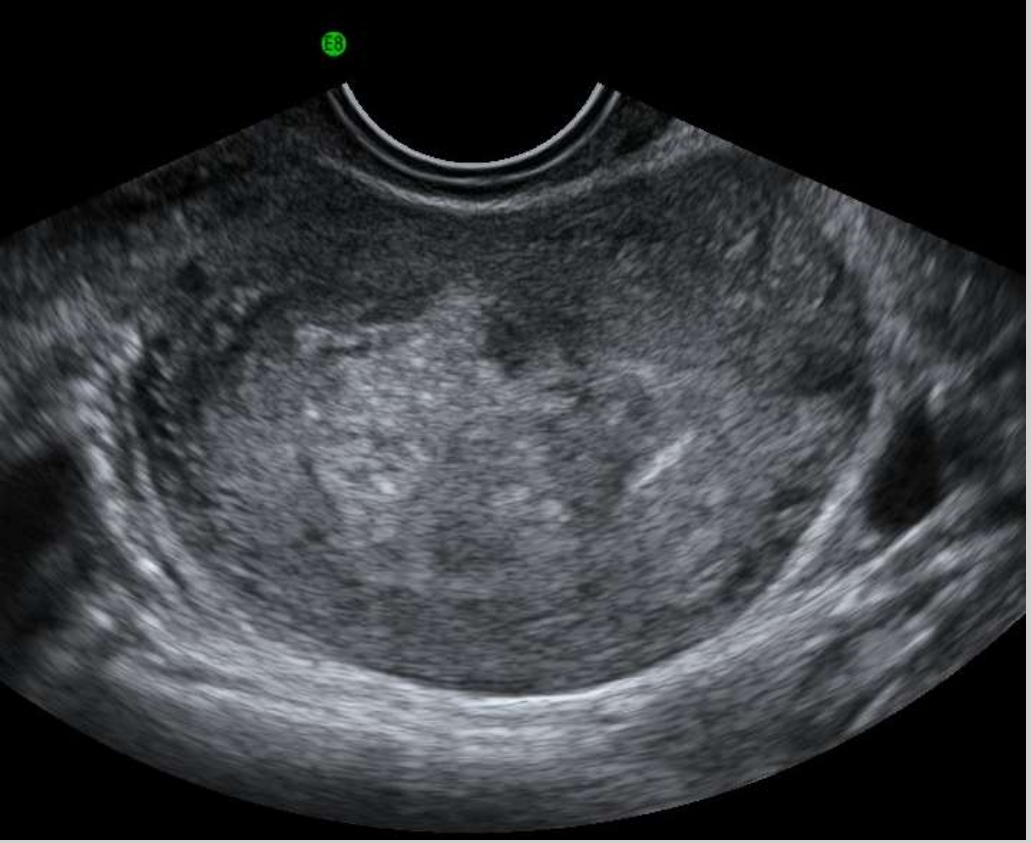
B. Irregular multiple branching vessels within increased risk of EC by a factor of 10

Both absent 10% risk of endometrial cancer in a focal lesion

Both present 90% risk of endometrial cancer in a focal lesion

A more specific US sign is irregularity of the endometrium-myometrium border, a finding that indicates invasive disease.





Endometrial carcinoma

A more specific US sign is irregularity of the endometrium-myometrium border, a finding that indicates invasive disease.

AVM

Actually very rare and typically arise following instrumentation of the endometrial cavity commonly in association with pregnancy loss or delivery

They can be associated with

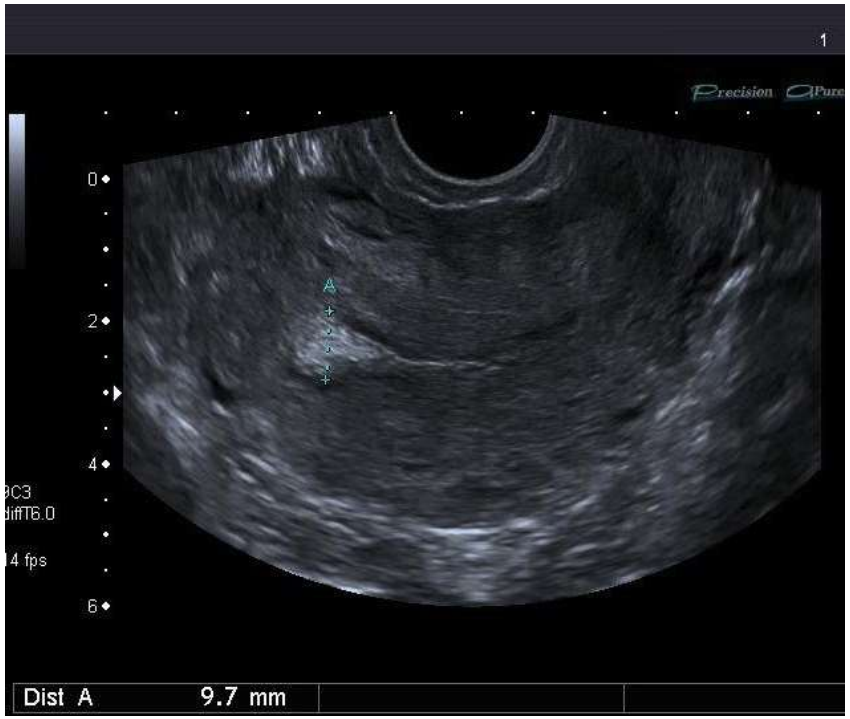
- Malignancies
- Infection
- **RPOCS**
- Molar gestations

They can be congenital and these are even less common and less symptomatic than acquired variety

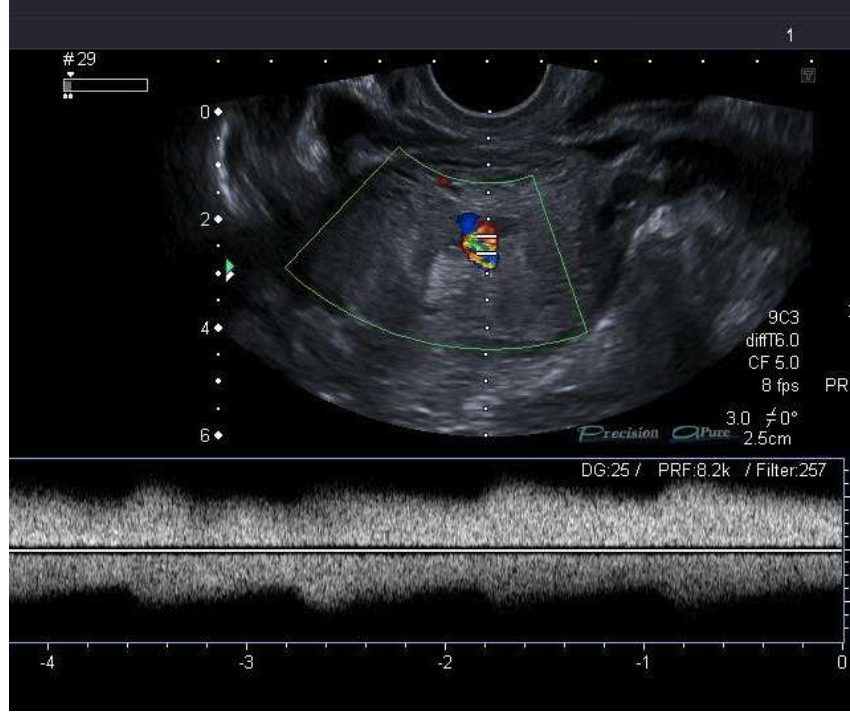
- Heavy bleeding
- Pelvic pain and dyspareunia

Anechoic spaces with an irregular contour

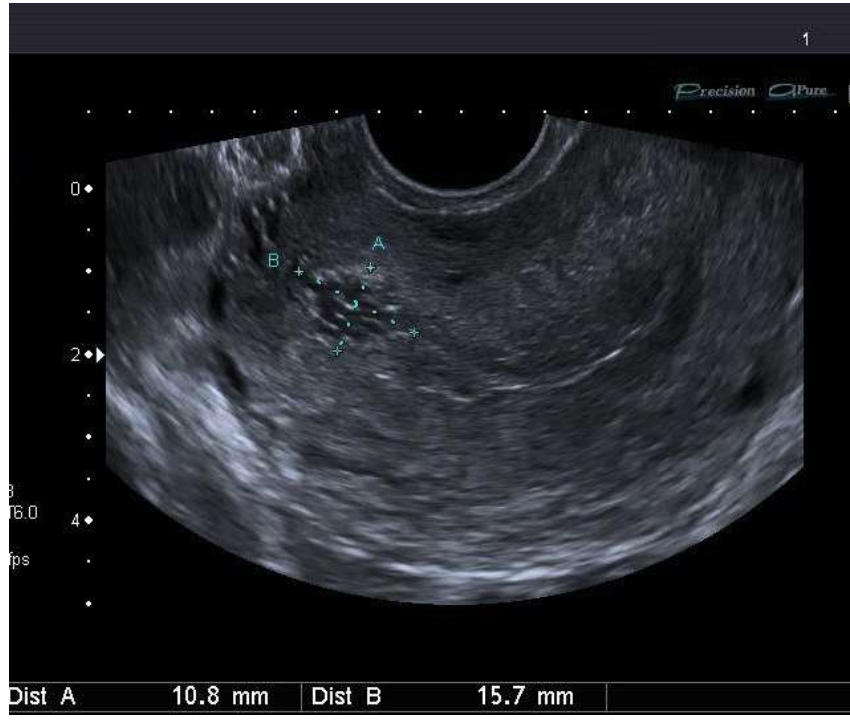
Turbulent flow with aliasing and pulsed Doppler demonstrates high velocity flow with low impedance


1
Precision
A
9C3
diffT6.0
14 fps
Dist A 9.7 mm


Precisio


1
#29
9C3
diffT6.0
CF 5.0
8 fps
3.0
2.5cm
DG:25 / PRF:8.2k / Filter:257


1
Precision
17.3
17.3 cm/s
MI:(1.0)
2DG
90
DR
60
CG
40
PRF
11.2k
Filter
4
9C3
diffT6.0
14 fps
9C3
diffT6.0
CF 5.0
8 fps

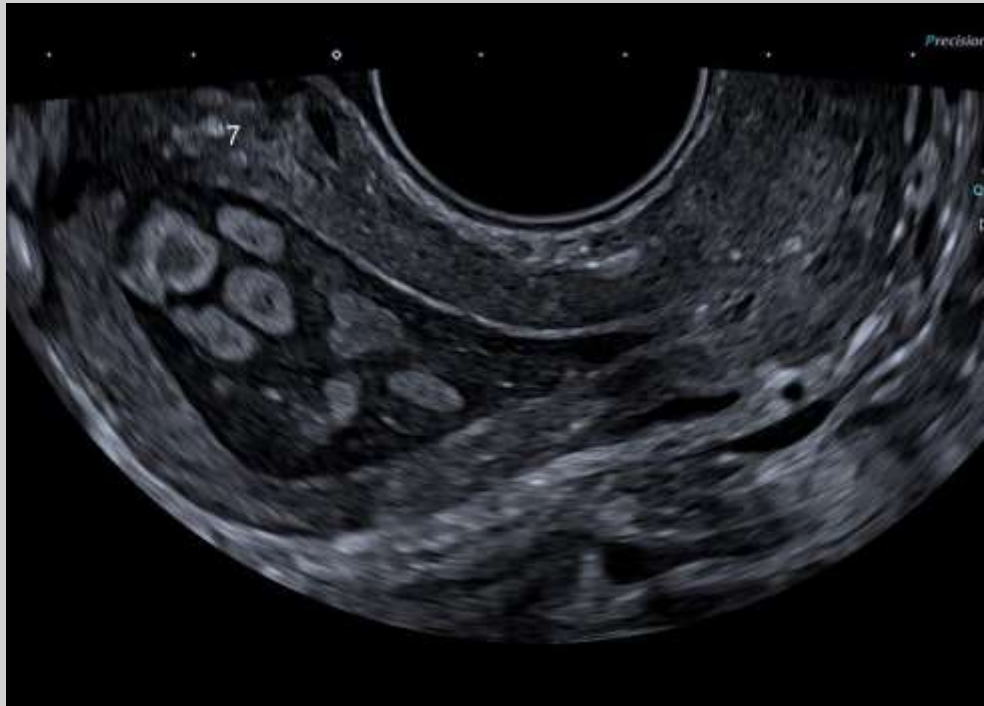

1
Precision
A
B
Dist A 10.8 mm
Dist B 15.7 mm

Vaginal atrophy +/- stenosis

Failed hysteroscopy


Precision
7


7


7


Precision+
MI
(0.7)
11C3
d7.0
19 fps
Qscan
G:80
DR:65
P:2


MI
(0.7)
11C3
d7.0
19 fps
Qscan
G:80
DR:65
P:2


Prec

Teaching points

TVU is a key clinical tool for use in the diagnosis of AUB.

ALL structural causes of AUB such as polyps, adenomyosis, leiomyomas, and malignancy, can be evaluated using TVU.

The use of Doppler evaluation, 3D reconstruction, and saline infusion sonography can improve the diagnostic accuracy of traditional 2D TVU.

GOOD US gray scale AND SIS can modify the risk of endometrial cancer

TRANSRECTAL scanning is a very useful adjunct to US assment

THANK YOU FOR YOUR ATTENTION

MUSA

In 2015, the international Morphological Uterus Sonographic A
group publish
which termin
describing ult
adenomyosis.

ULTRASOUND
in Obstetrics & Gynecology

isuog

Consensus Statement | Free Access

Terms, definitions and measurements to describe sonographic features of myometrium and uterine masses: a consensus opinion from the Morphological Uterus Sonographic Assessment (MUSA) group

T. Van den Bosch, M. Dueholm, F. P. G. Leone, L. Valentin, C. K. Rasmussen, A. Votino, D. Van Schoubroeck, C. Landolfo, A. J. F. Installé, S. Guerriero, C. Exacoustos ... See all authors

First published: 04 February 2015 | https://doi.org/10.1002/uog.14806 | Citations: 374

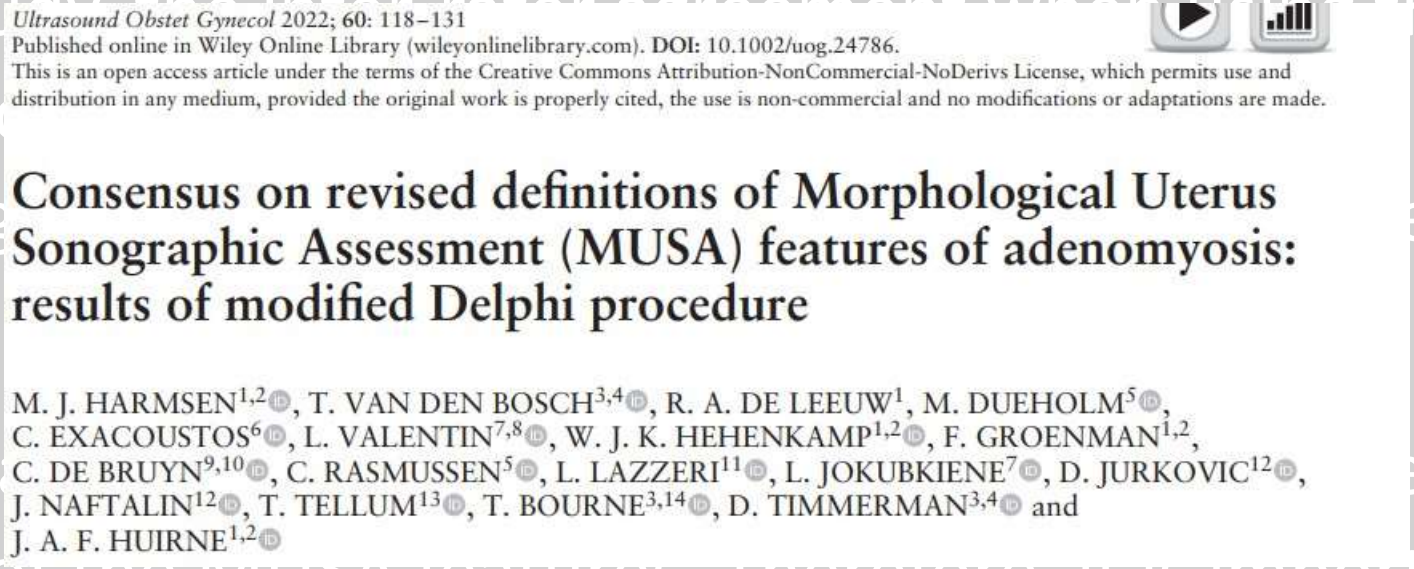
MUSA

In 2019, the MUSA group suggested a uniform classification and reporting system to be used when describing morphological variations of adenomyosis and its extent on ultrasound.

MUSA

In a pilot study the inter-rater agreement when using the MUSA features to d was poor both among enced raters.

Poor inter-r ear definitions of the MUSA features. Therefore, it is important to investigate if the definitions of the MUSA features are sufficiently clear, and if all or some of them need to be revised.



Ultrasound Obstet Gynecol 2022; 60: 118–131
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Consensus on revised definitions of Morphological Uterus Sonographic Assessment (MUSA) features of adenomyosis: results of modified Delphi procedure

M. J. HARMSEN[1,2], T. VAN DEN BOSCH[3,4], R. A. DE LEEUW[1], M. DUEHOLM[5], C. EXACOUSTOS[6], L. VALENTIN[7,8], W. J. K. HEHENKAMP[1,2], F. GROENMAN[1,2], C. DE BRUYN[9,10], C. RASMUSSEN[5], L. LAZZERI[11], L. JOKUBKIENE[7], D. JURKOVIC[12], J. NAFTALIN[12], T. TELLUM[13], T. BOURNE[3,14], D. TIMMERMAN[3,4] and J. A. F. HUIRNE[1,2]