MIOMI ATIPICI E SARCOMI

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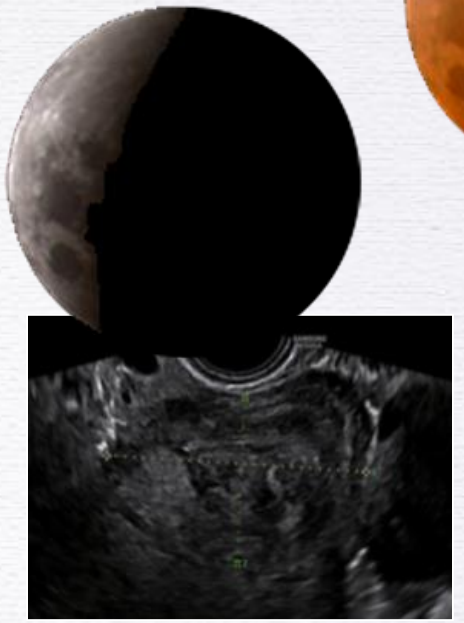
Leiomyoma

Variants of Leiomyoma



STUMP

Sarcomas

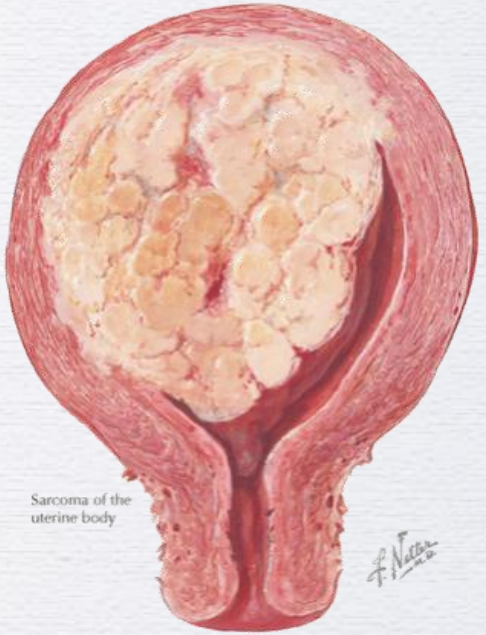
What do we know about uterine sarcomas?

Epidemiology and Classification

Histologic type (more than one may apply)	
Leiomyosarcoma	63%
Low-grade endometrial stromal sarcoma*	
Low-grade endometrial stromal sarcoma with: ▪ Smooth muscle differentiation ▪ Sex cord elements ▪ Glandular elements ▪ Other (specify)	21%
High-grade endometrial stromal sarcoma	
Undifferentiated uterine/endometrial sarcoma	
Adenosarcoma	
Adenosarcoma with: ▪ Rhabdomyoblastic differentiation ▪ Cartilaginous differentiation ▪ Osseous differentiation ▪ Other heterologous element (specify)	16%
Adenosarcoma with sarcomatous overgrowth	
Other (specify)	

Uterine Sarcoma represent about **3 – 7%** of all uterine cancers

Incidence: 1.55-2.8 per 100,000 women/year



Tropè, 2012
College of American Pathologists, 2013

Epidemiology and Classification

Prevalence in pts operated for "**myometrial lesion**":

0.20%

Prevalence in pts operated for "**myometrial lesions with a rapid growth**": **0.27 %**

Parker, Obstet Gynecol 1994

U.S. Food and Drug Administration
Protecting and Promoting Your Health

Medical Devices

Laparoscopic Uterine Power Morcellation in Hysterectomy and Myomectomy: FDA Safety Communication

Quantitative Assessment of the Prevalence of Unsuspected Uterine Sarcoma in Women Undergoing Treatment of Uterine Fibroids

If laparoscopic power morcellation is performed in women with unsuspected uterine sarcoma, there is a risk that the procedure will spread the cancerous tissue within the abdomen and pelvis, significantly worsening the patient's likelihood of long-term survival. For this reason, and because there is no reliable method for predicting whether a woman with fibroids may have a uterine sarcoma, the FDA discourages the use of laparoscopic power morcellation during hysterectomy or myomectomy for uterine fibroids.

Prevalence:
1 / 352
0.3 %

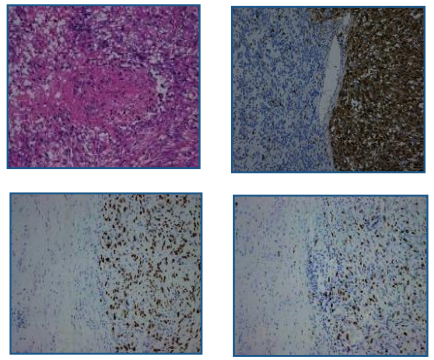
Cancer Manag Res. 2019 Jul 25;11:7007-7014. doi: 10.2147/CMAR.S208405. eCollection 2019.

Unexpected uterine sarcomas after hysterectomy and myomectomy for presumed leiomyoma: a retrospective study of 26,643 patients.

Cao H[#1], Li L[#1], Yang B[2], Luo G[2], Lou J[1], Xi M[#1].

88 sarcomas
in 26.643 pts
0.33%

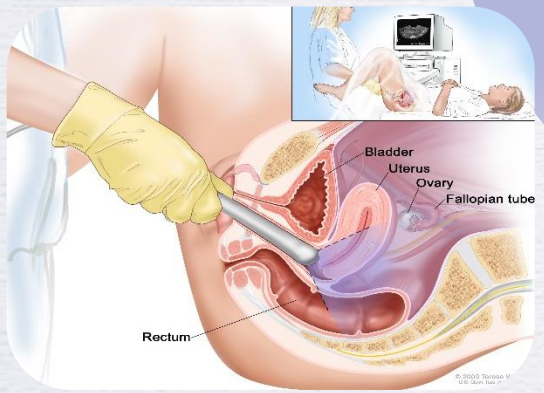
Diagnosis



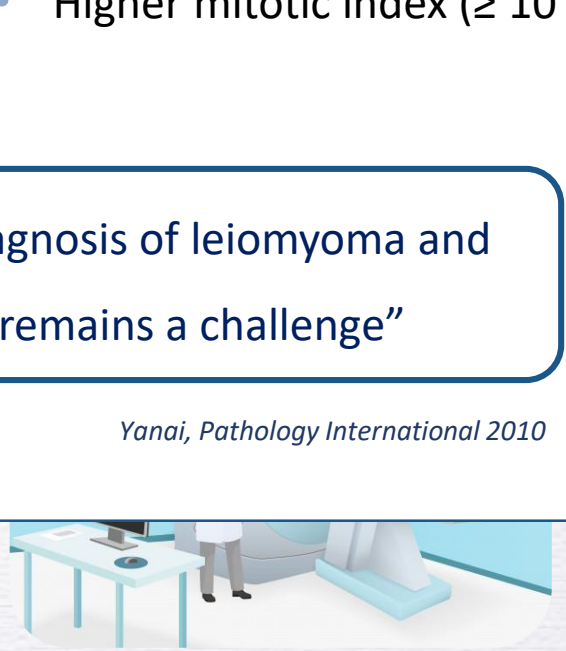
- Coagulative necrosis
- Cellular atipiae
- Higher mitotic index (≥ 10 HPFs)

"A histopathologic diagnosis of leiomyoma and leiomyosarcoma remains a challenge"

Yanai, Pathology International 2010

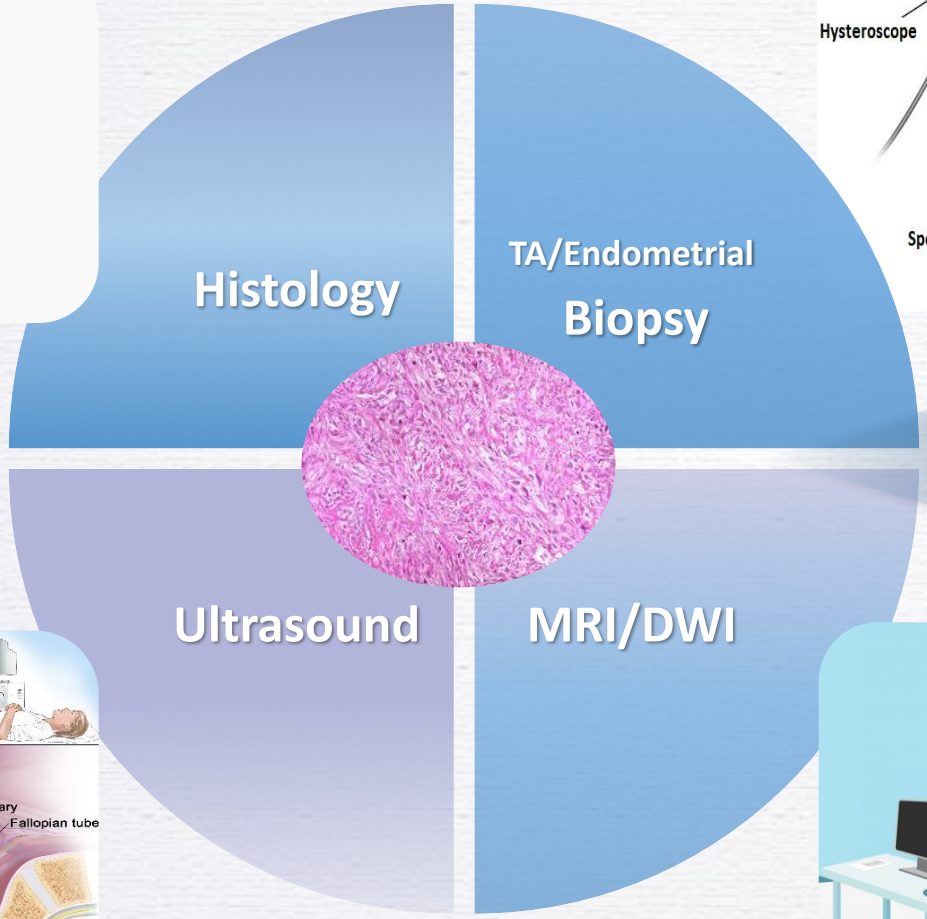


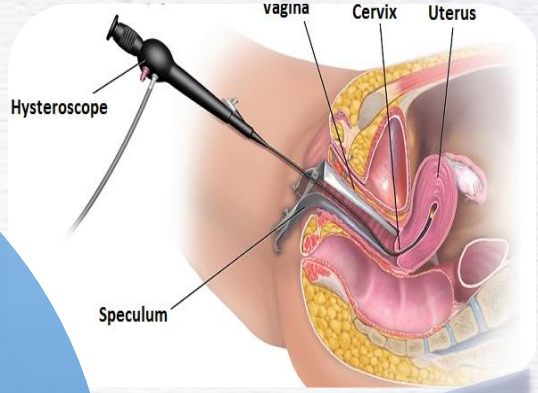
Van Den Bosch, 2012



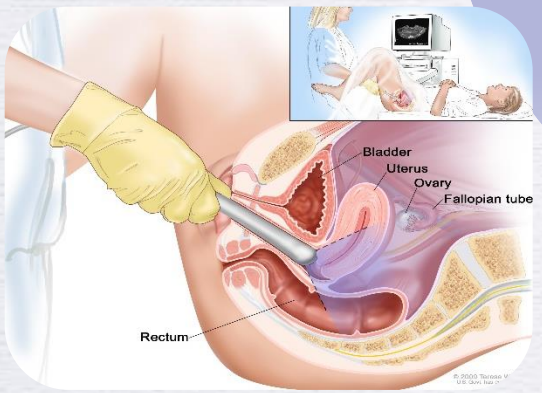
De Mulder, 2018

Diagnosis

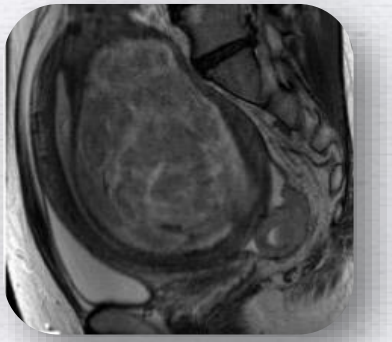




Bansal, 2008



Van Den Bosch, 2012



De Mulder, 2018

Diagnosis

- PCNA
- AR-ER
- Ki-67
- P16 – p53
- PTEN
- HER2
- TOPO2A
- PD-L1

UMG index

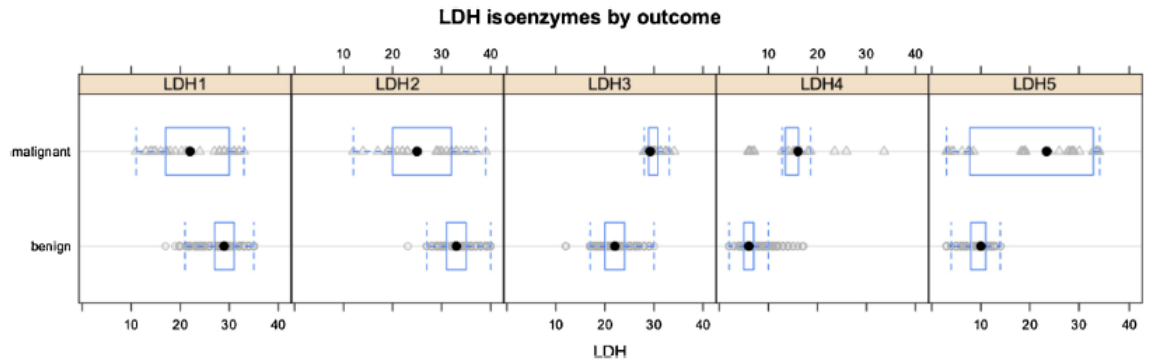


Table 2
U.M.G. index performance as a classifier of uterine masses (fibroids and sarcomas), with 29 as a cut-point.

	U.M.G. ≤ 29	U.M.G. > 29	Total
Fibroids	2202	9	2211
Sarcomas	0	43	43
Total	2202	52	2254

U.M.G. index = LDH3 + 24/LDH1.
LDH: Lactate Dehydrogenase; U.M.G.= Uterine mass Magna Graecia.

Di Cello A. 2019

…ity 62%

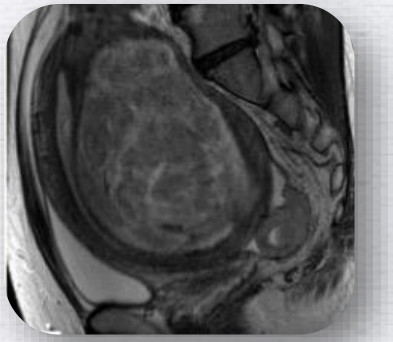
Bansal, 2008

- LDH – PCR – D-dimer
- LDH isoenzymes

"No reliable
pathognomo
ultrasound fe
distinguish b
uterine sarco… and a
benign leiomyoma"

Van Den Bosch, 2012

…borders
…d areas
…intensity
…hancement



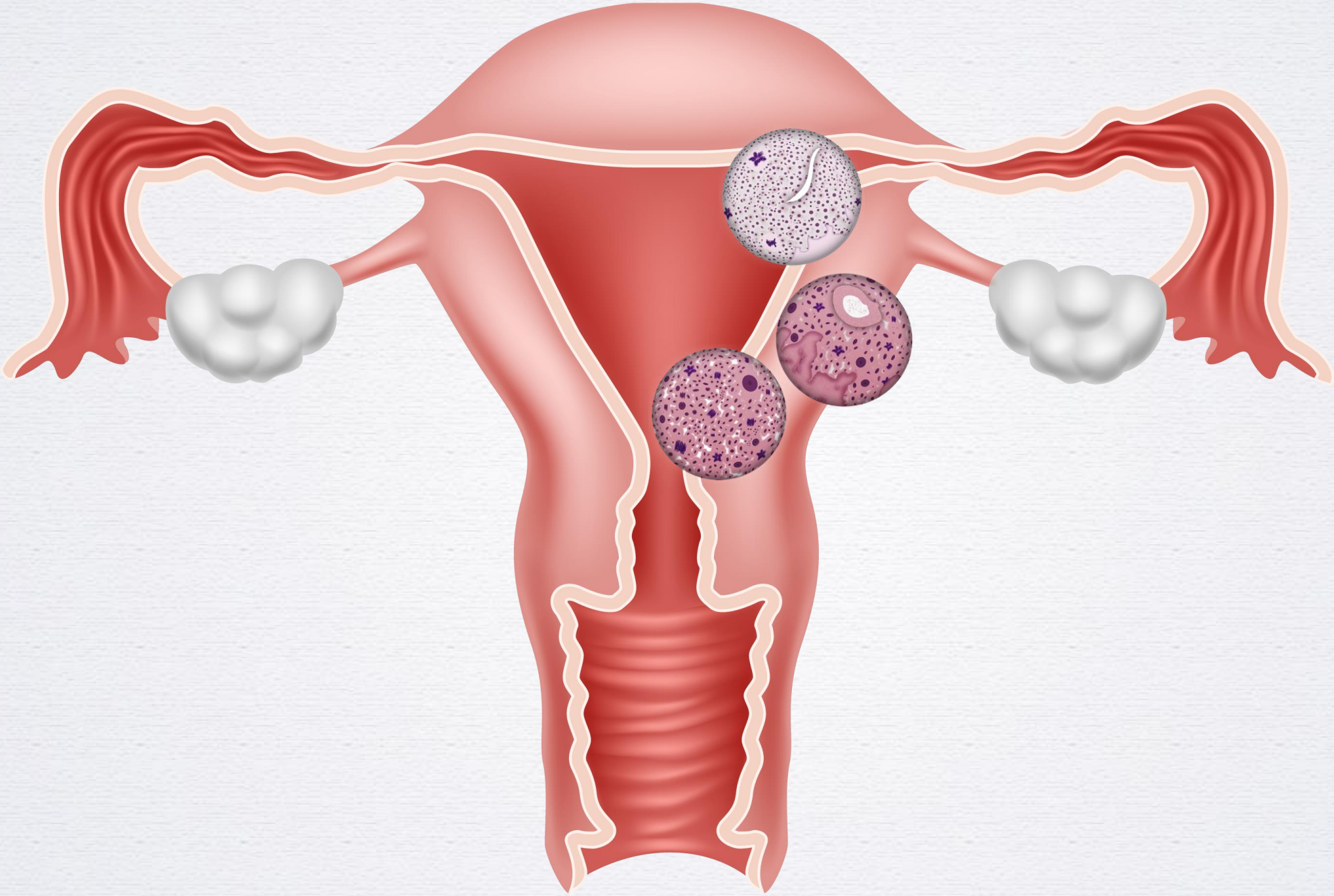
De Mulder, 2018

What about the differential diagnosis between

Variants of leiomyomas

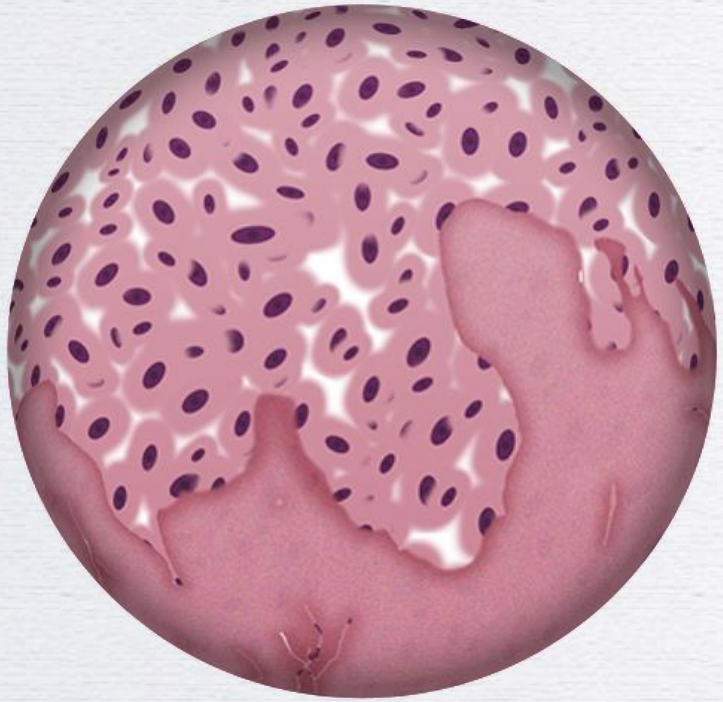
STUMP

Sarcomas

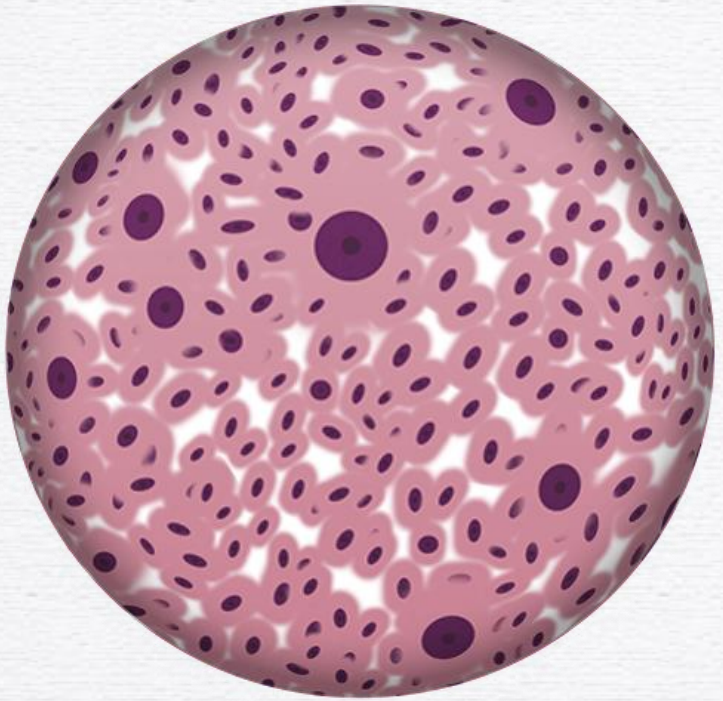


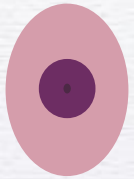
Crucial features for the diagnosis of Sarcoma

NECROSIS

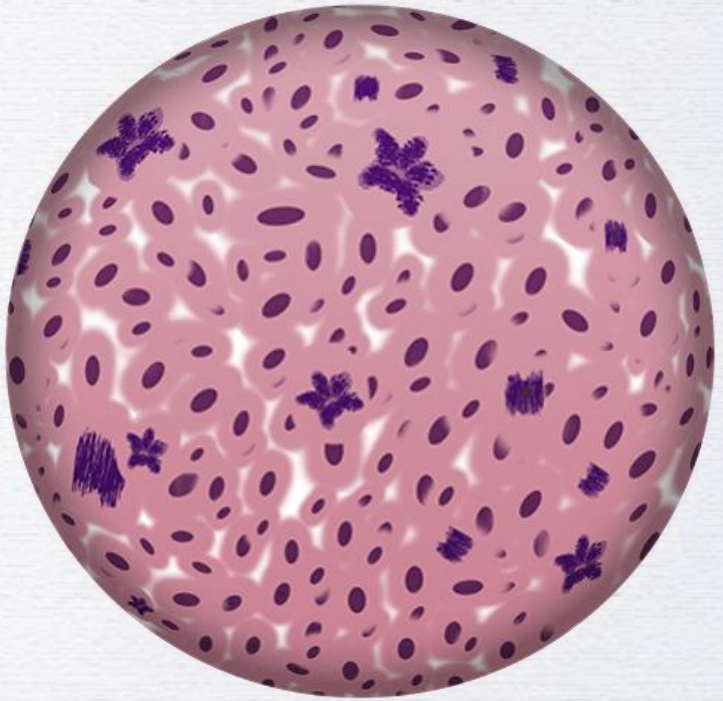


ATYPIA





MITOSIS



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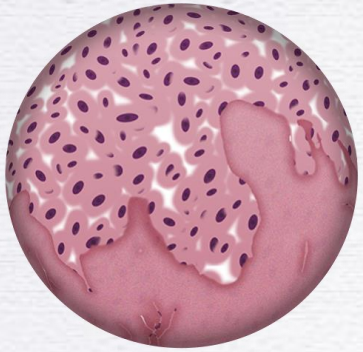

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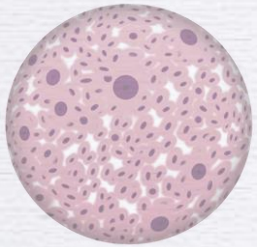

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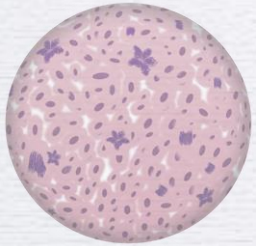

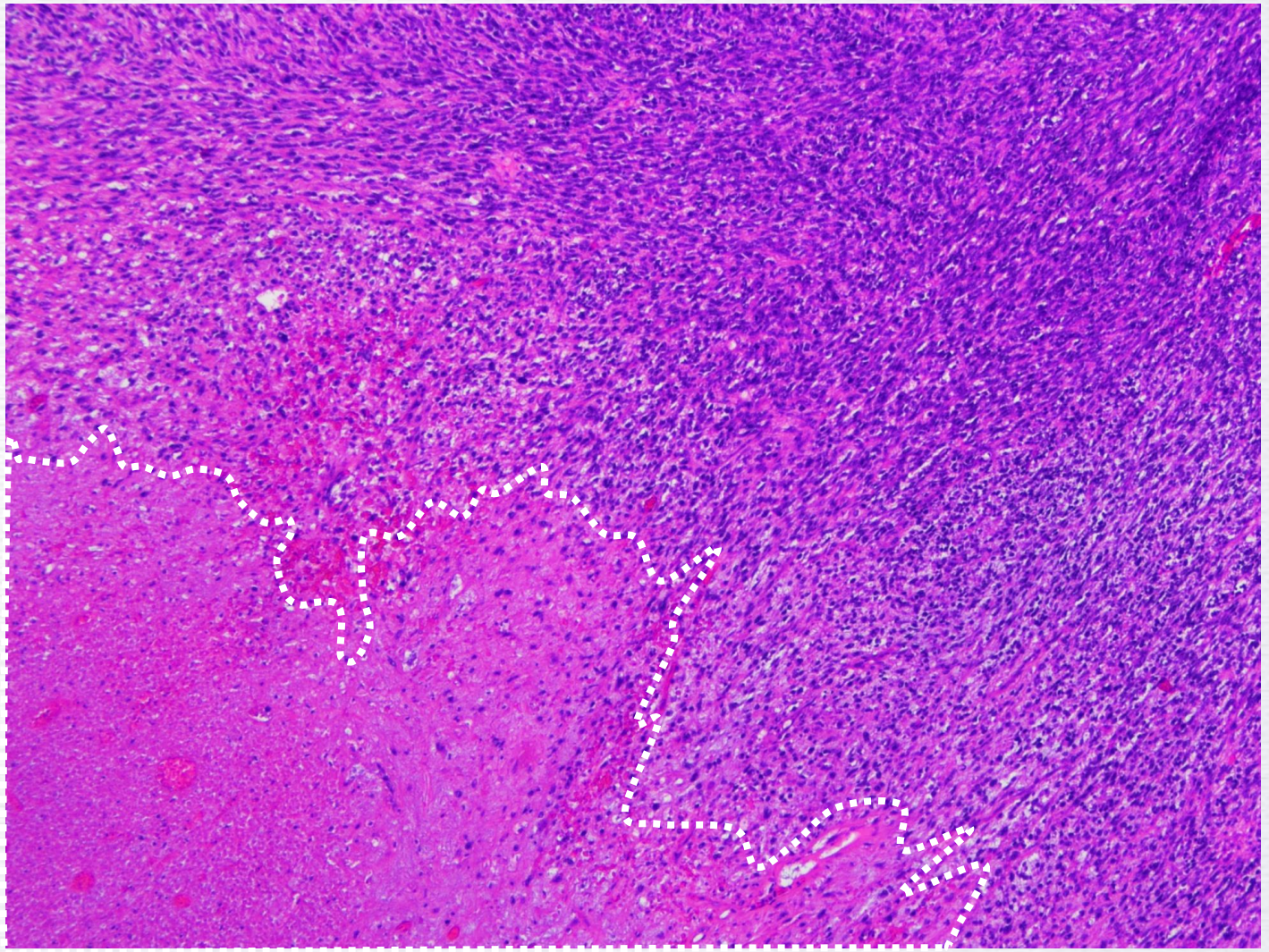

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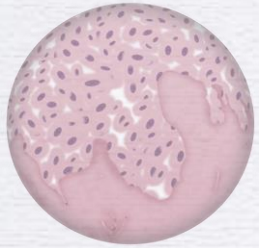

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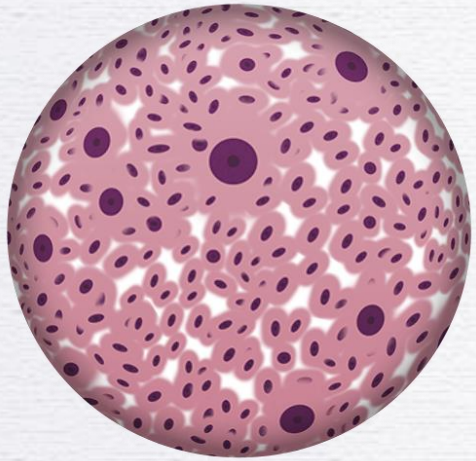

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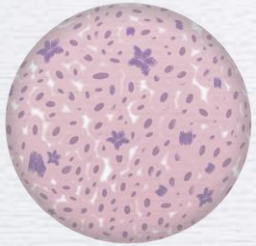
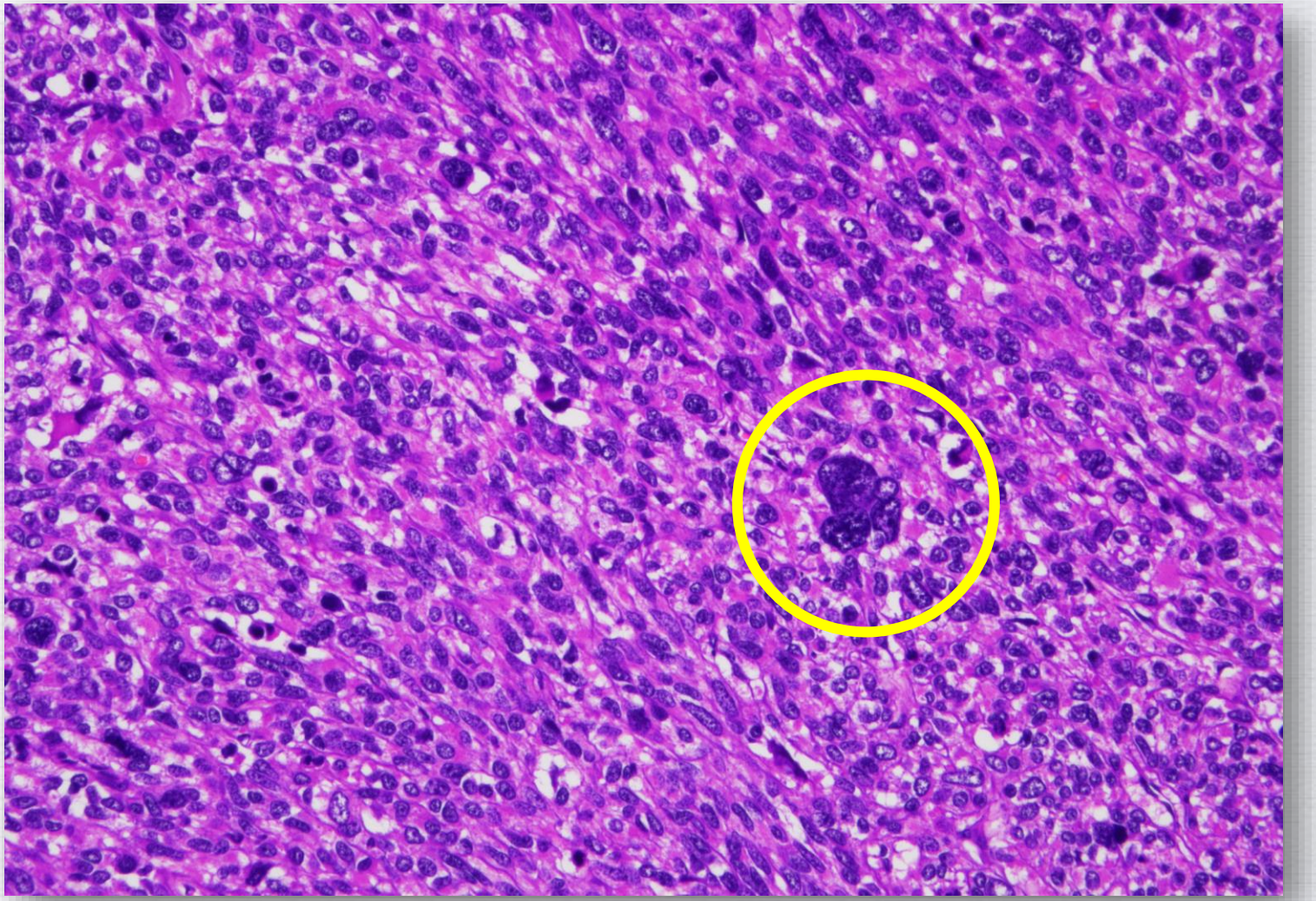
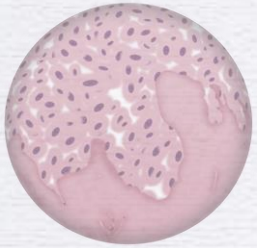




NECROSIS



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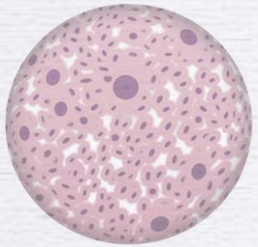

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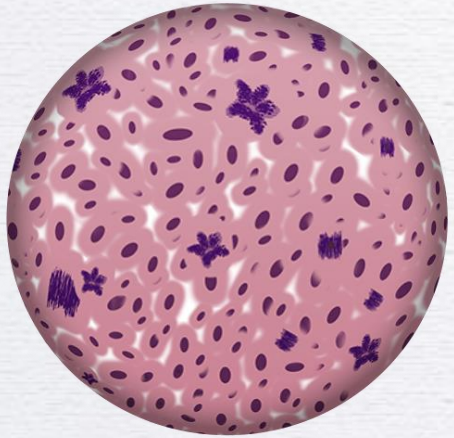
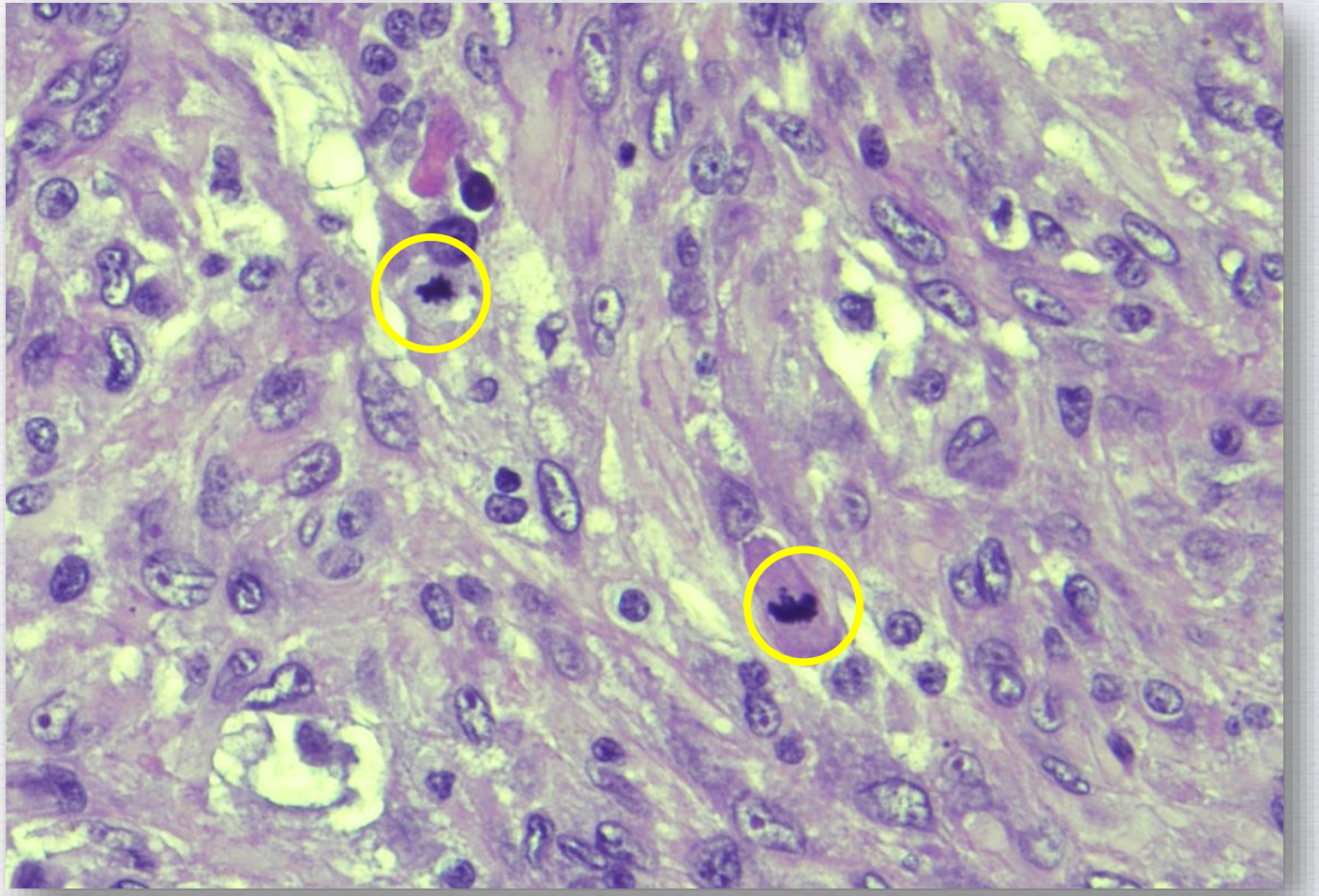
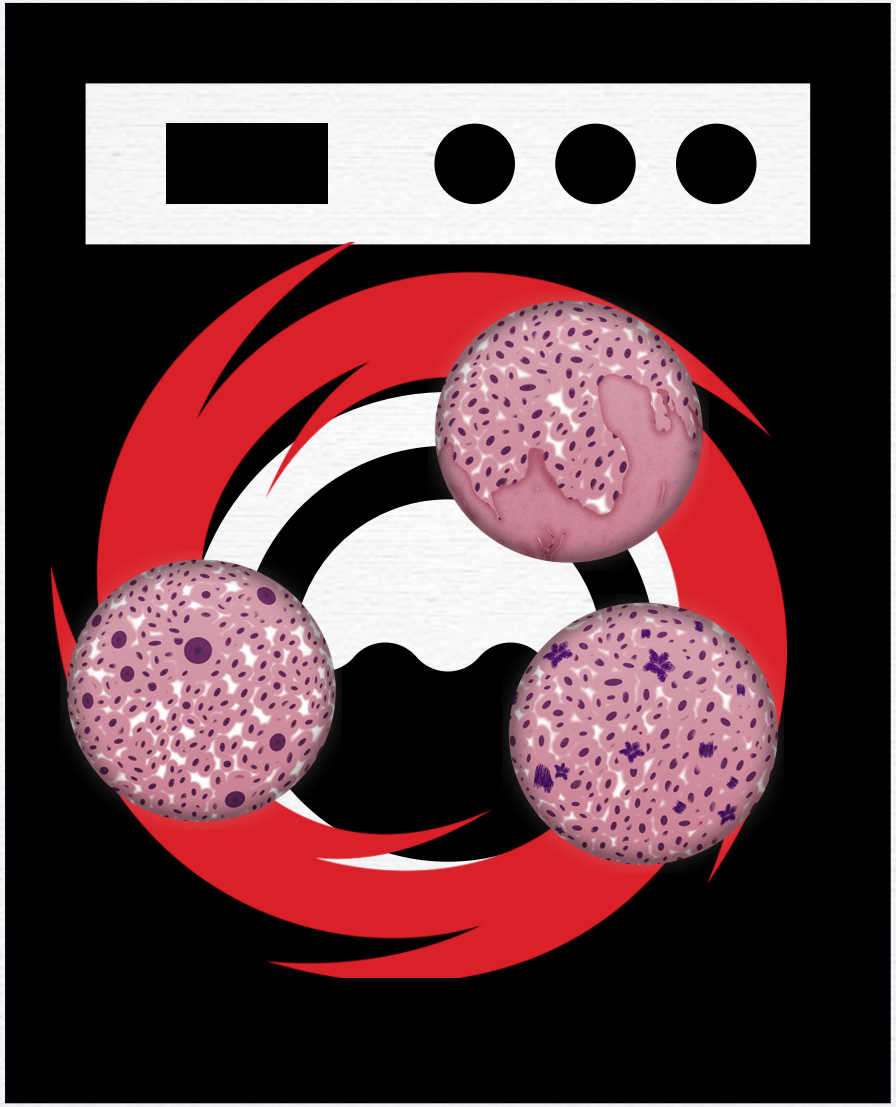
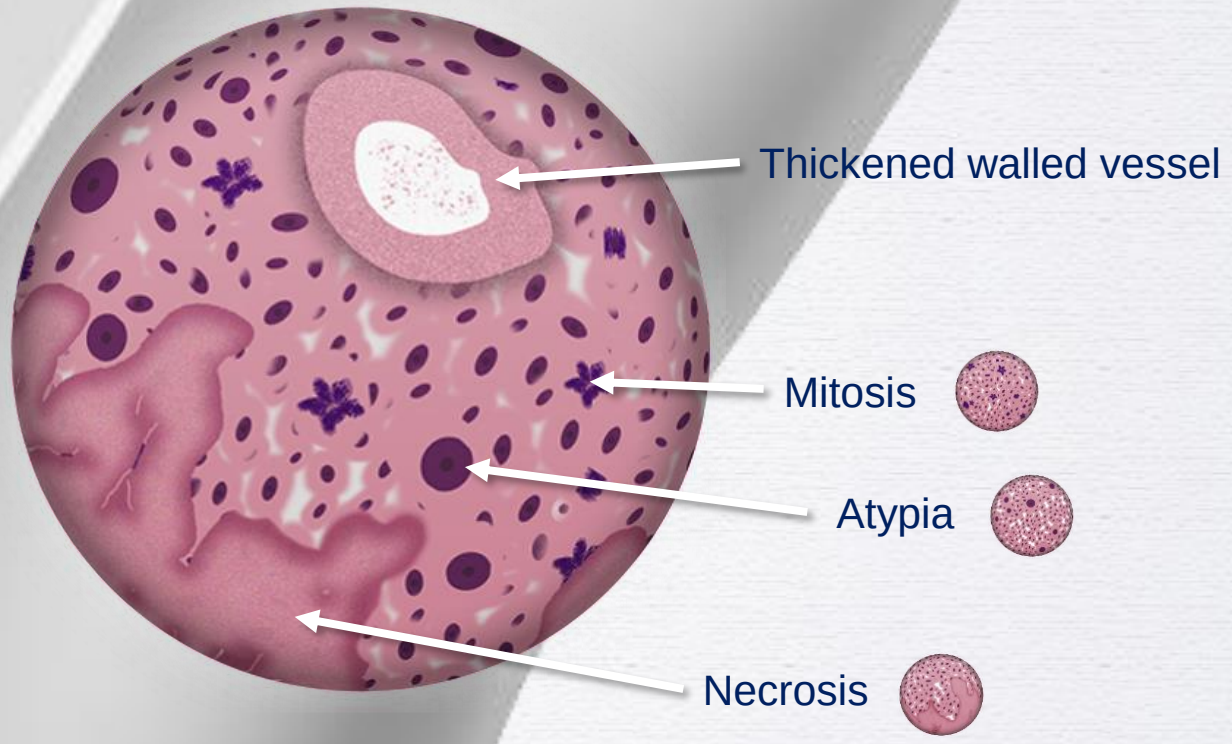




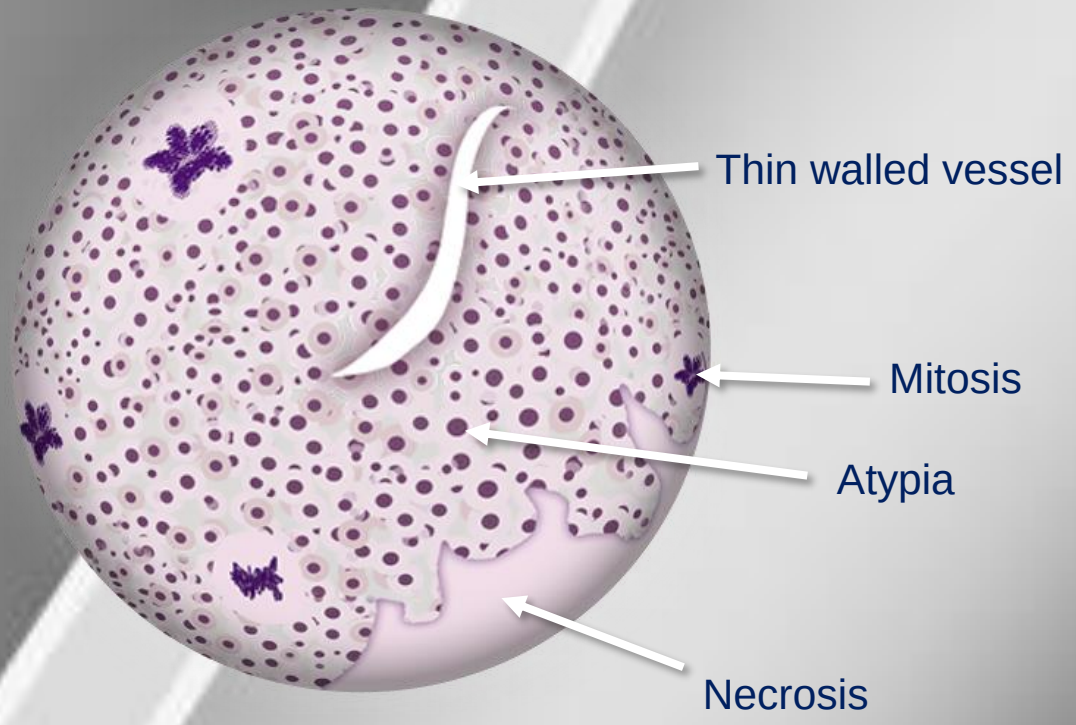
Three crucial features for the diagnosis of Sarcoma





LEIOMYOSARCOMA

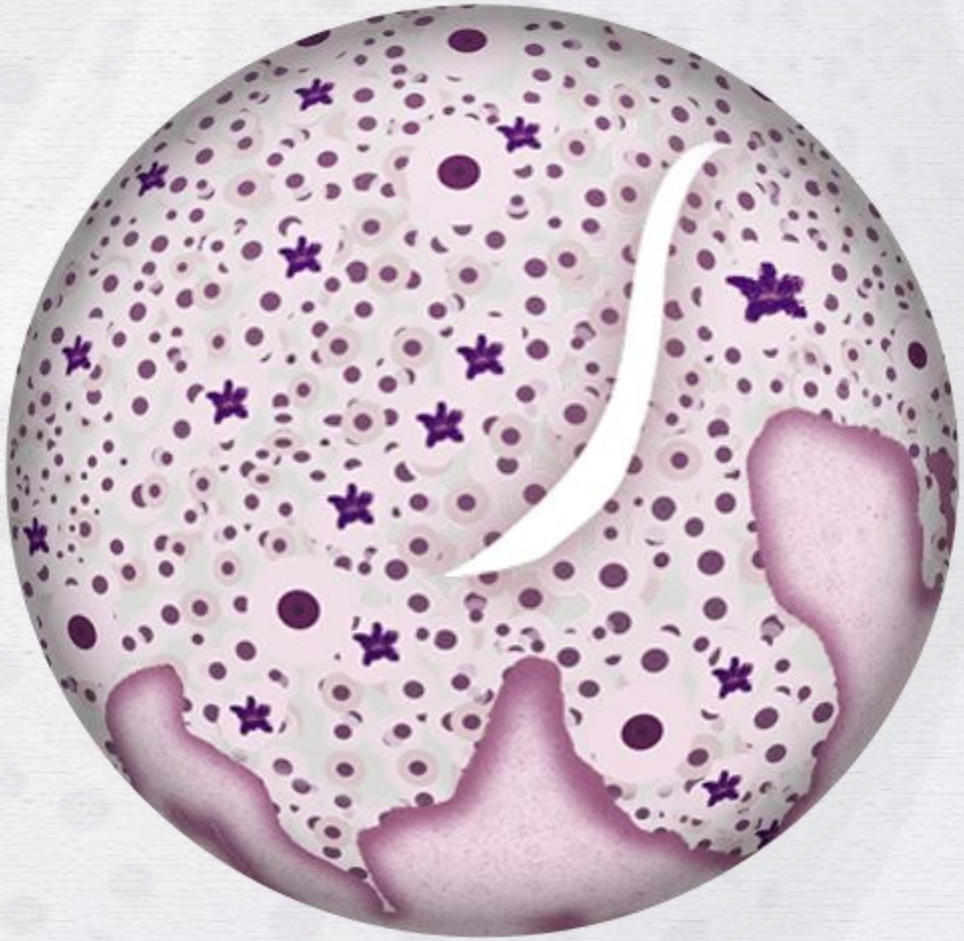
ENDOMETRIAL STROMAL SARCOMA

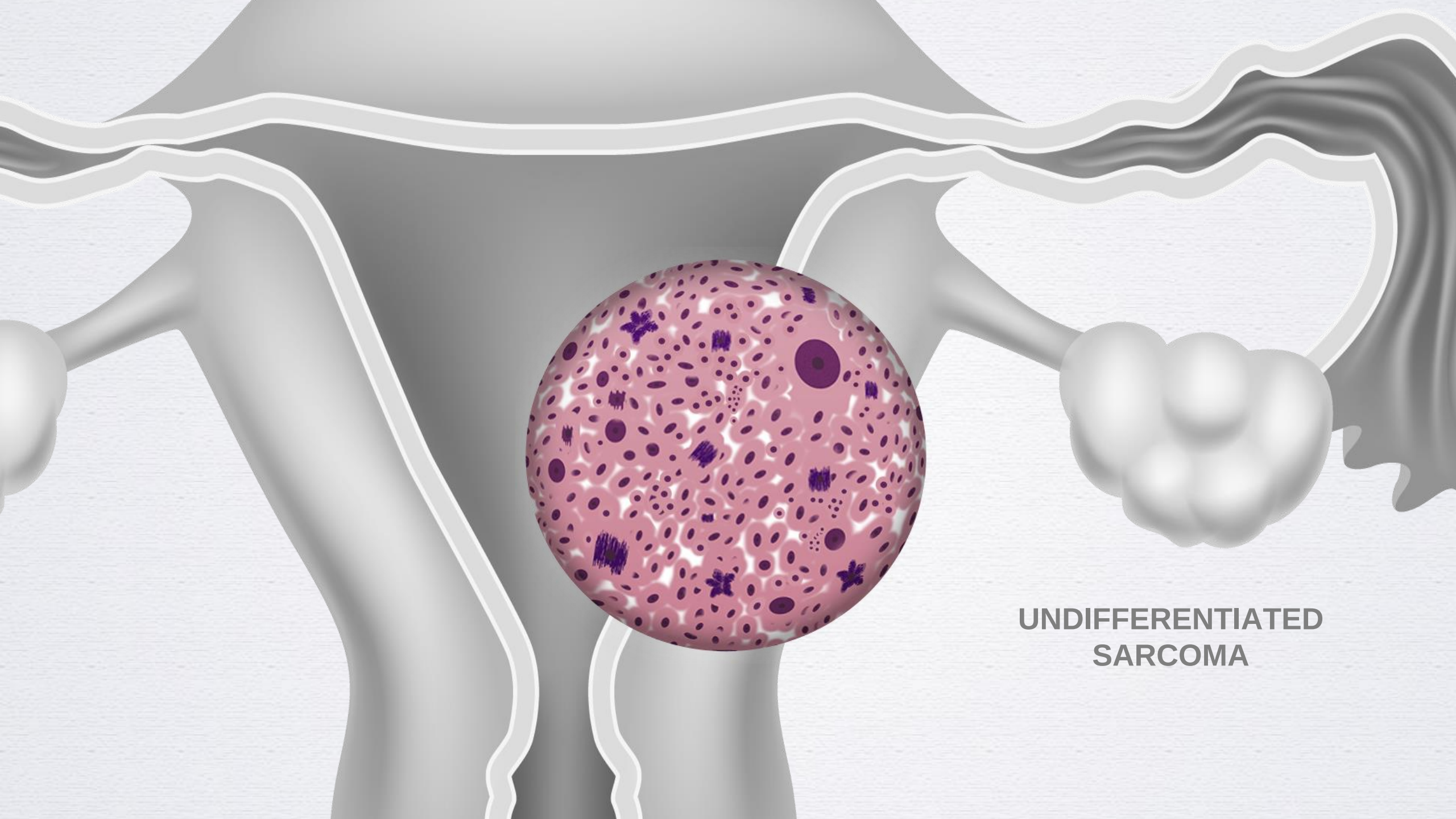


ENDOMETRIAL STROMAL SARCOMA

LOW GRADE

HIGH GRADE

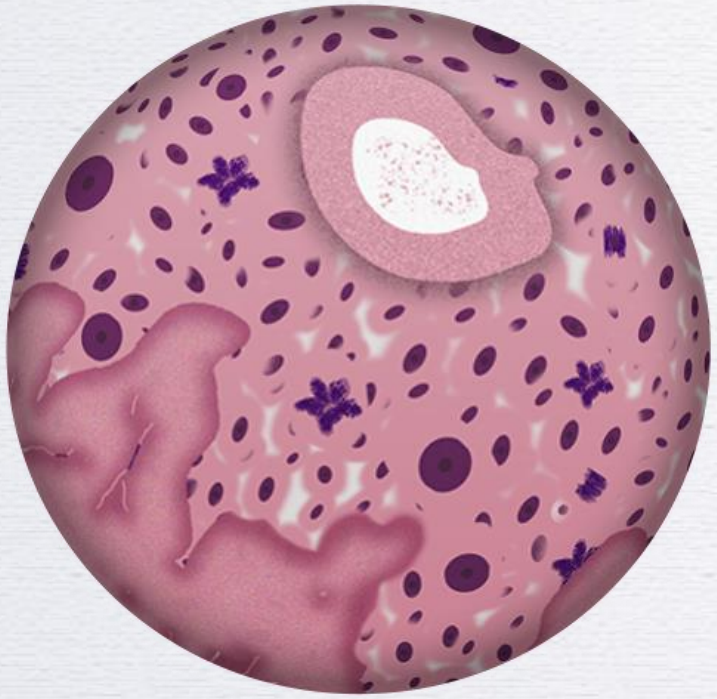




UNDIFFERENTIATED
SARCOMA

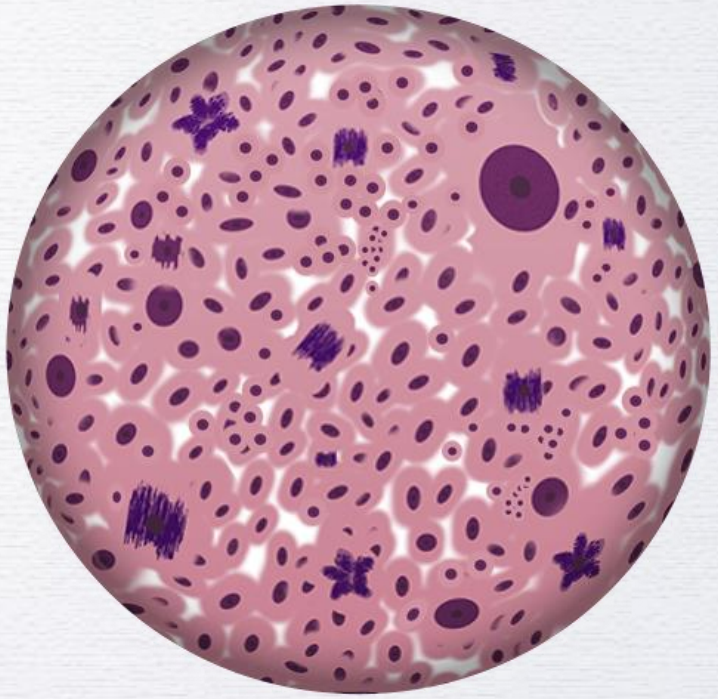
Malignant mesenchymal tumors

LEIOMYOSARCOMA



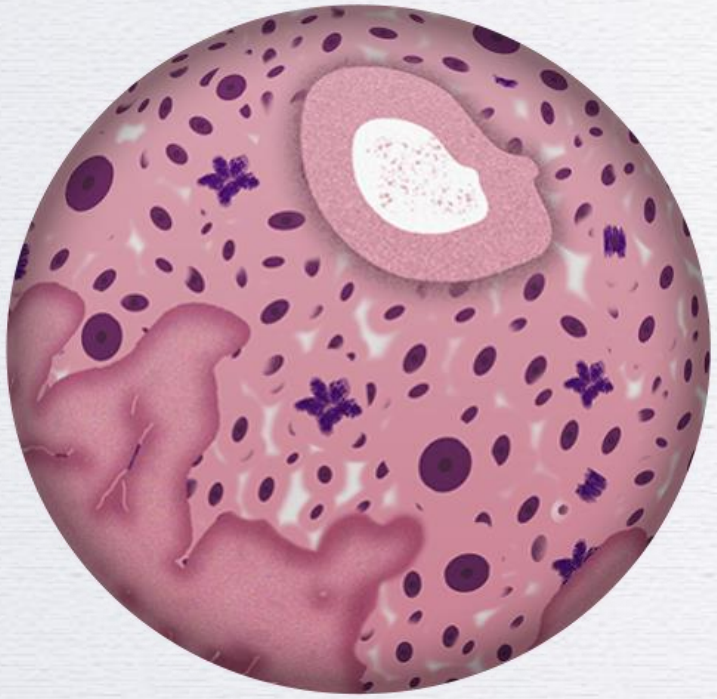
ENDOMETRIAL STROMAL SARCOMA

UNDIFFERENTIATED SARCOMA

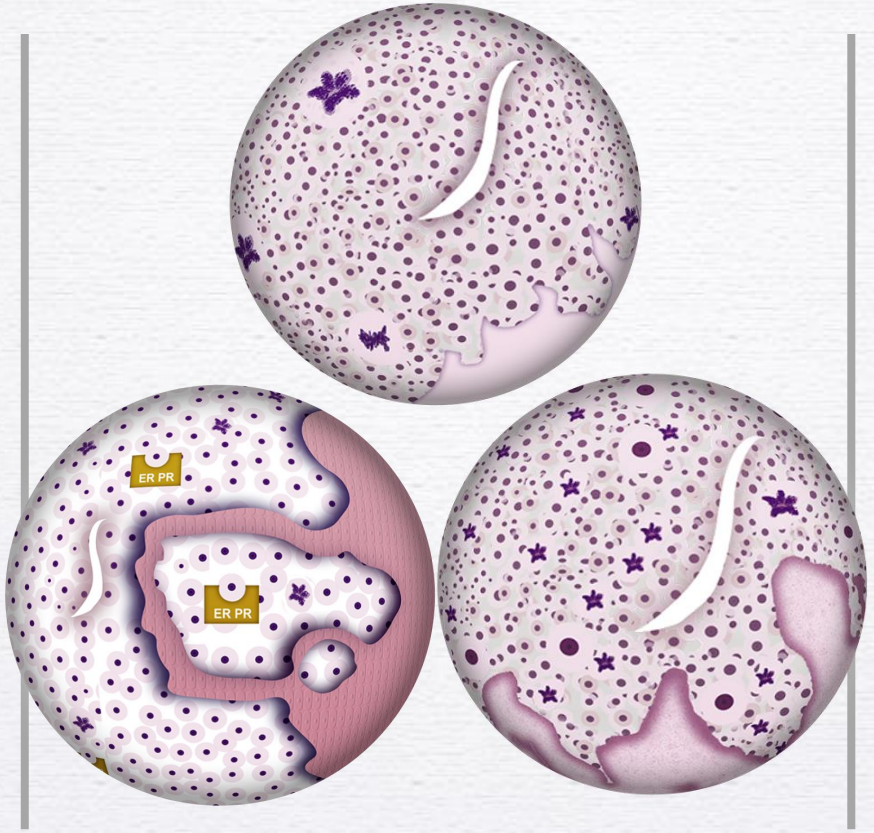


Malignant mesenchymal tumors

LEIOMYOSARCOMA



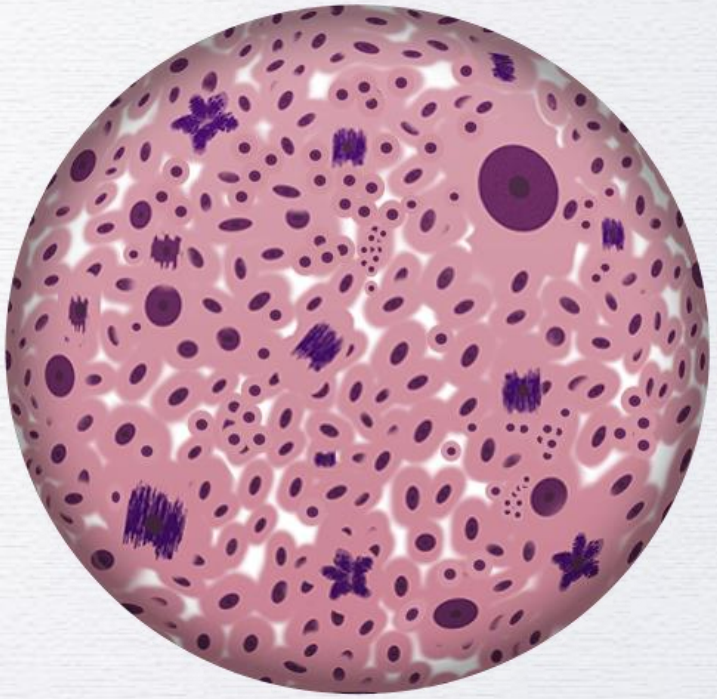
ENDOMETRIAL STROMAL SARCOMA



Low grade

High grade

UNDIFFERENTIATED SARCOMA



What about the differential diagnosis ON ULTRASOUND between

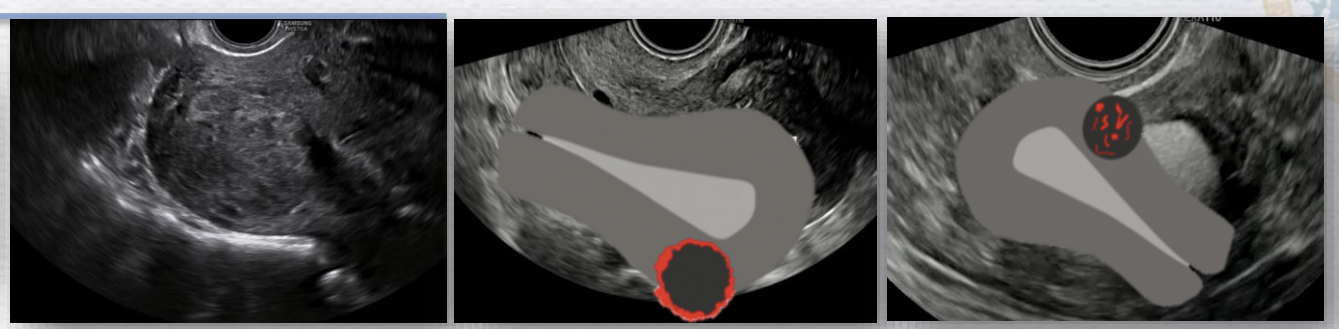
Variants of leiomyomas

STUMP

Sarcomas

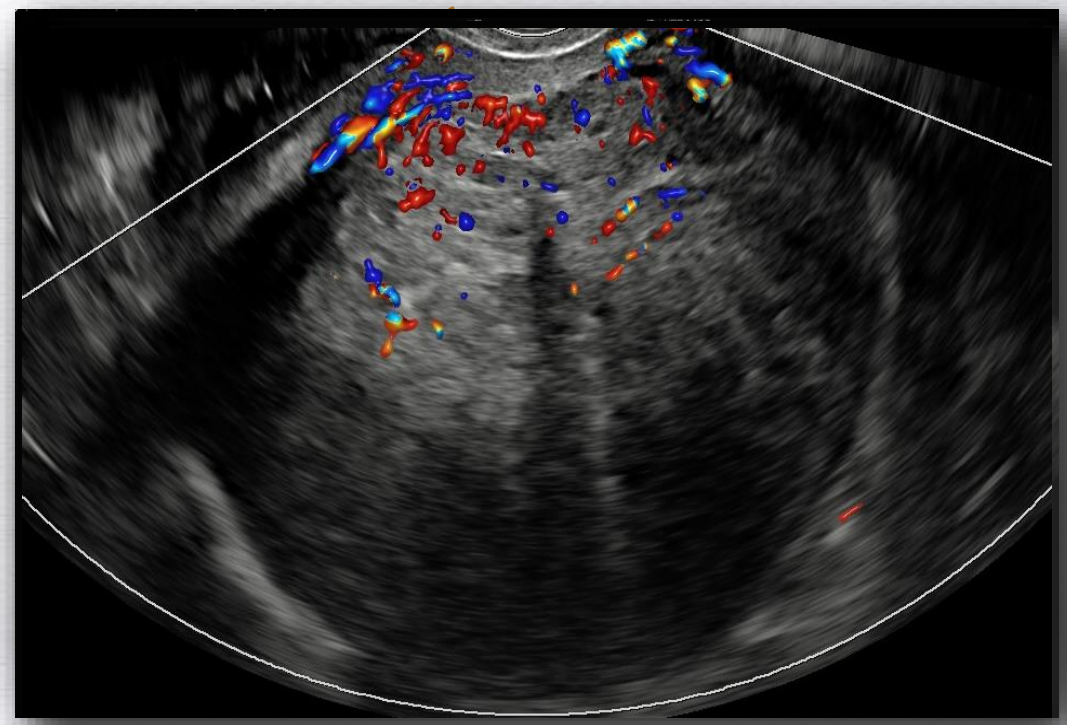
Classification

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

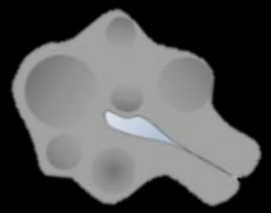


Consensus opinion on the terminology to be used when describing the US features of the myometrioum and of miometrial lesions

- Type of lesion: localized or diffuse
- Number, location, size and site
- IFM (inner lesion free margin) / OFM (outer lesion free margin)
- Echogenicity
- Vascularization



We are not worried about..



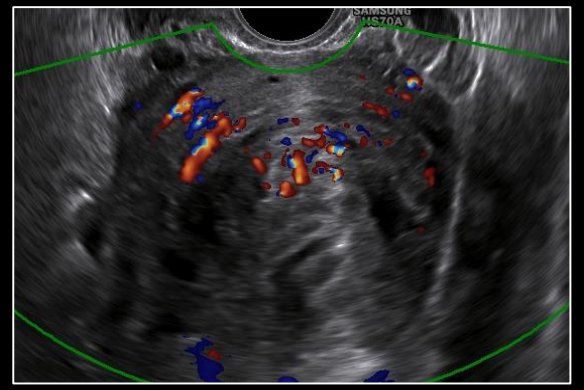
Multiple lesions

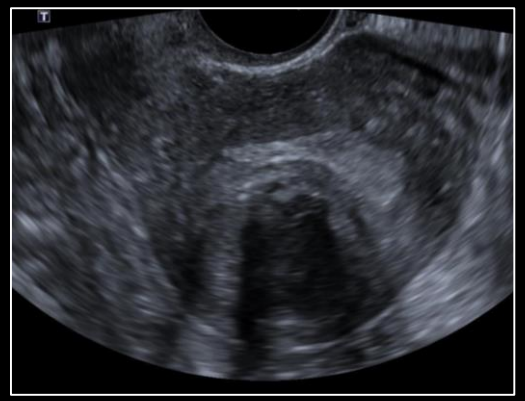
Pseudocapsule

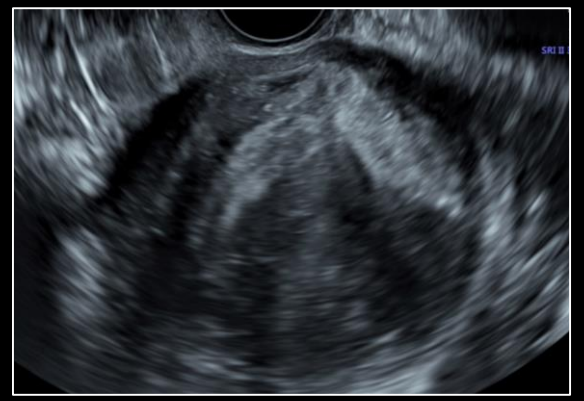
Shadowing

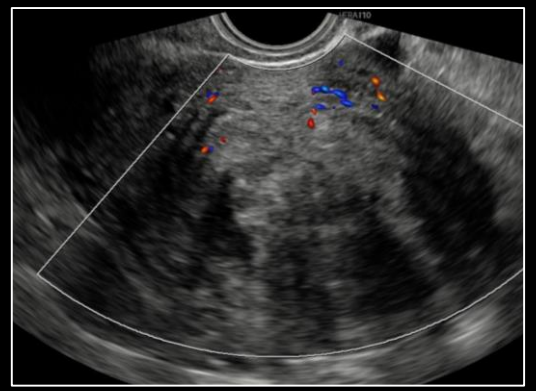
No cystic areas

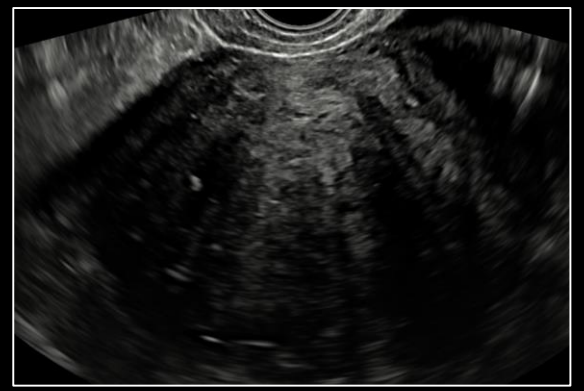
Vascularization
Color score 1/2





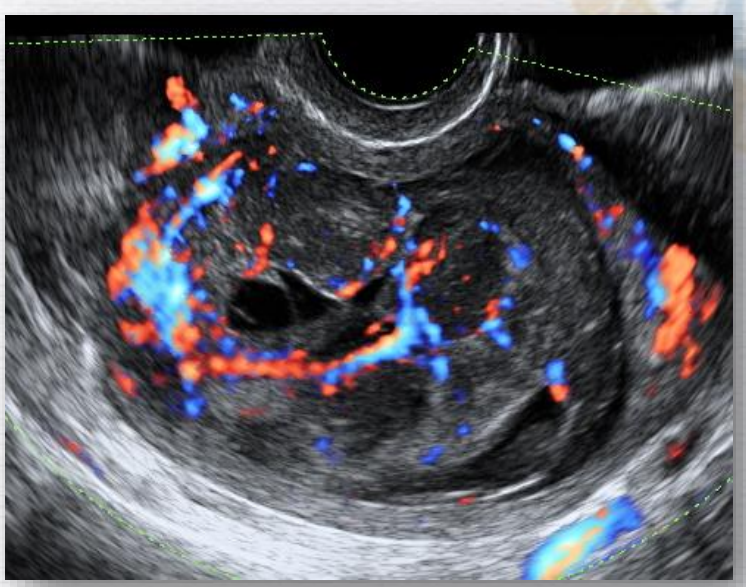






Ultrasound and uterine STUMP-Sarcomas

Author	Number of cases
Hata 1997	4 LMS, 1 MMT
Szabò 1997	3 LMS, 5 ESS, 1 MMT
Aviram 2005	6 LMS, 7 MMT
Exacoustos 2007	8 LMS
Adesiyun 2010	1 LMS
Bonneau 2014	3 LMS, 3 ESS, 7 UES, 1 Rhabdomyosarcoma
Gandolfo 2000	2 ESS
Perez-Montiel 2004	1 ESS
Toprak 2004	1 ESS
Pekindil 2005	1 ESS
Kim 2006	10 ESS
Jayakrishnan 2009	1 ESS
Cho 2011	1 ESS
Somma 2012	1 ESS
Park 2016	10 ESS
Kim 2019	27 LMS, 27ESS, 7ADS, 1MMMT
Cotrino 2020	18 STUMP
Exacoustos 2022	1 LMS, 1 STUMP, 1 neuroendocrine tumor, 2 not specified uterine sarcoma



Ultrasound

Ultrasound Obstet Gynecol. 2019 Mar 25. doi: 10.1002/uog.20270.

Imaging of gynecological disease: clinical and ultrasound characteristics of uterine sarcomas.

Ludovisi M[1], Moro F[1], Pasciuto T[1], Di Noi S[1], Giunchi S[2], Savelli L[3], Pascual MA[4], Sladkevicius P[5], Alcazar JL[6], Franchi D[7], Mancari R[7], Moruzzi MC[1], Jurkovic D[8], Chiappa V[9], Guerriero S[10], Exacoustos C[11], Epstein E[12], Frühauf P[13], Fischerova D[13], Fruscio R[14], Ciccarone F[1], Zannoni GF[15], Scambia G[1], Valentin L[5,16], Testa AC[17].

Retrospective multicentric international study

Objective: Describe the clinical and US characteristics of **uterine sarcomas**

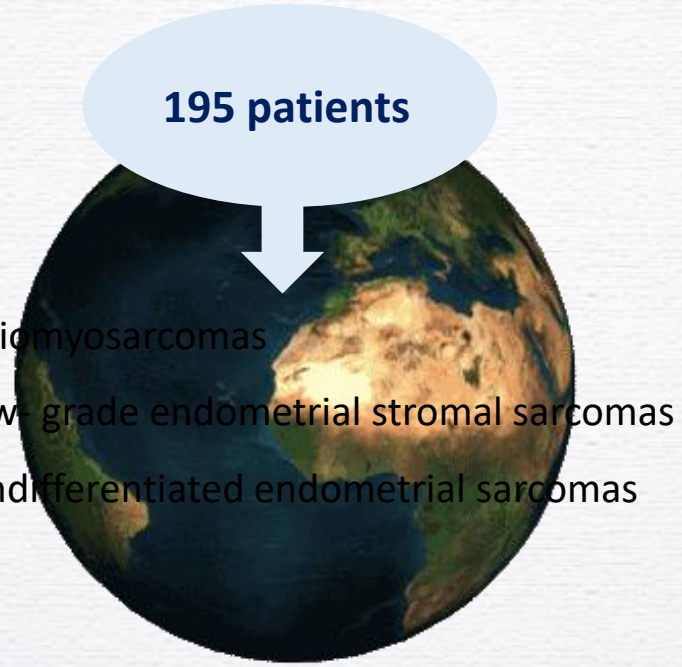
Ultrasound

Methods: Databases of 13 ultrasound centers

Preoperative ultrasound examination between 1996 and 2016

- Rome UCSC
- Rome PTV
- Cagliari
- Bologna
- Monza
- Milan INT
- Milan IEO

- London



- Malmo
- Stockholm

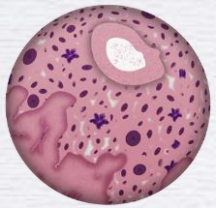
- Barcelona
- Pamplona

- Prague

Clinical features of uterine sarcomas

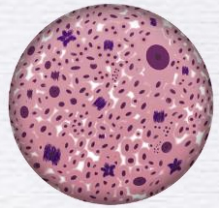
	Total	Leiomyosarcoma	Endometrial Stromal Sarcoma	Undifferentiated Endometrial Sarcoma
Age (ys)	**56** (26-86)	57 (30-86)	46 (26-79)	60 (28-84)
Post-menopause	111 **56.9**	69 (59.5)	16 (33.3)	26 (83.9)
Vaginal bleeding	91 **49.7**	42 (39.3)	28 (60.9)	21 (70.0)
Pelvic Pain	30 **16.4**	19 (17.8)	8 (17.4)	3 (10.0)
Abdominal distension	15 **8.2**	13 (12.1)	0	2 (6.7)
Asymptomatic	19 (10.4)	12 (11.2)	5 (10.9)	**2 (6.7)**

Data are expressed as **Median** (range) or **number** (%)

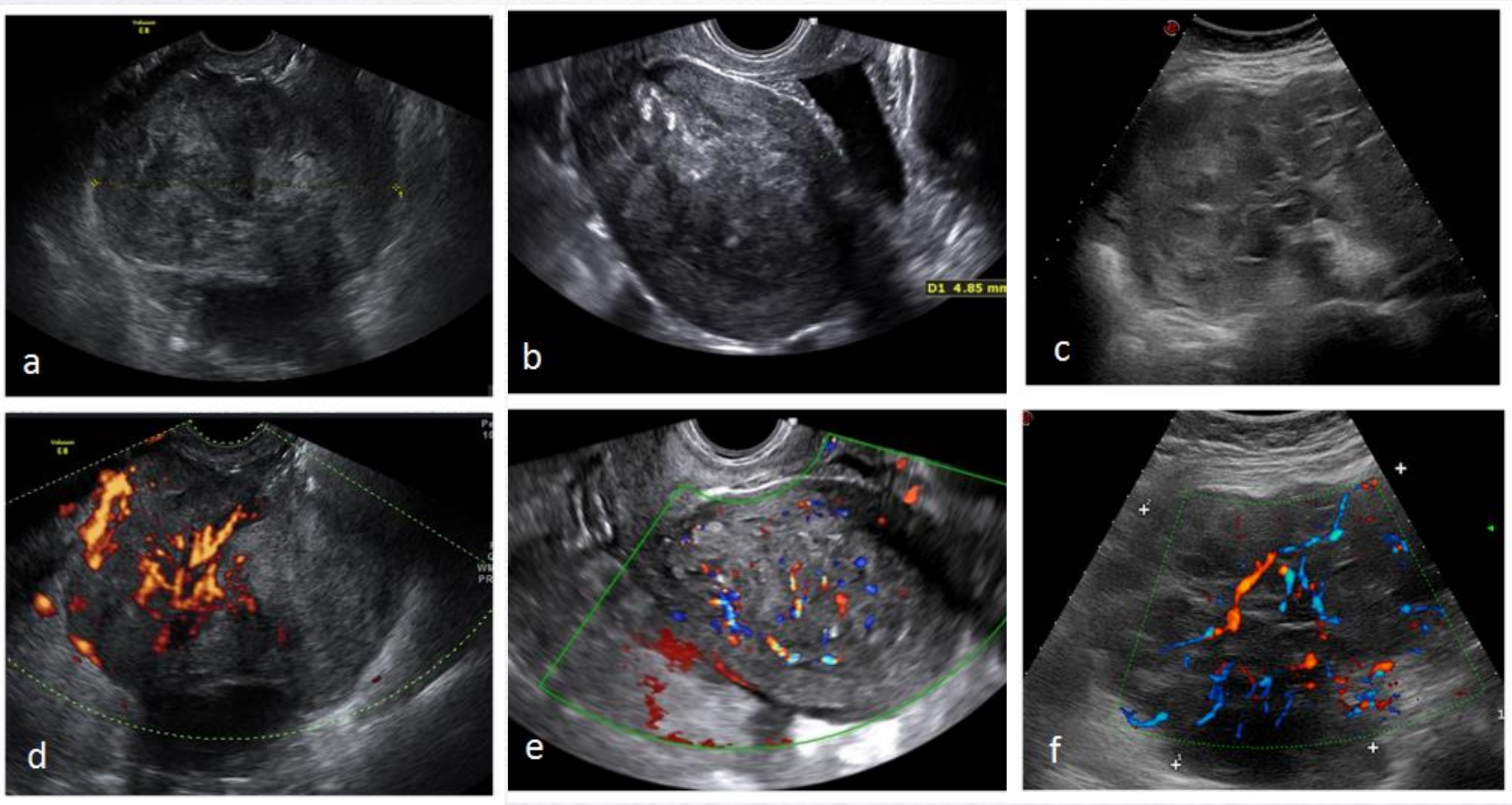


LMS

ESS



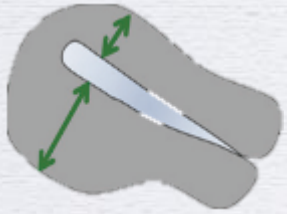
UES



Results. Ultrasound features of uterine sarcomas

Diameter

91 (7-321) mm



Free myometrium

Visible: 76%

Echostructure and tumor borders

Inhomogeneous
Irregular margins

sarcoma

Vascularization

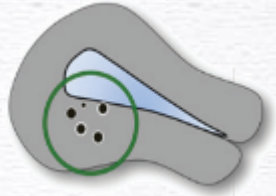
Color score 3/4

sarcoma

Calcifications

Absence of calcifi

sarcoma



Cystic areas

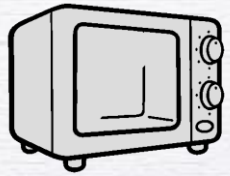
Presence of irregular cistic areas

sarcoma

Shadowing

Absence of shado

sarcoma

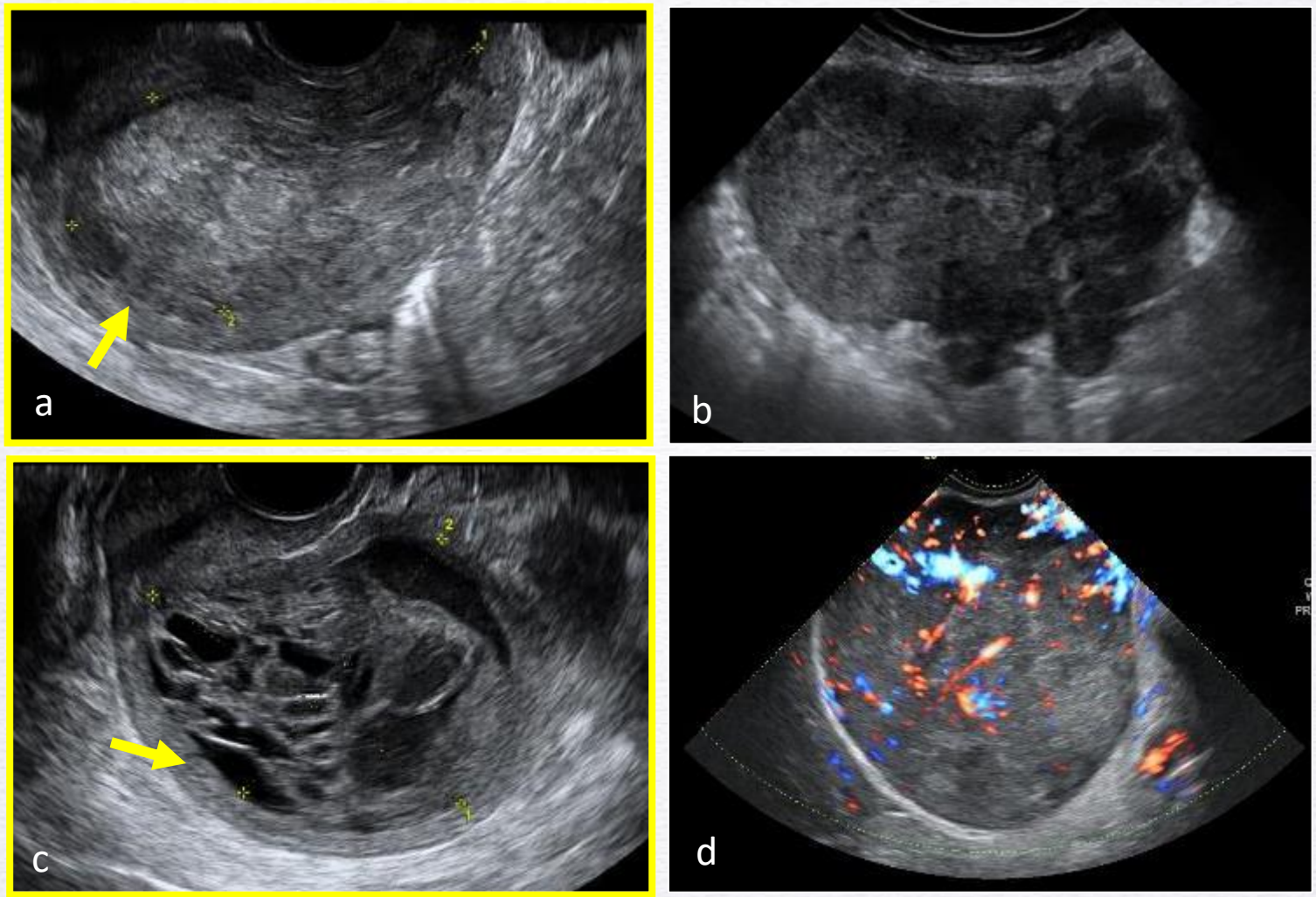


«Cooked» aspect

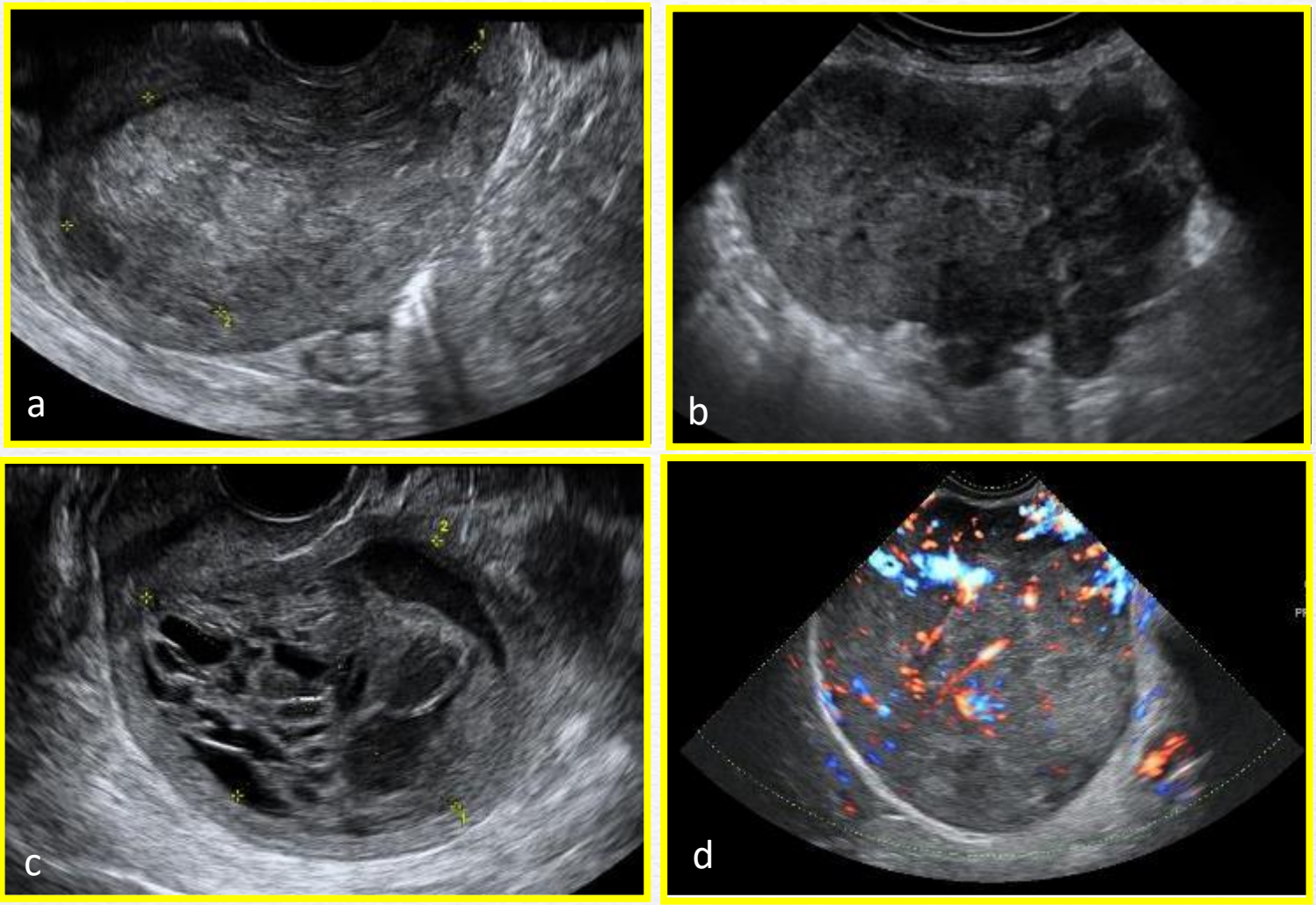
Presence of cooked aspect

sarcoma

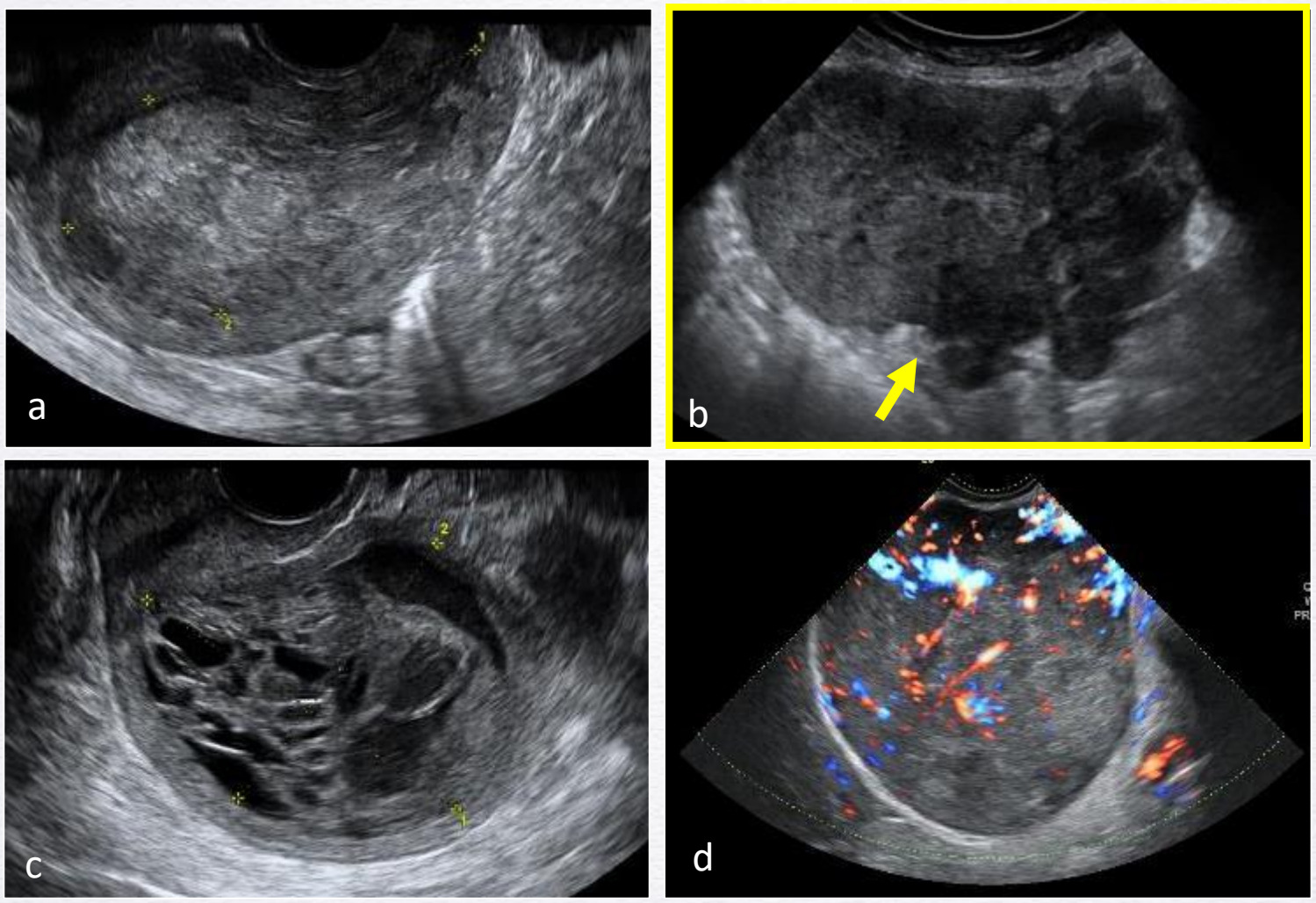
Non visible myometrium (76.4%)



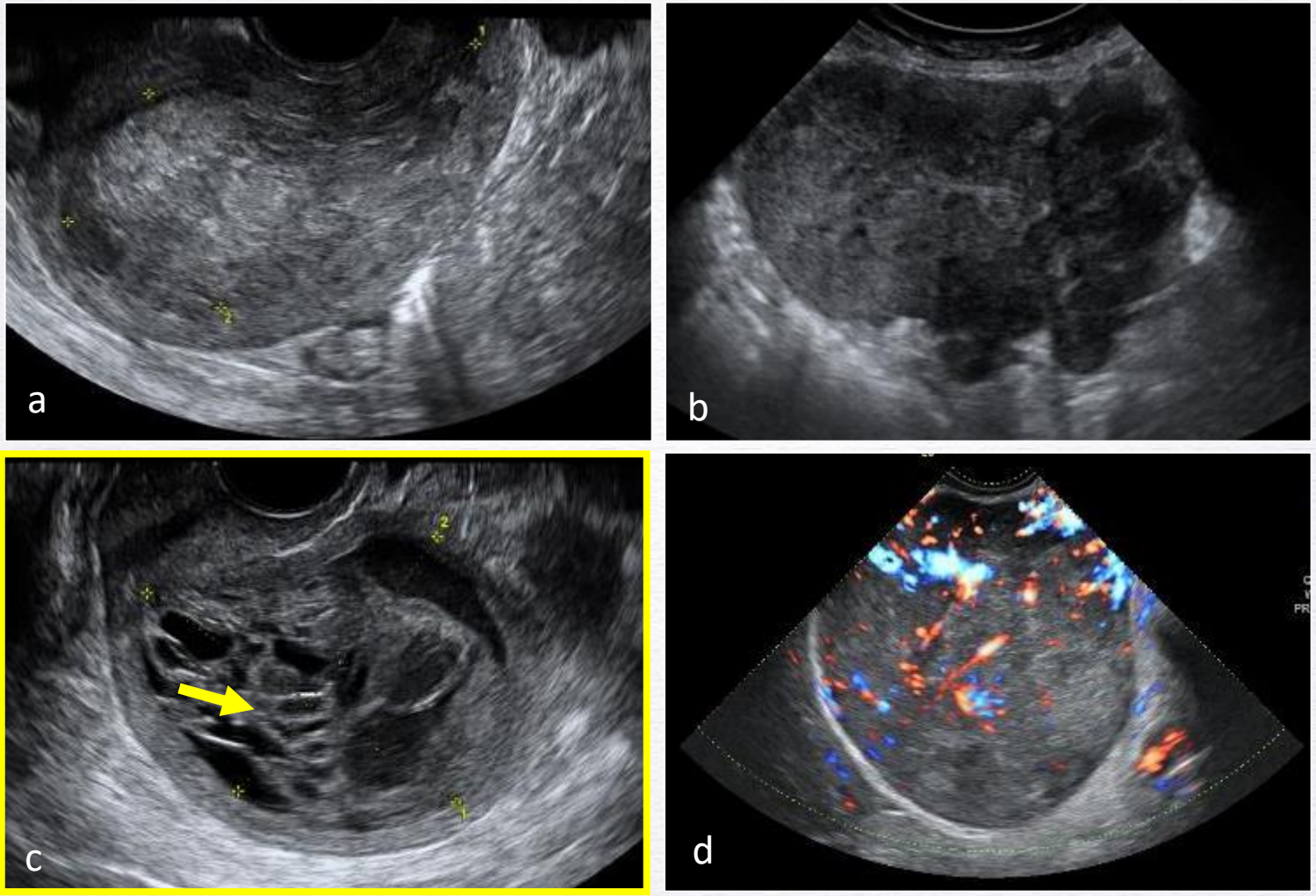
Non-uniform echogenicity (77.9%)



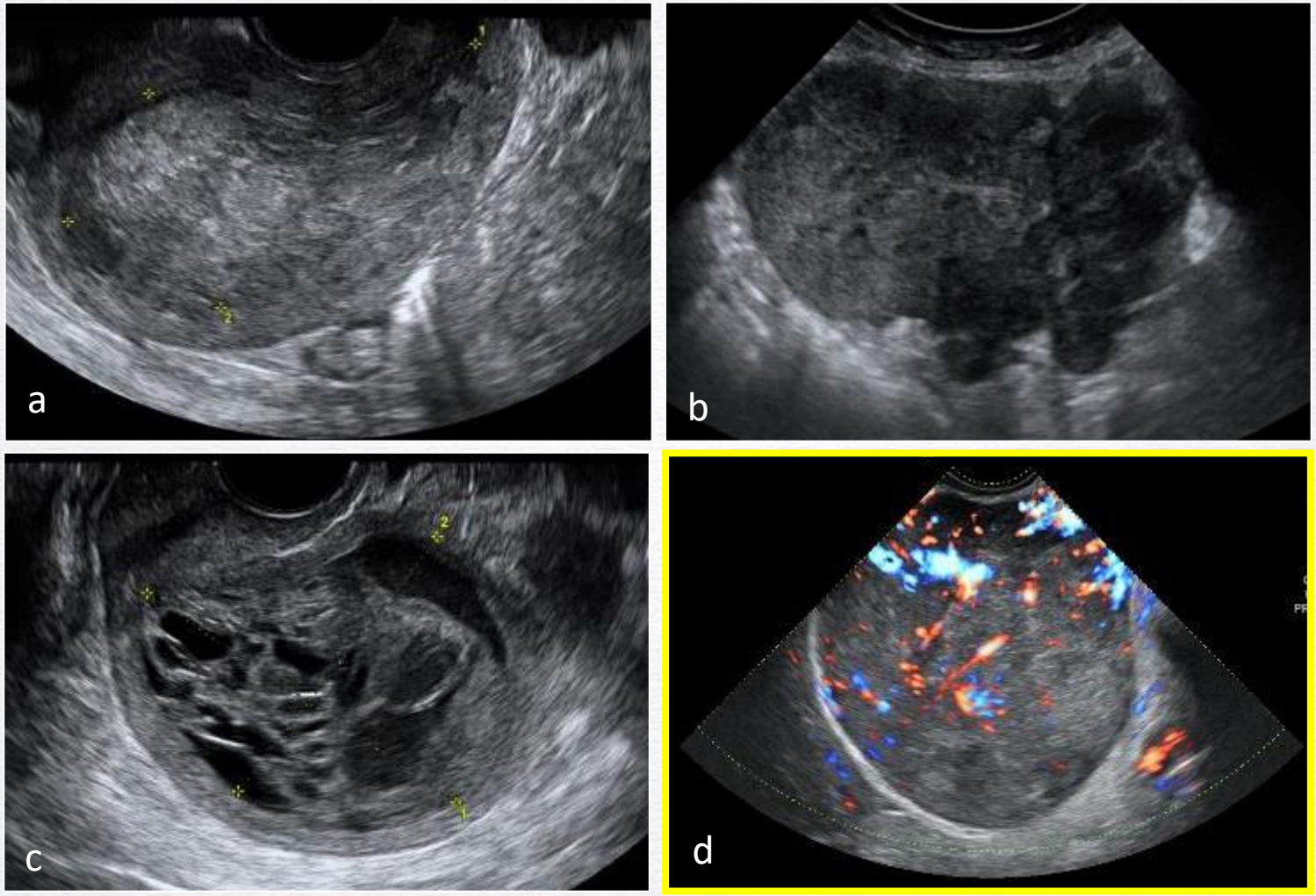
Irregular tumor borders (52.8%)



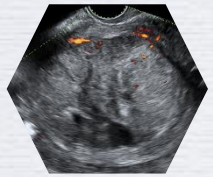
Cystic areas (44.6%)

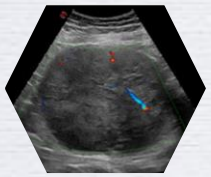


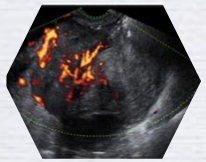
Moderate or rich vascularization (67.9%)

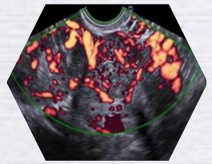


Color score





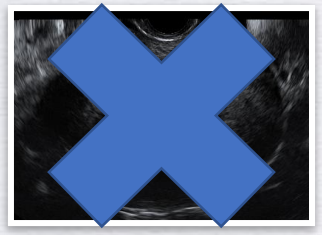




	Total	Leiomyosarcoma	Endometrial Stromal Sarcoma	Undifferentiated Endometrial Sarcoma
Color score 1	6 **3.2**	5 (4.5)	1 (2.1)	0
Color score 2	54 **28.9**	27 (24.3)	19 (40.4)	8 (27.6)
Color score 3	73 **39**	45 (40.5)	16 (34)	12 (41.4)
Color score 4	54 **28.9**	34 (30.6)	11 (23.4)	9 (31.0)

Data are expressed as **Median** (range) or **number** (%)

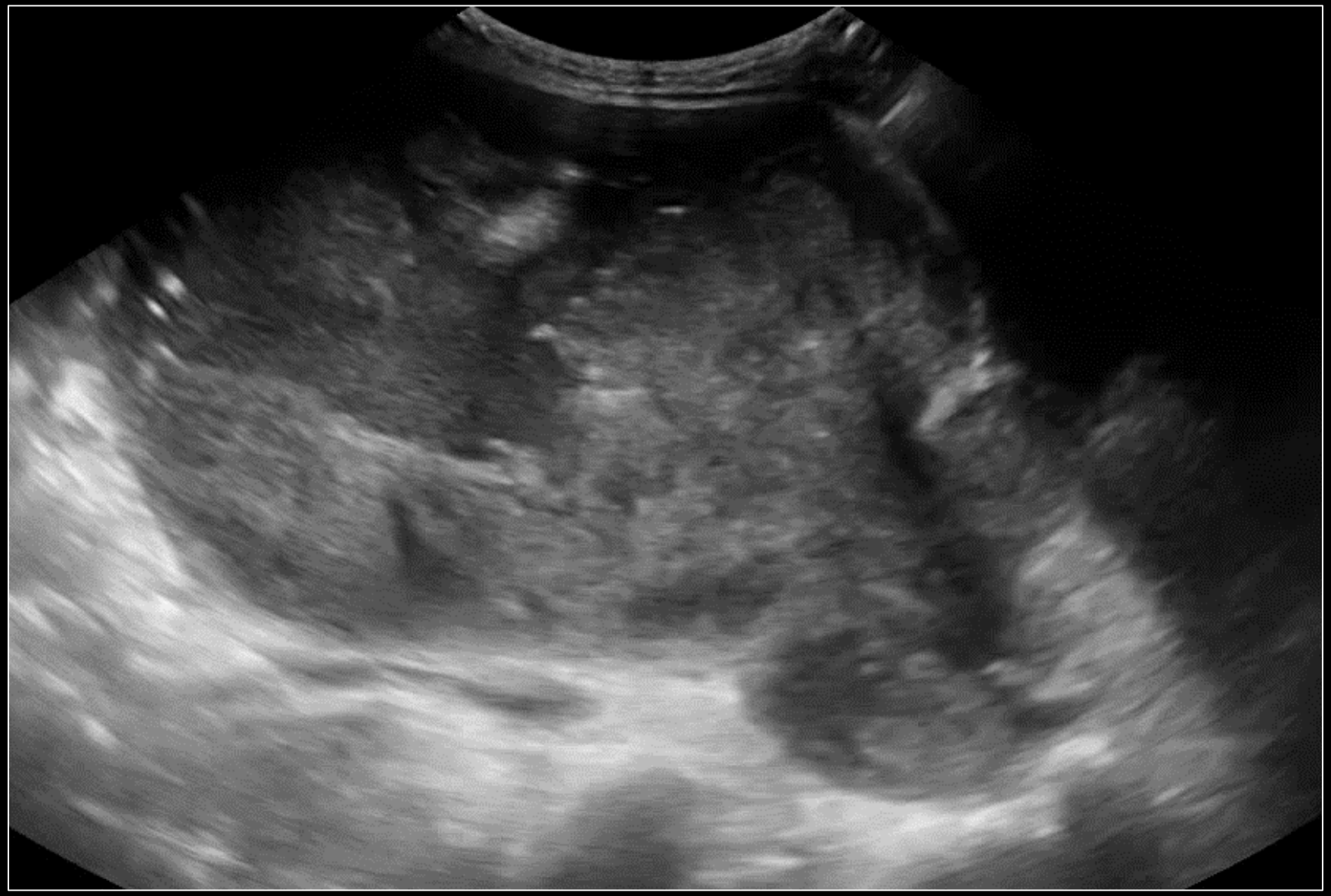
Ultrasound findings



	Total	Leiomyosarcoma	Endometrial Stromal Sarcoma	Undifferentiated Endometrial Sarcoma
Shadowing	146			
Absent	104 (76.0)	82 (71.3)	37 (78.7)	27 (90)
Sparse	42 (21.9)	32 (27.8)	8 (17.0)	2 (6.7)
Calcifications Absent	163 (90.1)	97 (89.0)	40 (90.9)	26 (92.9)
Morphological aspect of a typical benign myoma?	28 (14.5)	18 (15.8)	9 (18.8)	1 (3.2)

Data are expressed as **Median** (range) or **number** (%)

Uterine sarcomas: is there a US sign of necrosis?



What’s next?

MYLUNAR Materials and methods

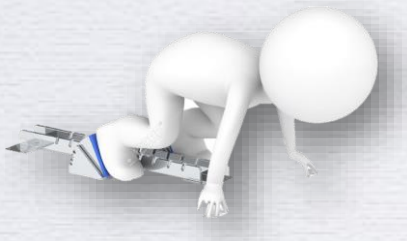
Prospective study with large series

To define the best management of myometrial lesion

END POINTS

- Accuracy of the algorithm in **identifying uterine sarcomas**
- Accuracy of **subjective assessment** in detecting uterine sarcomas
- To compare clinical and US characteristics of **benign myometrial lesion** vs **uterine sarcomas**

MYLUNAR Materials and methods



2019 January → 2021 December → 2 years Fup

2633 patients

ORANGE CARD

- Age, symptoms, LDH ☐
- Lesion size ☐
- Margins ☐
- Cystic areas ☐
- Acoustic shadow ☐
- Color score ☐
- Cooked aspect ☐

Ultrasound
≥3 cm myometrial lesion

White

Green

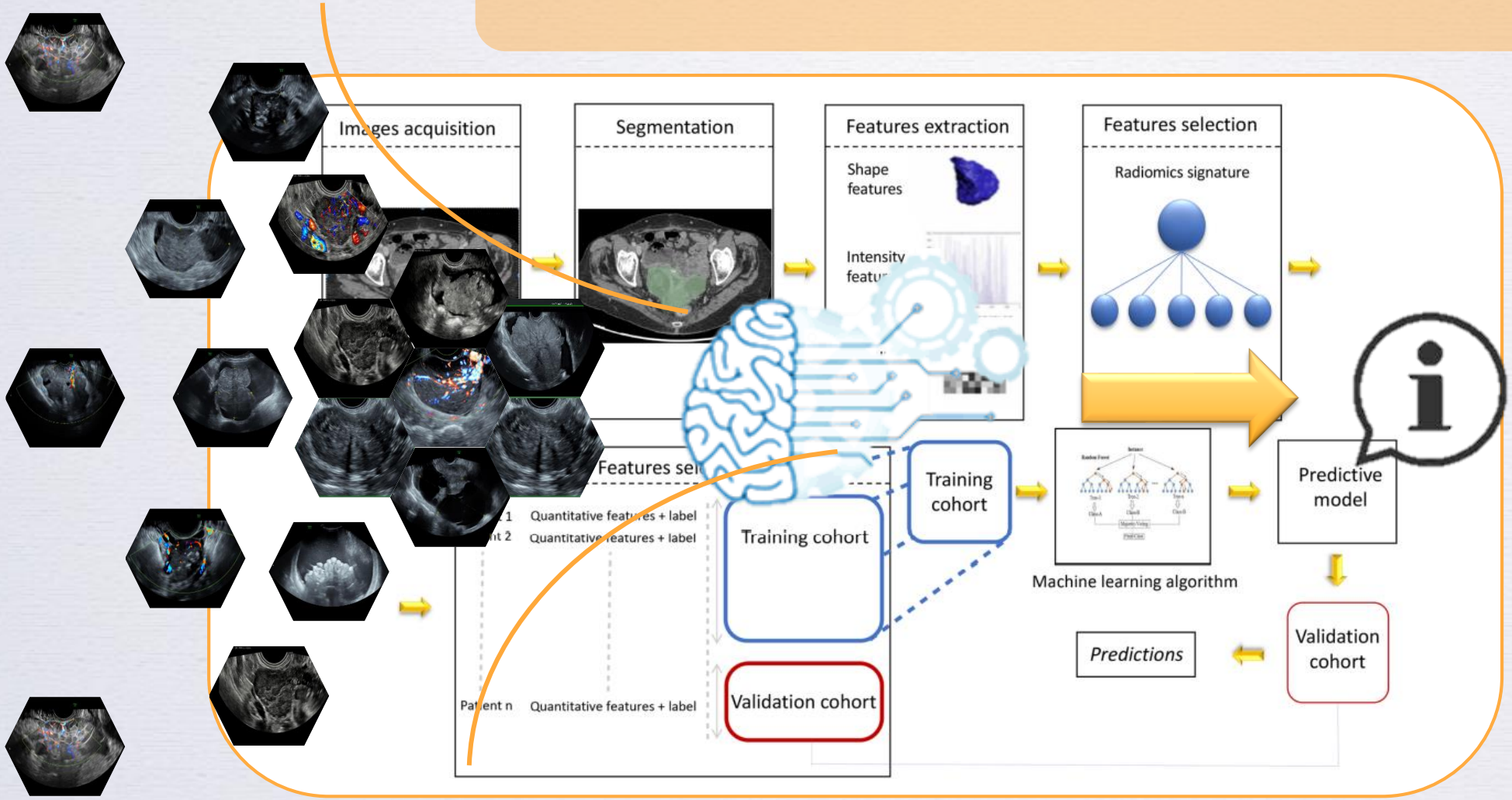
Orange

FUTURE PERSPECTIVES

Radiomics analysis

Radiomics

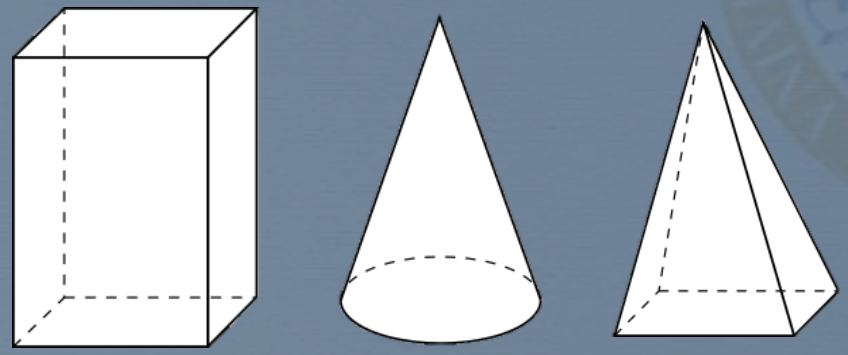
Radiomics is the extraction of **quantitative data** from images, which **cannot be assessed visually**



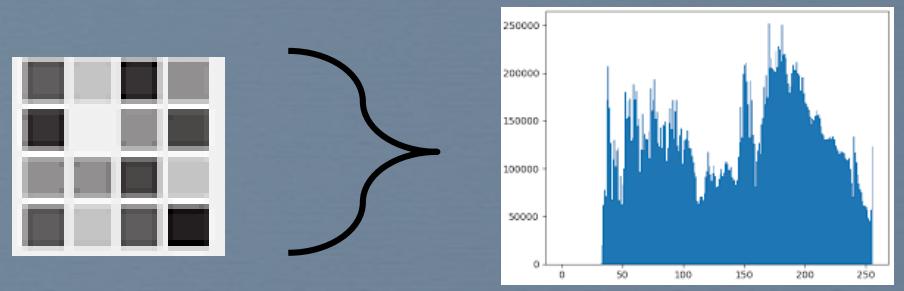
Nougaret et al. 2020

Radiomics features

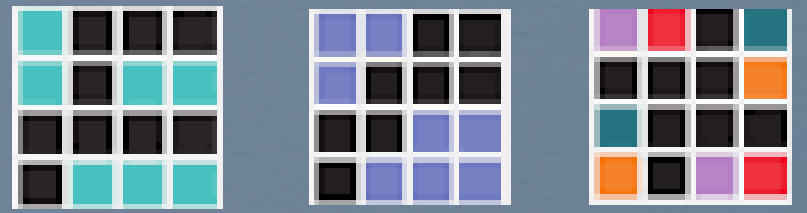
MORPHOLOGICAL FEATURES



STATISTICAL FEATURES

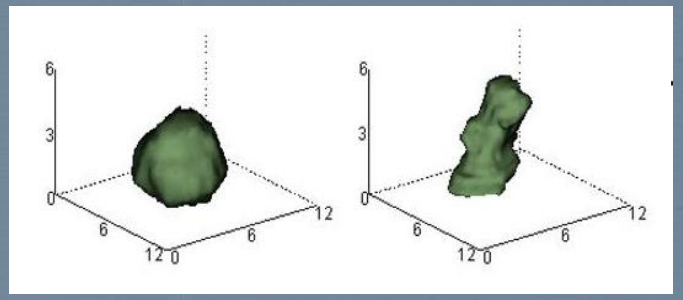


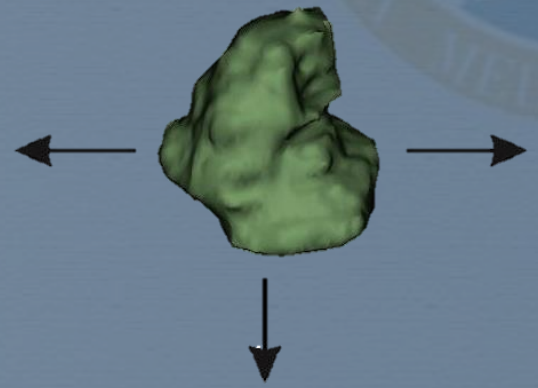
TEXTURAL FEATURES



Radiomics features

MORPHOLOGICAL FEATURES

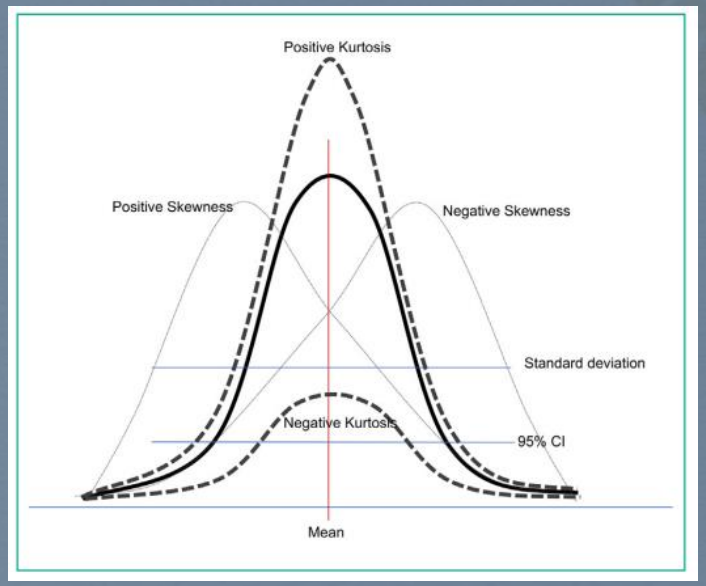




Morphological features **describe geometric aspects** of a region of interest (ROI), such as **area** and **volume.** Morphological features are based on ROI voxel representations of the volume.

Radiomics features

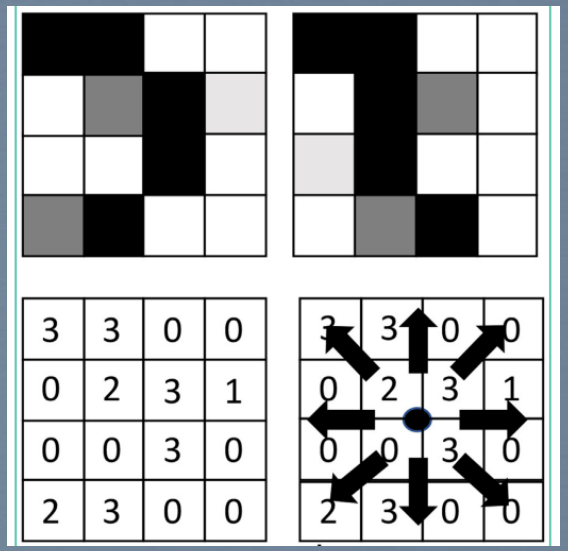
STATISTICAL FEATURES



Statistical features are **related to the frequency distribution of the pixel intensity** inside the ROI.
The intensity-based statistical features describe **how gray levels within the ROI are distributed.**

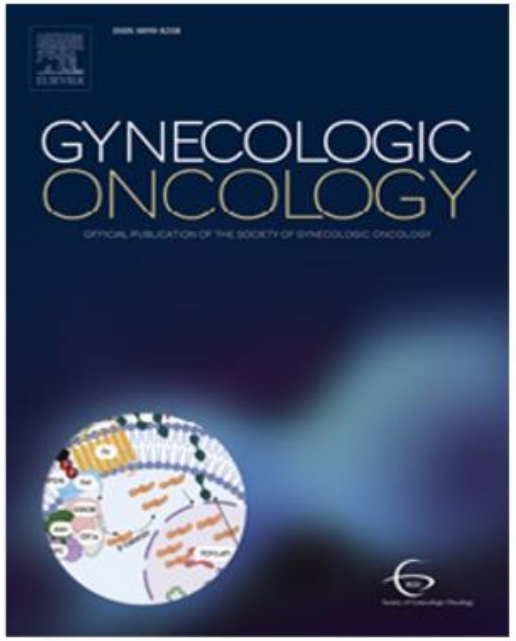
Radiomics features

TEXTURAL FEATURES



The textural features provide information on **how different levels of gray of neighboring pixels are distributed** in the image and characterize **spatial relationships** between pixels.

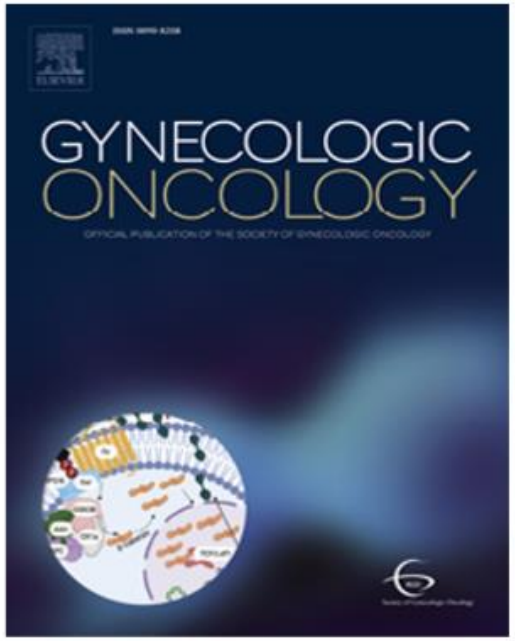
ADMIRAL pilot study



Using rADioMIcs and machine learning with ultrasonography for the differential diagnosis of myometRiAL tumors (the ADMIRAL pilot study). Radiomics and differential diagnosis of myometrial tumors

V. Chiappa [a,*], M. Interlenghi [b], C. Salvatore [b], F. Bertolina [a], G. Bogani [a], A. Ditto [a], F. Martinelli [a], I. Castiglioni [c,1], F. Raspagliesi [a,1]

[a] *Gynecologic Oncology, Fondazione IRCCS Istituto Nazionale Tumori di Milano, Italy*
[b] *DeepTrace Technologies S.R.L., Milan, Italy*
[c] *Dipartimento di Fisica G. Occhialini, University of Milan-Bicocca, Milan, Italy*



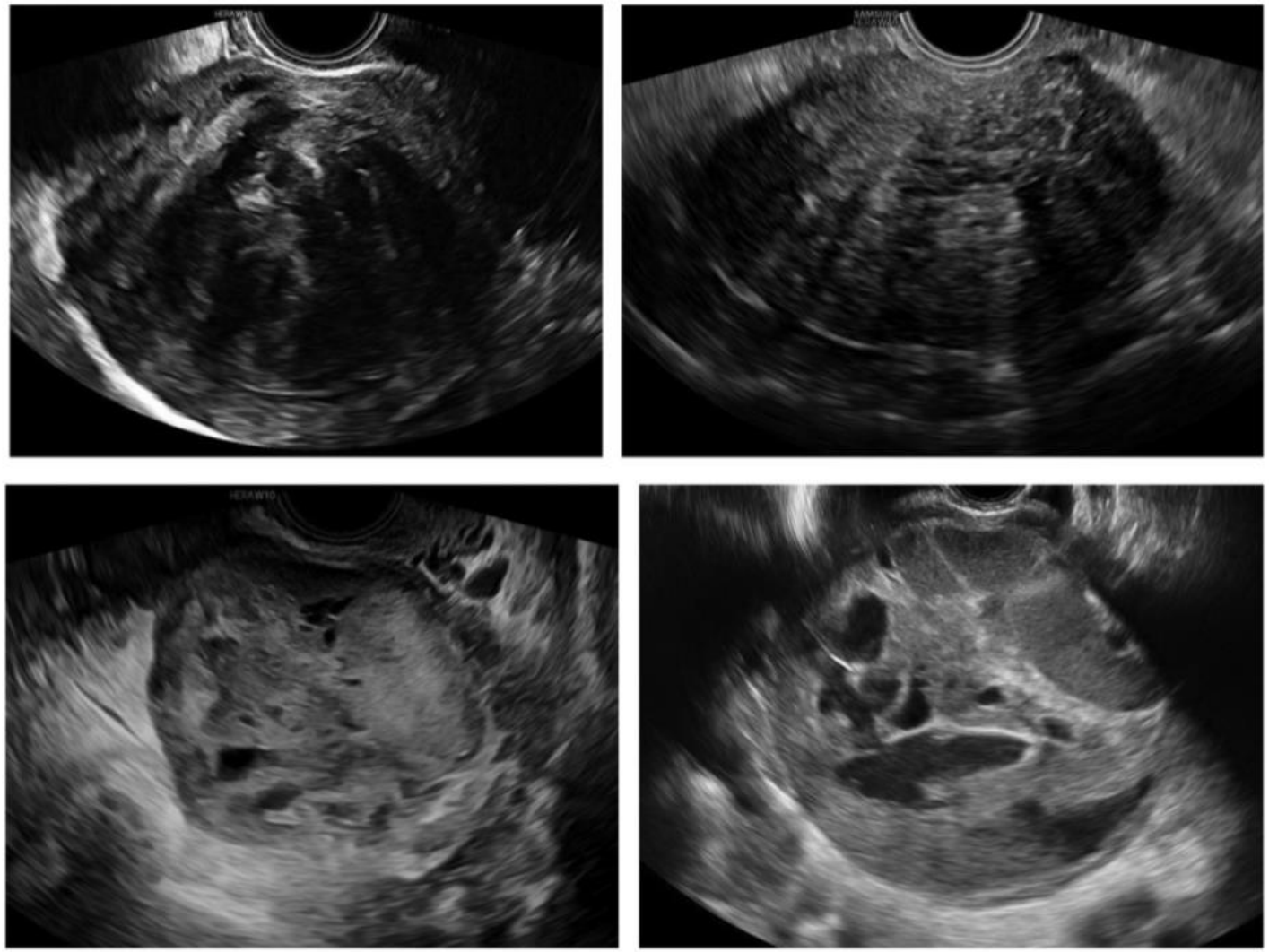
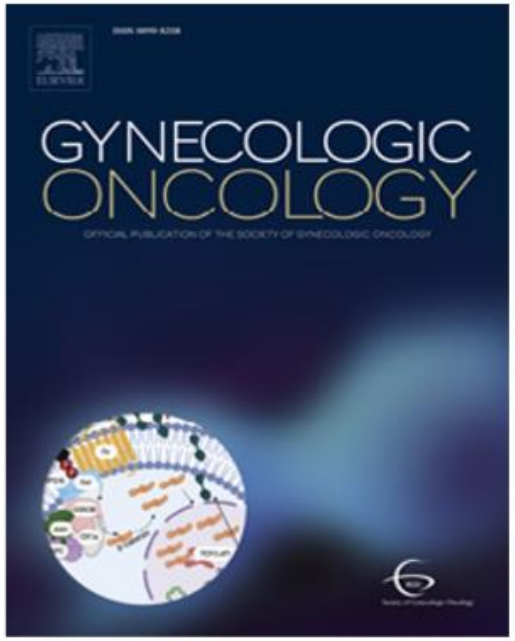


Fig. 1. US recurrent characteristics of uterine mesenchymal tumors: uterine myomas (1A and 1B) are usually solid lesions showing homogeneous echogenicity and shadows; uterine sarcomas (1C and 1D) are solid or multilocular-solid lesions showing inhomogeneous echogenicity, no shadows, irregular cystic areas.



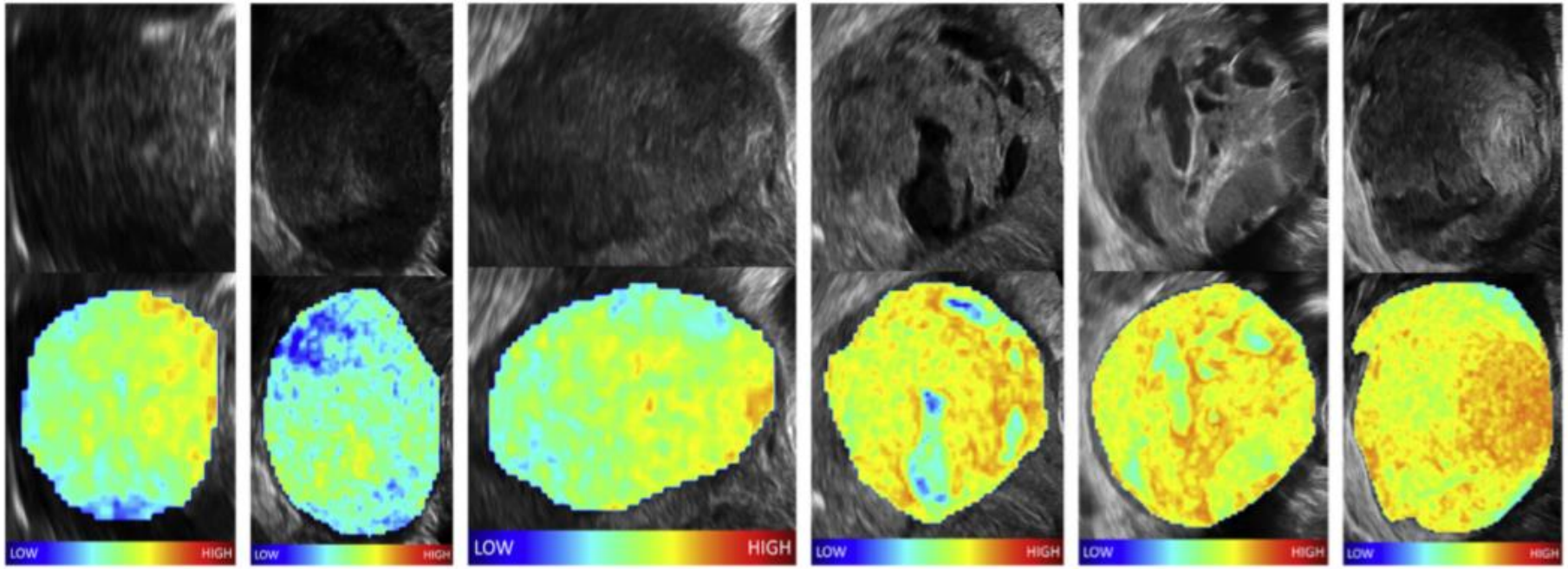


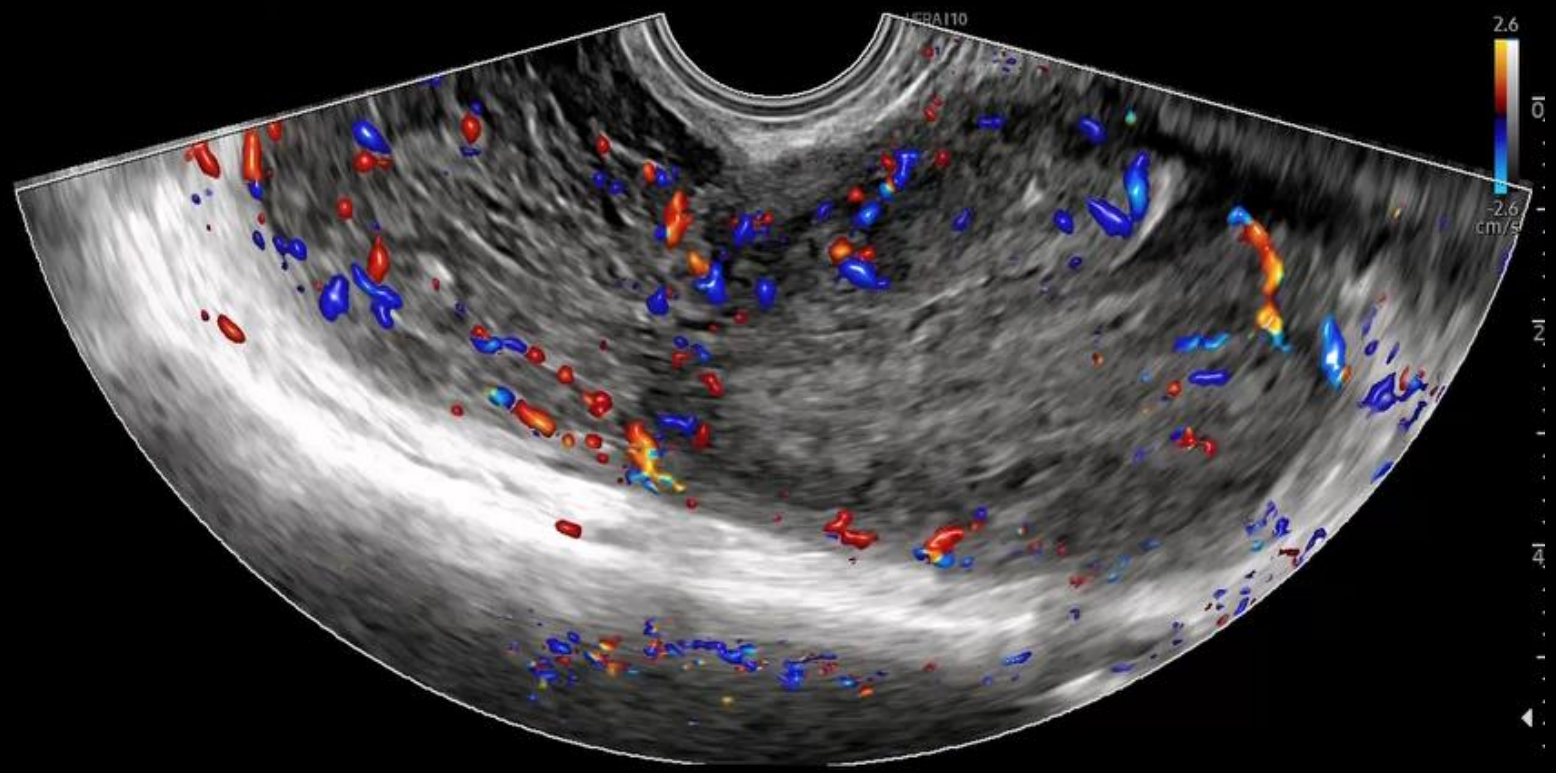
Fig. 2. Local spatial distribution of the feature Entropy evaluated on the Gray-Level Co-occurence Matrices: Sarcoma (2 a,b,c) and Myoma (2 d,e,f).

CLINICAL CASES

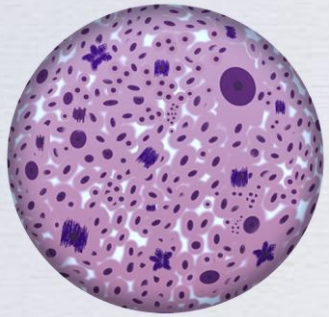
67 years old

Ultrasound examination showed the uterine corpus completely subverted by the presence of hypoechoic tissue, with multiple cystic areas and hyperechoic striae, of 92x45 mm in size. Free myometrial wall of 2 mm.

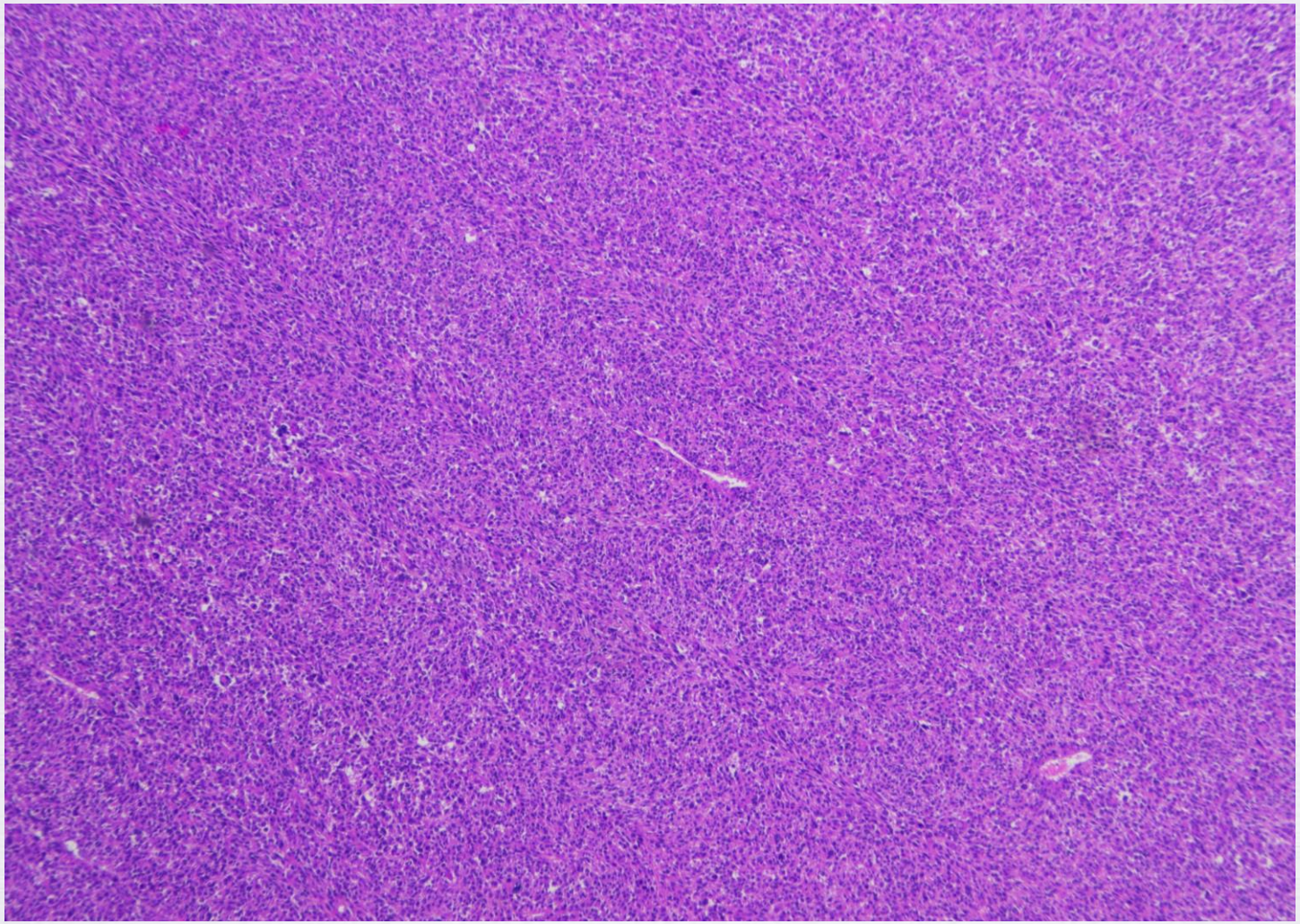
67 years old



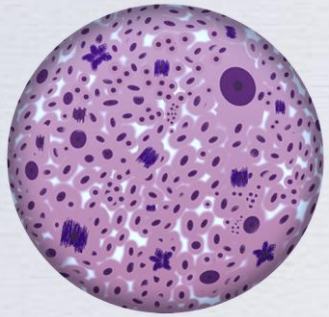
The lesion was richly vascularized at color Doppler examination



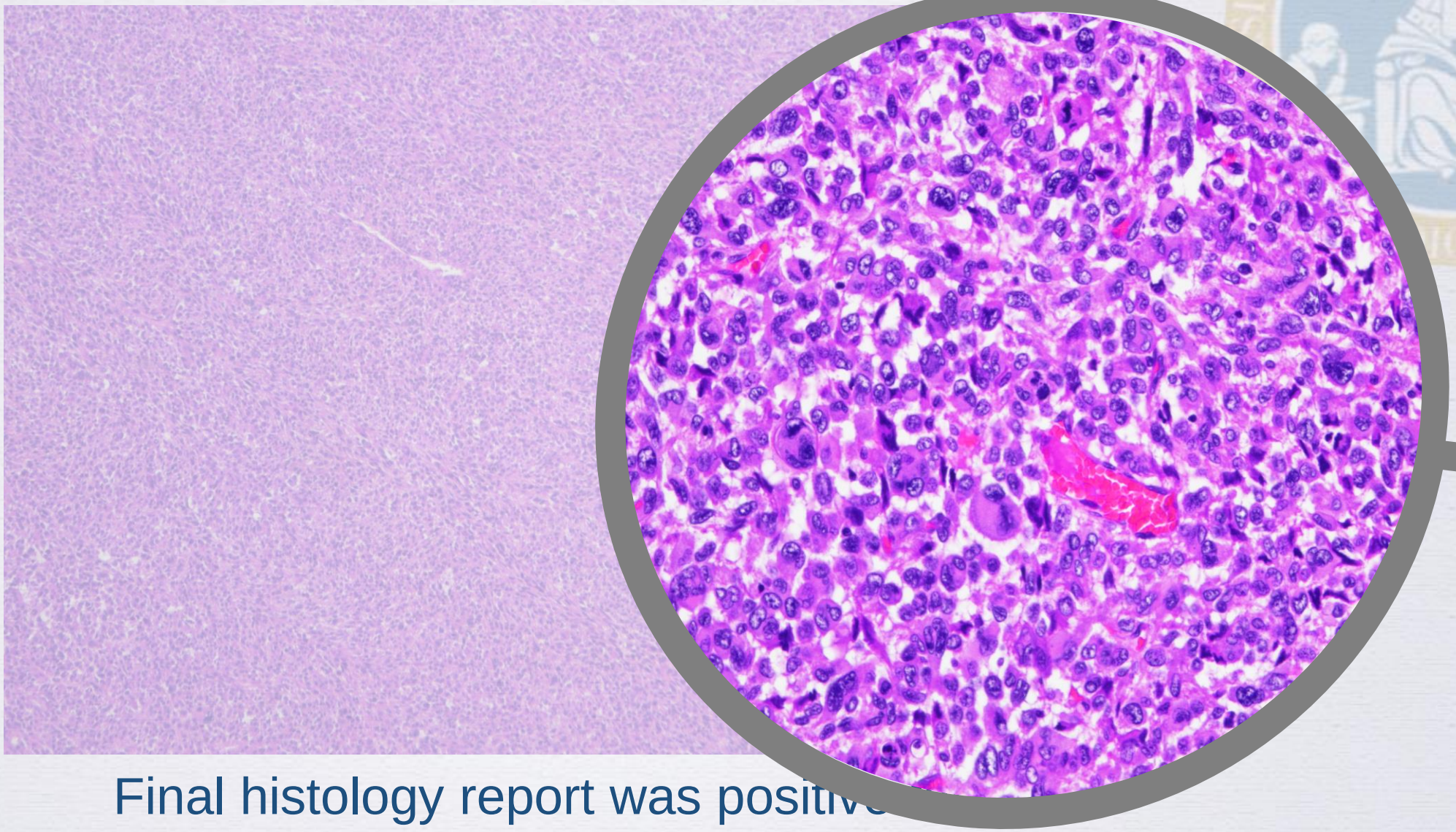
HISTOLOGY



Final histology report was positive for **undifferentiated sarcoma.**



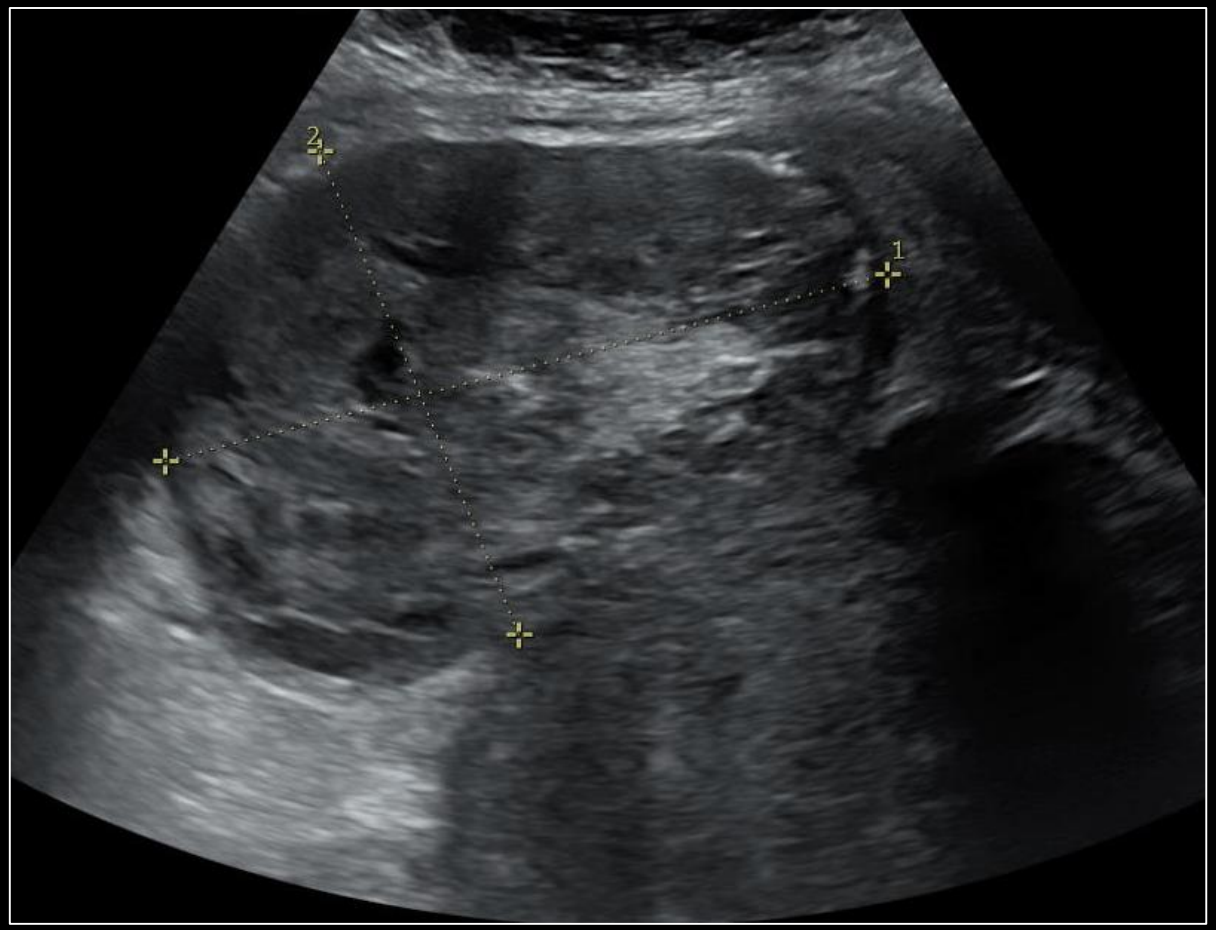
HISTOLOGY



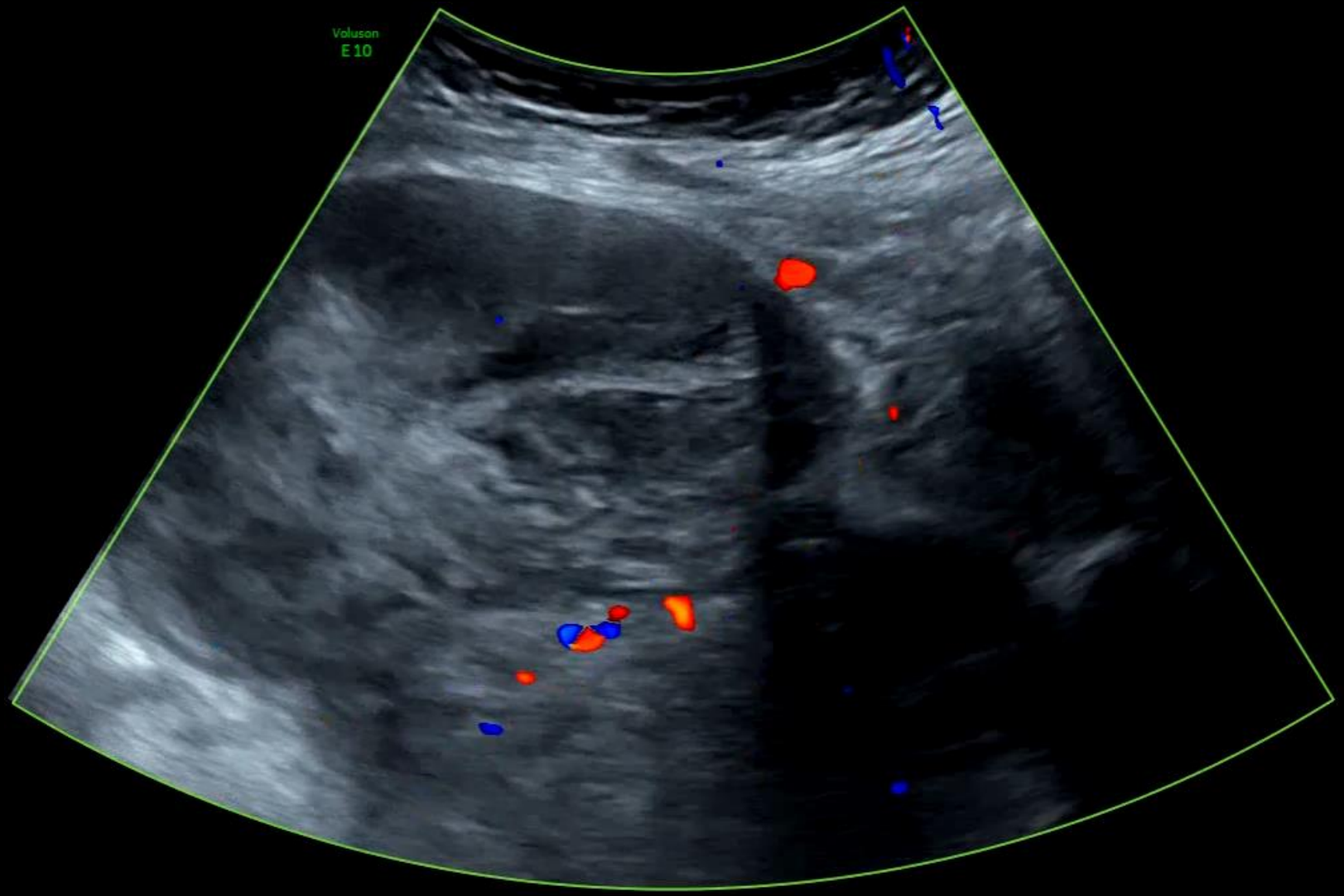
Final histology report was positive for

undifferentiated sarcoma.

60 years old

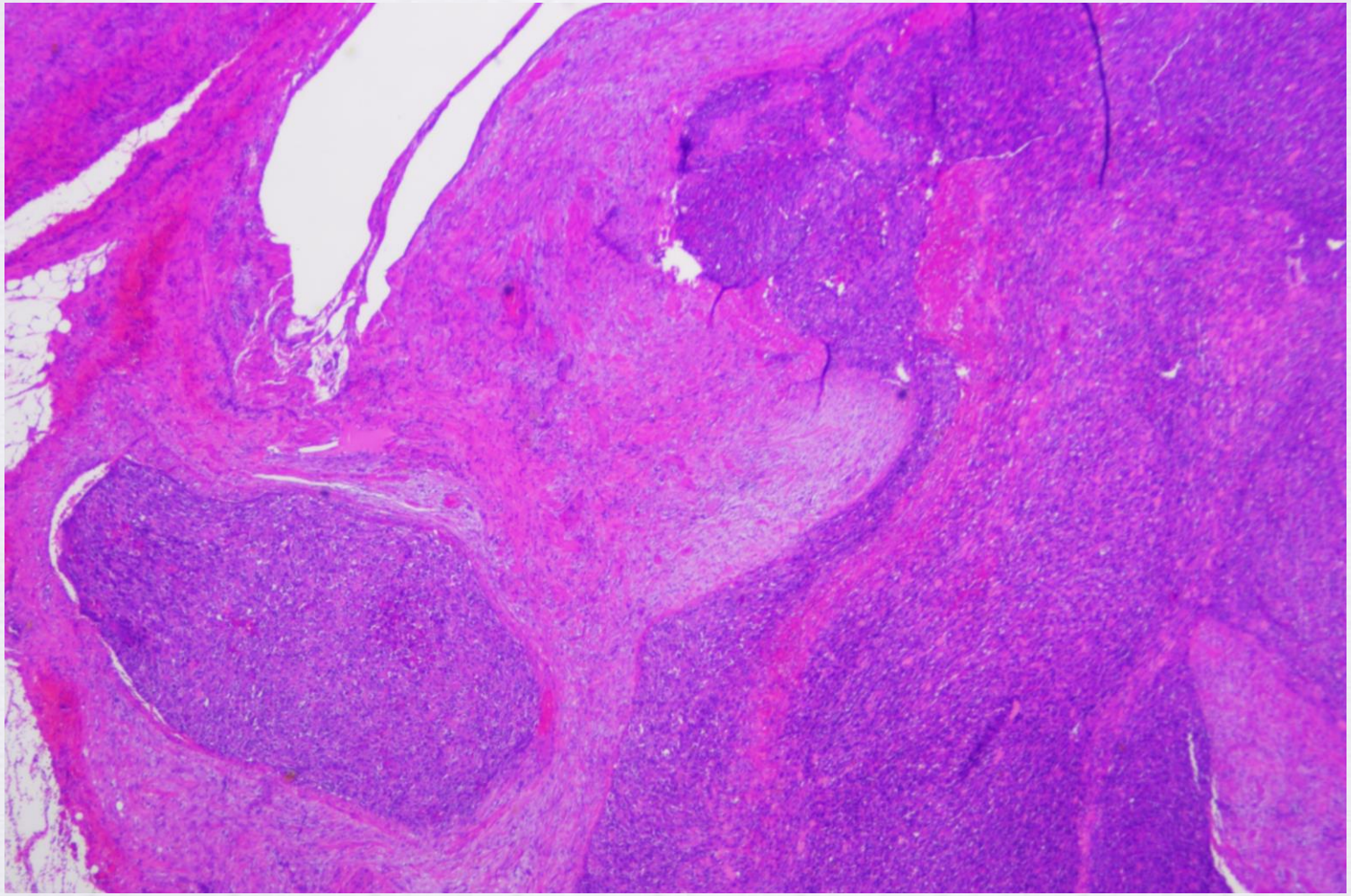


Ultrasound examination showed an enlarged uterus of 123x97x85 mm in size, with a widely subverted echostructure.
Transabdominal ultrasound showed a solid lesion, originating from the left anterolateral uterine wall and in apparent continuity with the uterus, of 94x66x140 mm in size, with irregular margins, inhomogeneous echostructure due to the presence of colliquative areas.



The lesion was moderately vascularized at color Doppler examination.

HISTOLOGY



Final histology report was positive for **high-grade endometrial stroma sarcoma with peritoneal, periureteral and ovarian localizations.**

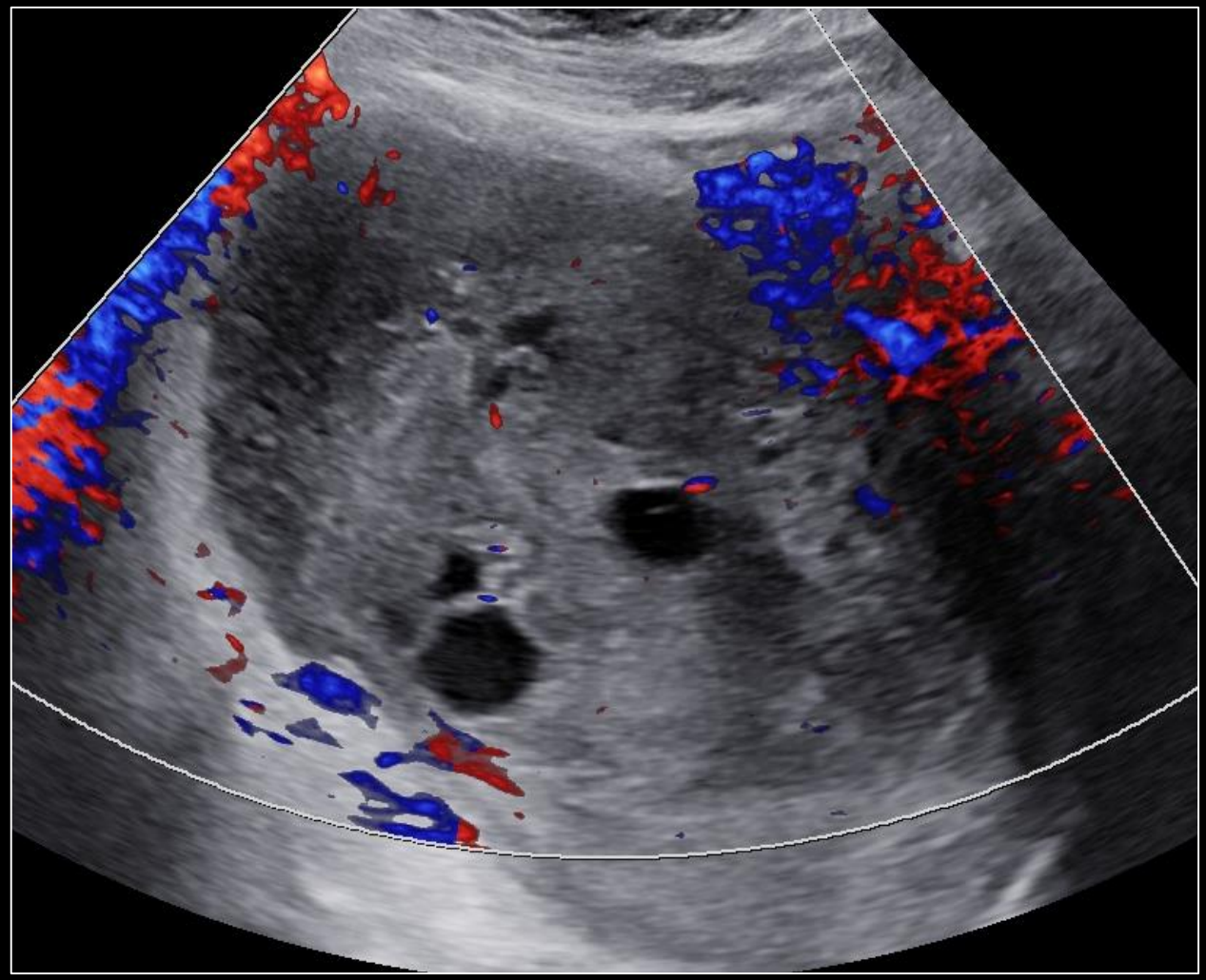
HISTOLOGY

Final histology report was positive for **high-grade endometrial stroma sarcoma with peritoneal, periureteral and ovarian localizations.**

47 years old

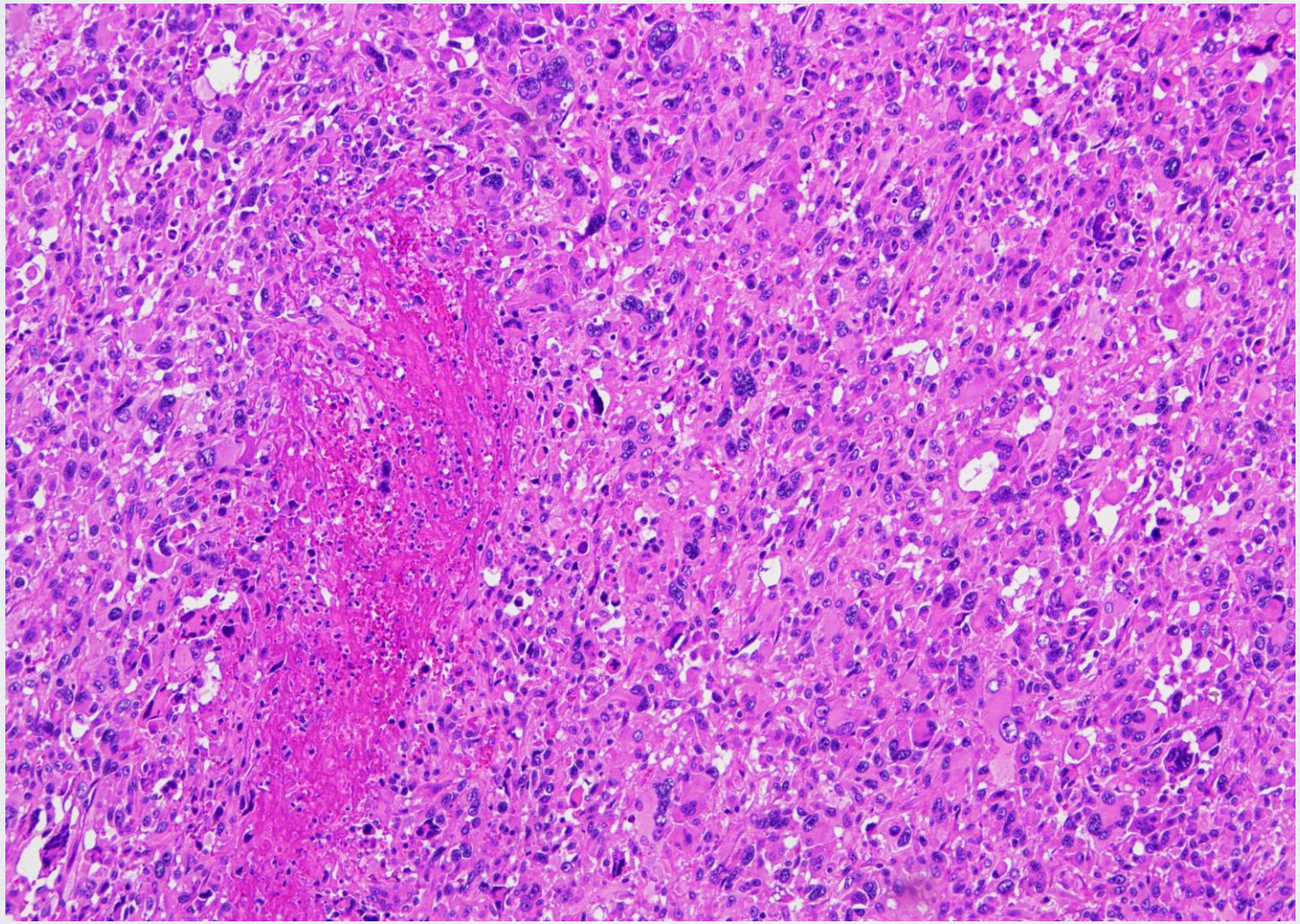
Transvaginal ultrasound showed an irregular solid tumor, originating from the anterior uterine wall, of 117x73x87 mm in size, with irregular walls and heterogeneous echostructure, due to the presence of cystic areas, characterized by a «Coocked» aspect.

47 years old

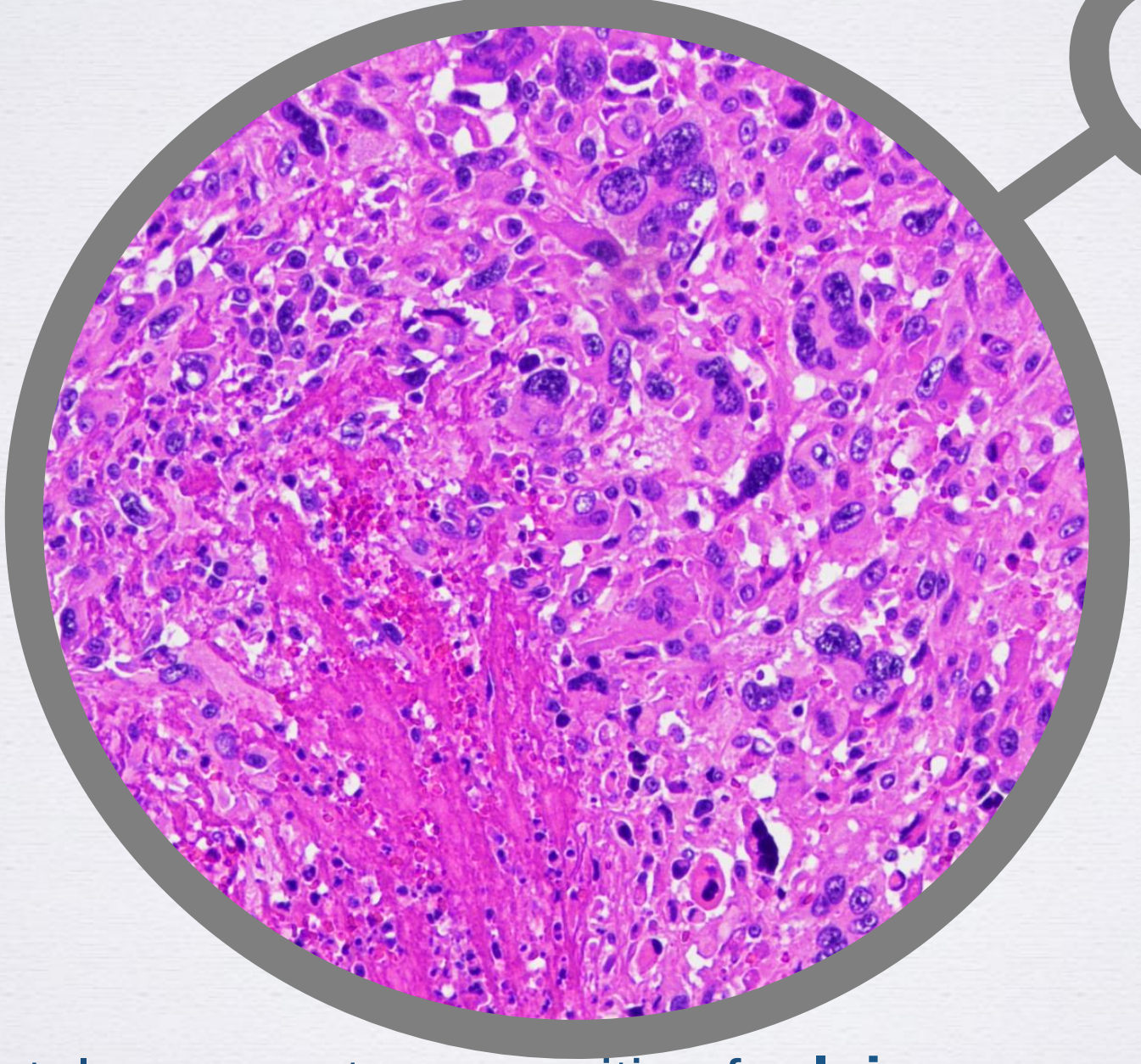


The mass showed a moderate vascularization at color Doppler examination.

HISTOLOGY



Final histology report was positive for **leiomyosarcoma with osteoclast-like giant cells.**

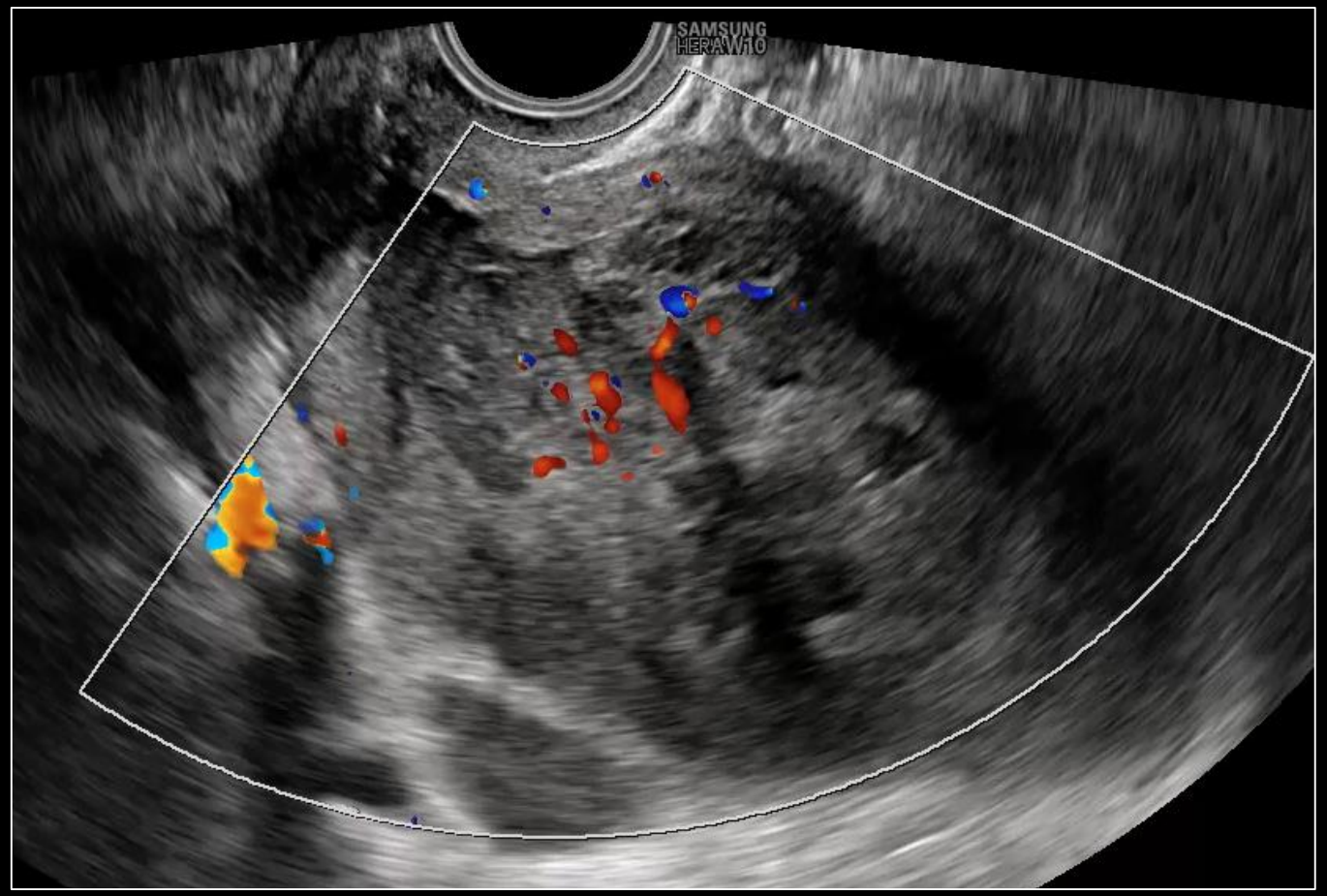


Final histology report was positive for **leiomyosarcoma with osteoclast-like giant cells.**

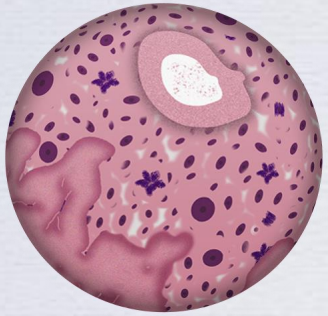
68 years old

Transvaginal ultrasound showed a uterine lesion of 67x46x68 mm in size, with inhomogeneous echogenicity, irregular margins, which appeared to infiltrate until the uterine serosa.

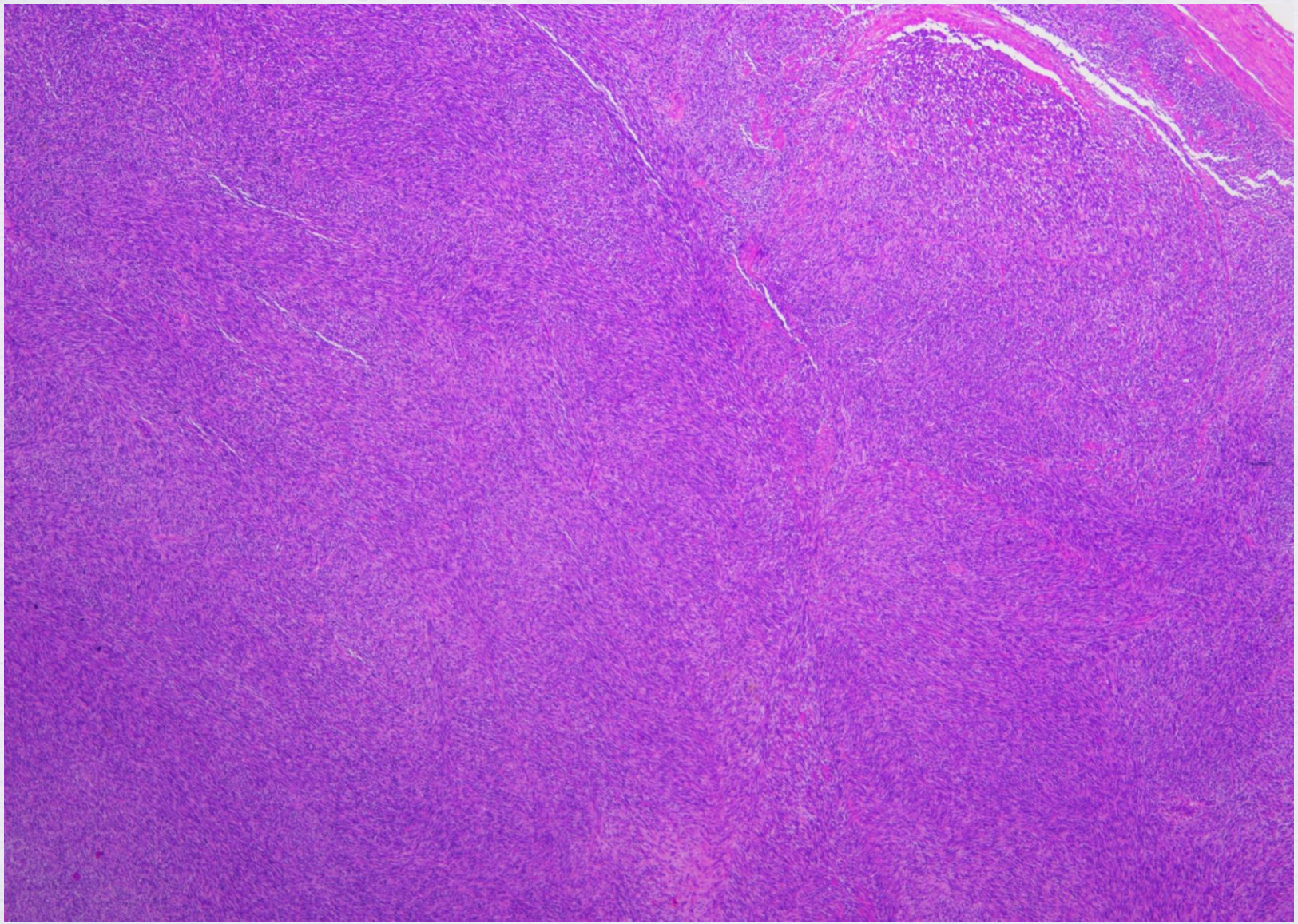
68 years old



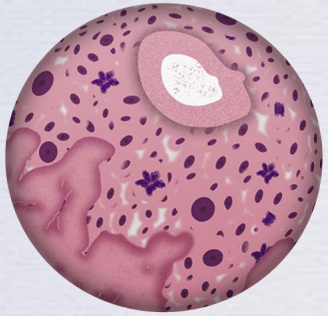
The mass showed a moderate vascularization at color Doppler examination.



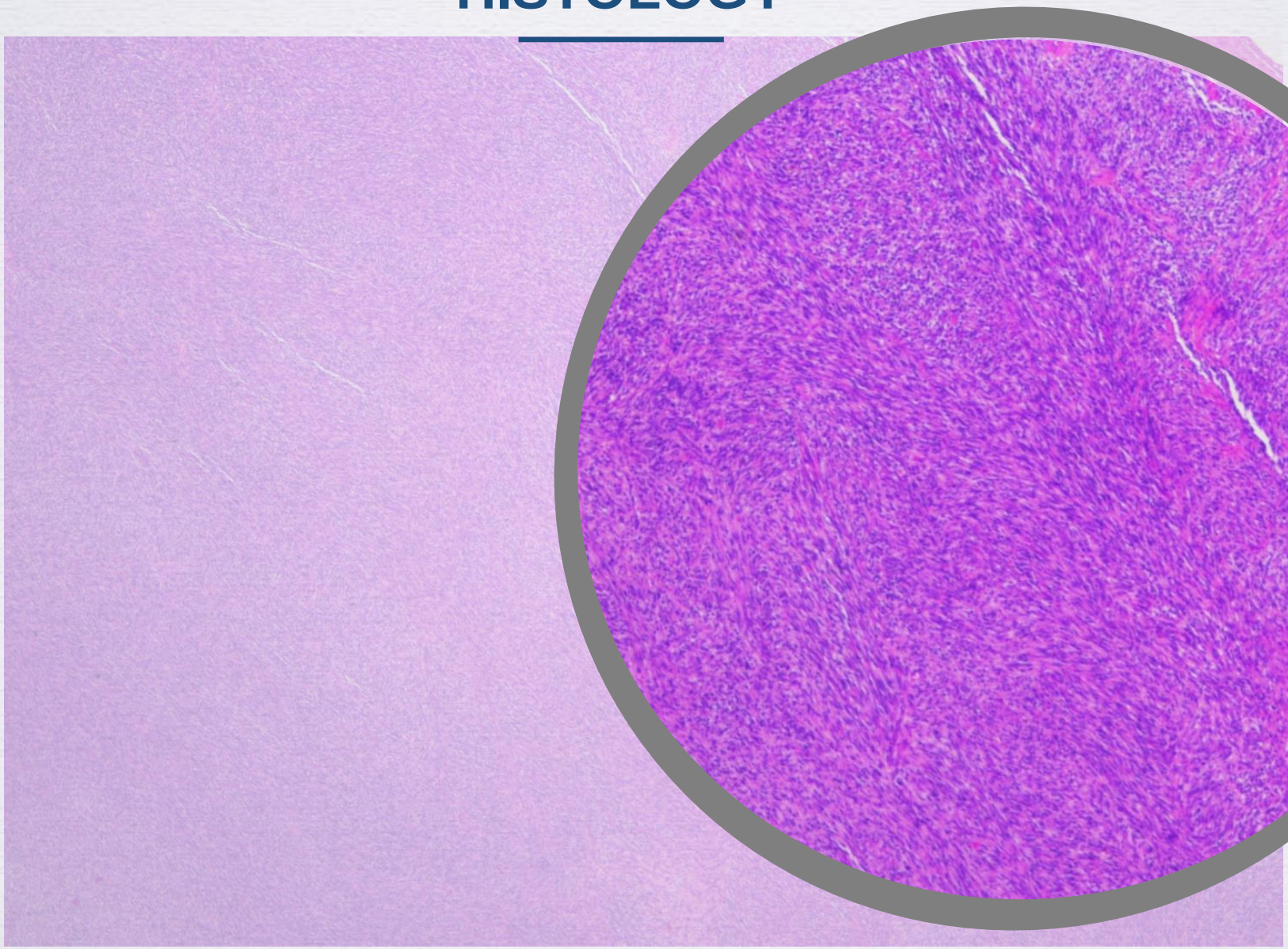
HISTOLOGY



Final histology report was positive for **leiomyosarcoma.**



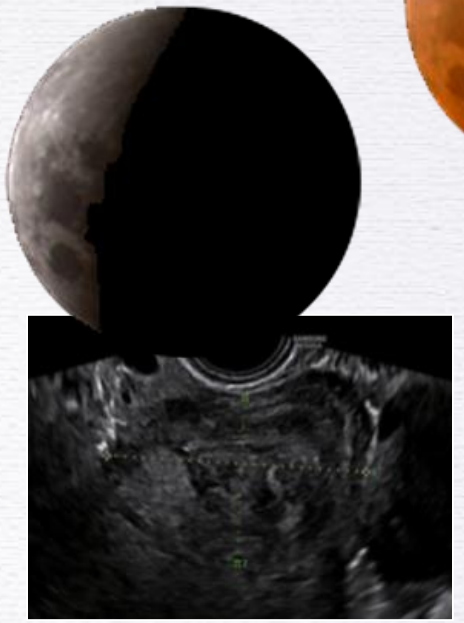
HISTOLOGY



Final histology report was positive for **leiomyosarcoma.**

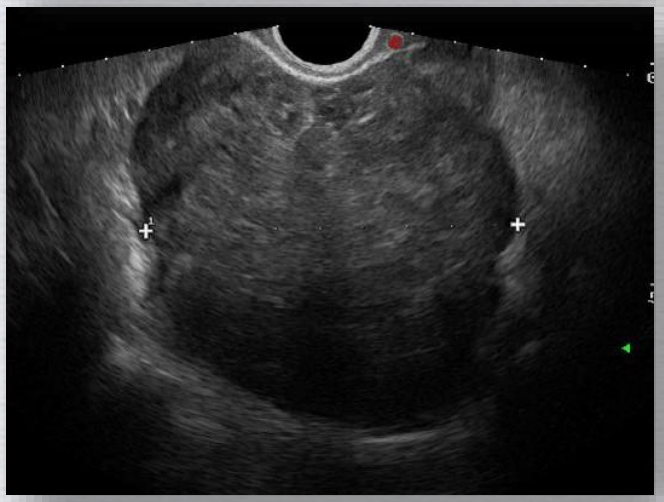
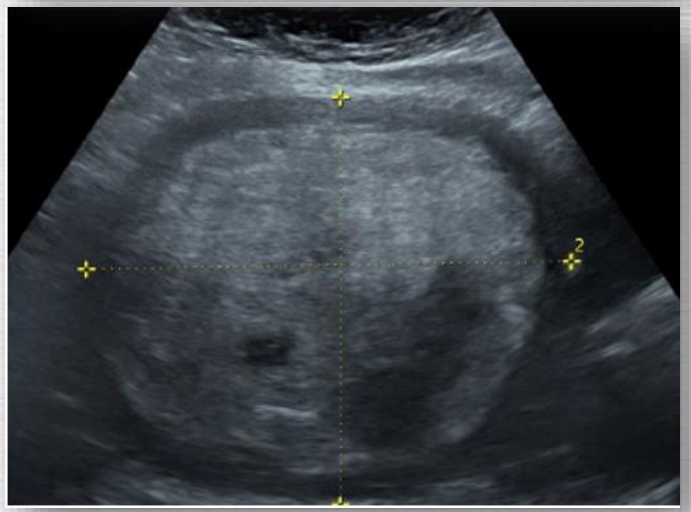
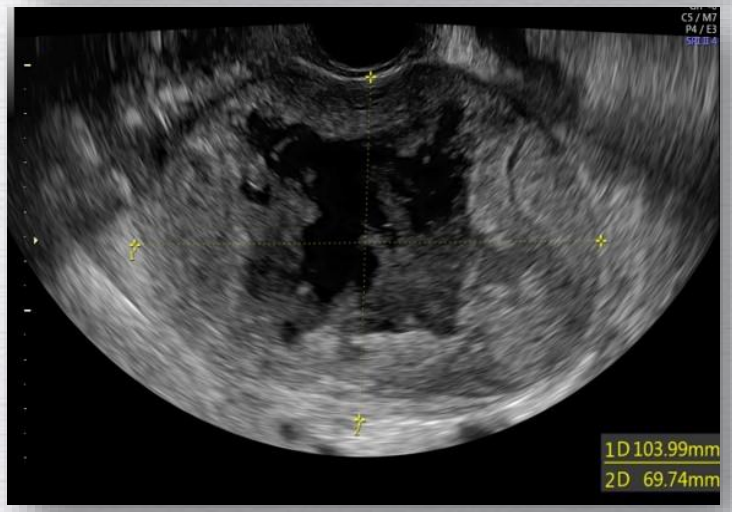
Leiomyoma

Variants of Leiomyoma

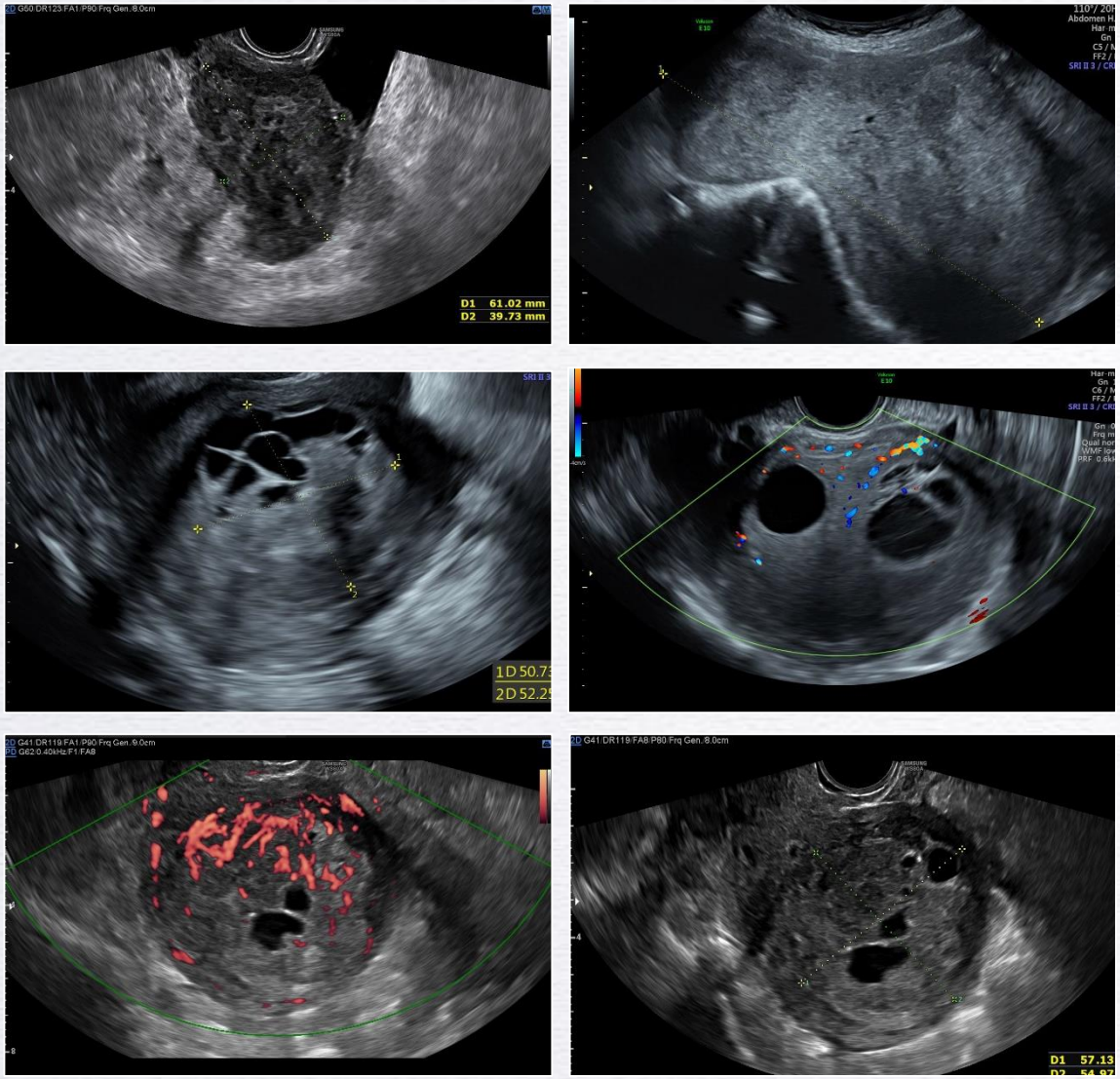


STUMP

Sarcomas




1D 103.99mm
2D 69.74mm

Take home messages



- ✓ Inhomogeneous echostructure
- ✓ Irregular borders
- ✓ Cystic areas
- ✓ Cooked aspect
- ✓ Absence of shadowing
- ✓ Color score moderate to high
- ✓ No calcifications
- ✓ No radial shadowing

MARATHON FOR SOLIDARITY

May 14th, 2022 *11:00-15:00 CET Time*

KEYNOTE LECTURES AND LIVE SCANNING FROM ALL OVER THE WORLD

ULTRASOUND OF PELVIC ANATOMY: PRESENTATION OF THE «12 PELVIC SITES PROJECT»

For information visit the website:

https://roma.unicatt.it/evt-marathon-for-solidarity-2022

CHOOSE A **PELVIC SITE** AND UPLOAD YOUR **ULTRASOUND CLIP**

1. Bladder and ureters

2. Retroperitoneum

3. Uterine cervix and paracervix

4. Sacrouterine ligaments

5. Uterus (endometrium)

6. Uterus (myometrium)

7. Fallopian tube

8. Ovary

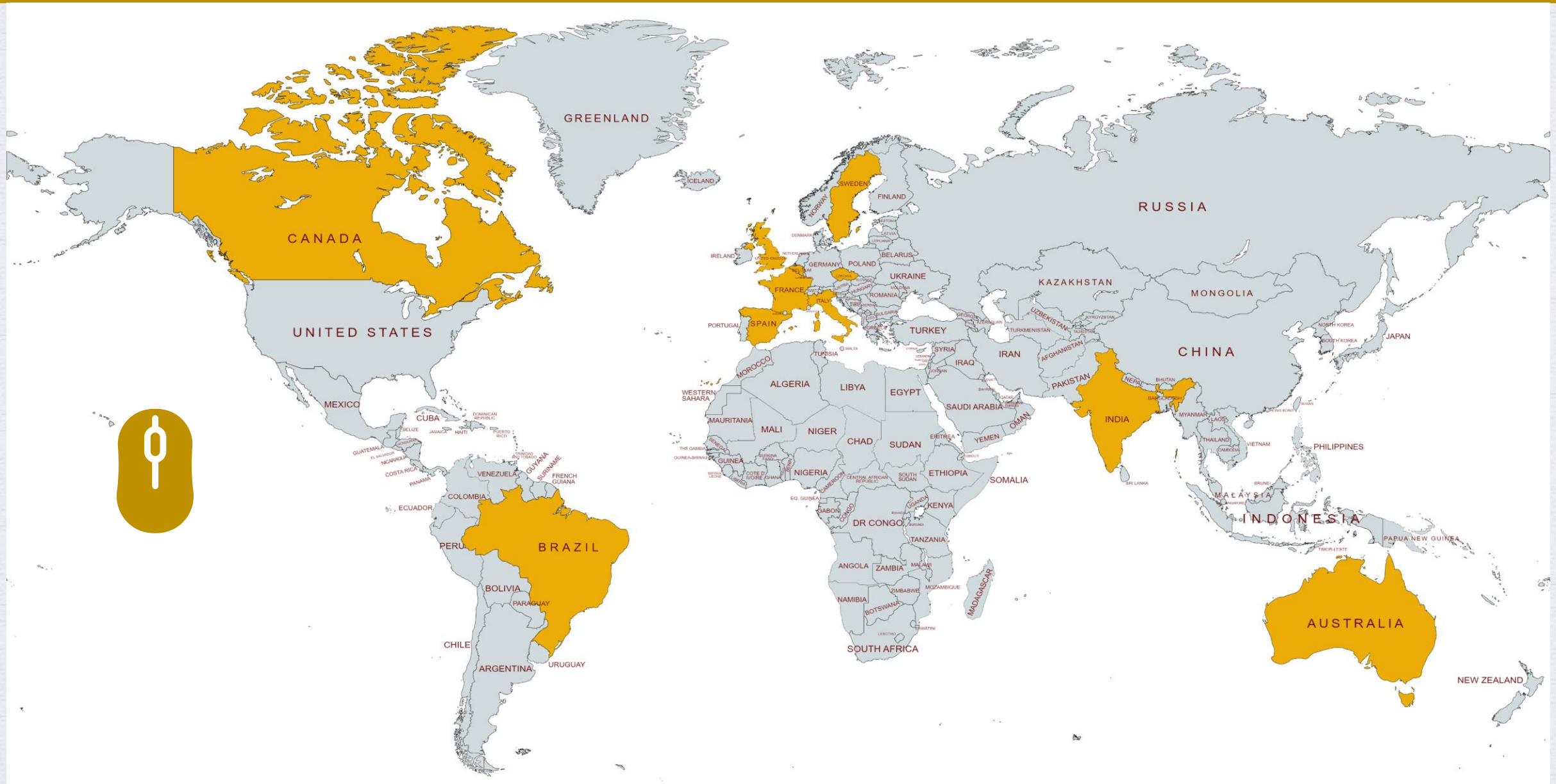
9. Non gynecological pelvic masses

10. Rectum

11. Pelvic floor

12. Pelvic vascularization

COUNTRIES / SOCIETIES THAT JOINED THE INITIATIVE



ROUND TABLES ON ULTRASOUND OF PELVIC ANATOMY: PRESENTATION OF THE «12 PELVIC SITES PROJECT»

PELVIC SITES PROJECT:

AN EXHIBITION OF THE **ULTRASOUND ASSESSMENT** OF PELVIC ANATOMY

November 14th, 2022 *12:00-14:00 CET Time*

UNIVERSITÀ CATTOLICA del Sacro Cuore

SOLIDARIETÀ INTERNAZIONALE CESI

https://roma.unicatt.it/evt-marathon-for-solidarity-2022

Thank you