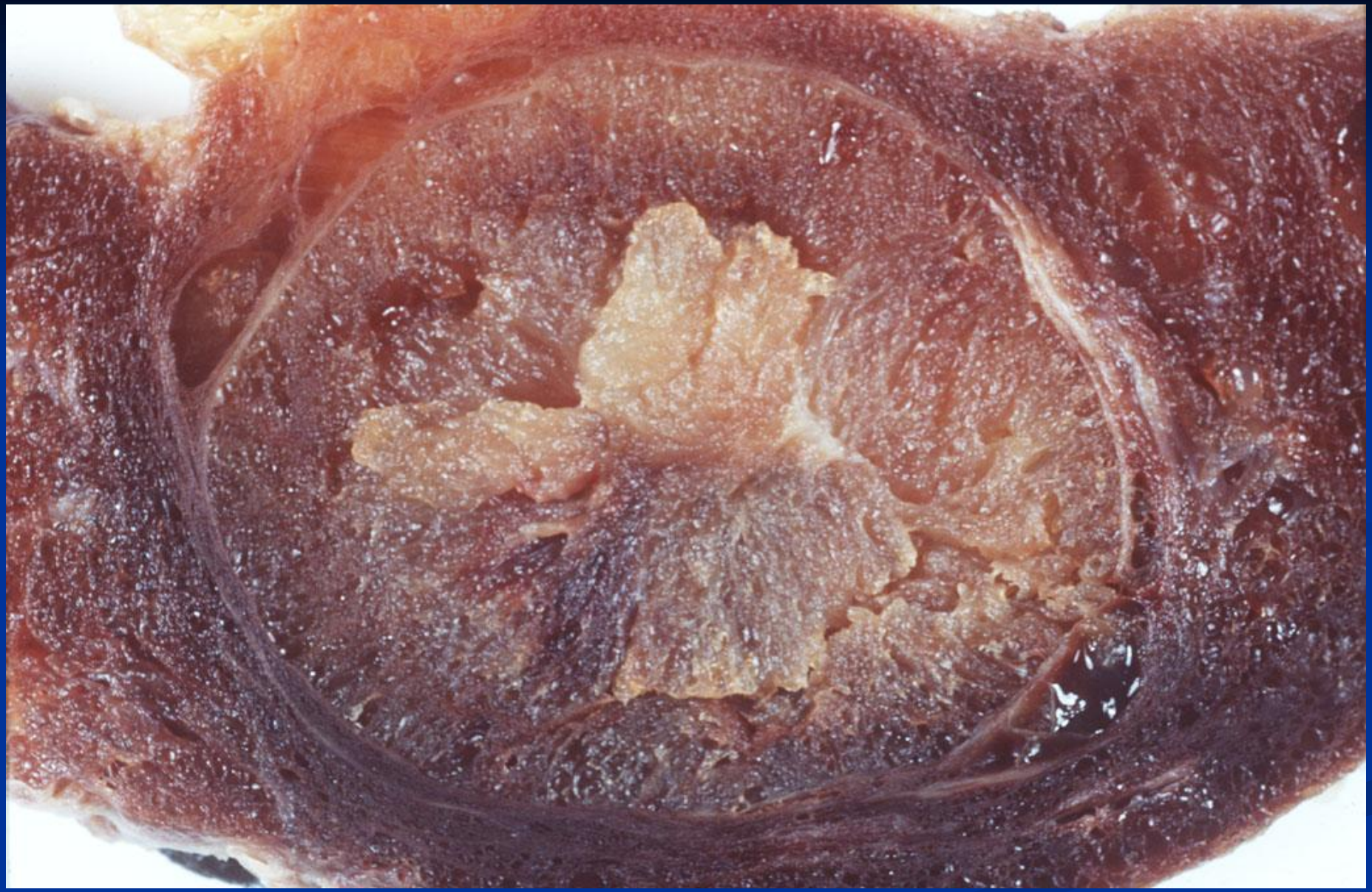
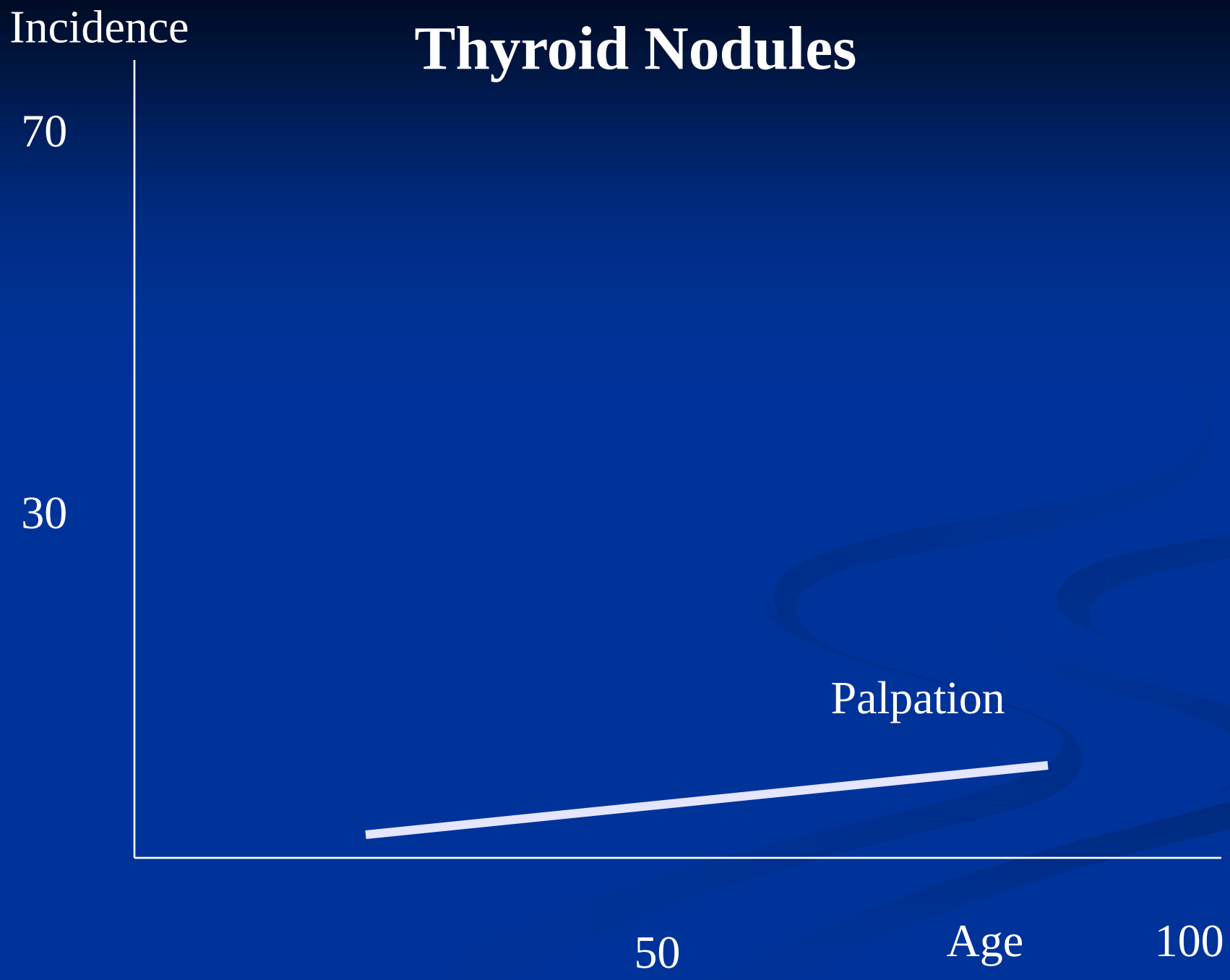
Thyroid nodules – the solution?

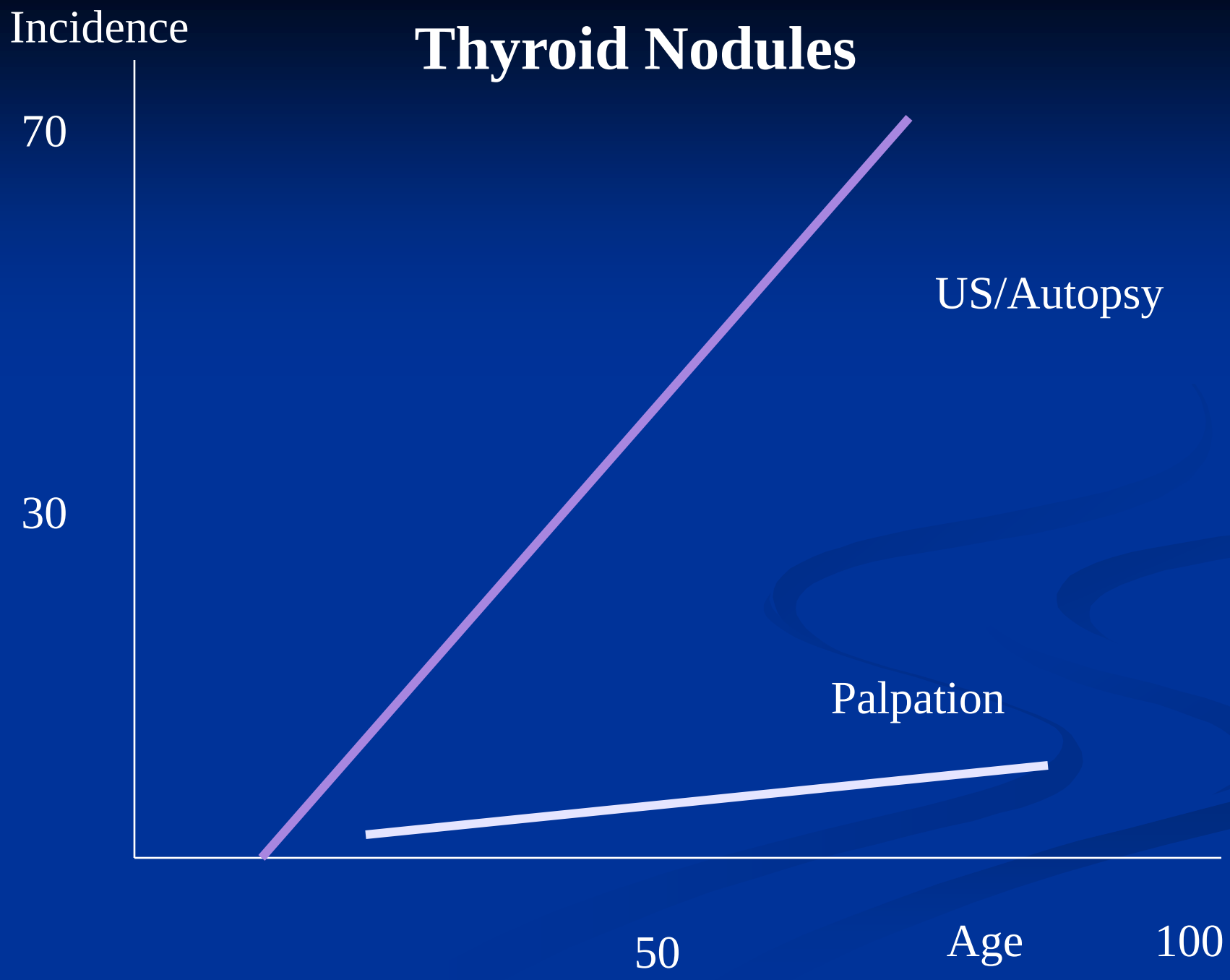
Rhodri M. Evans



Thyroid Nodules

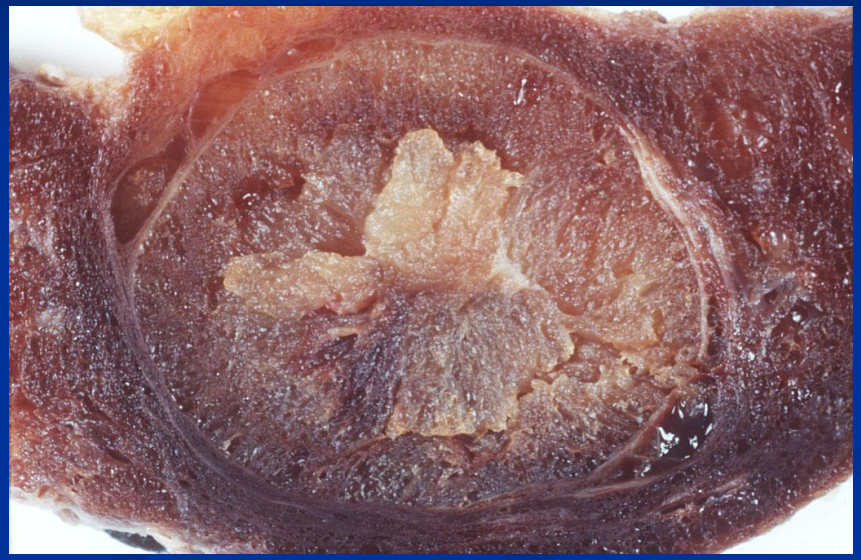


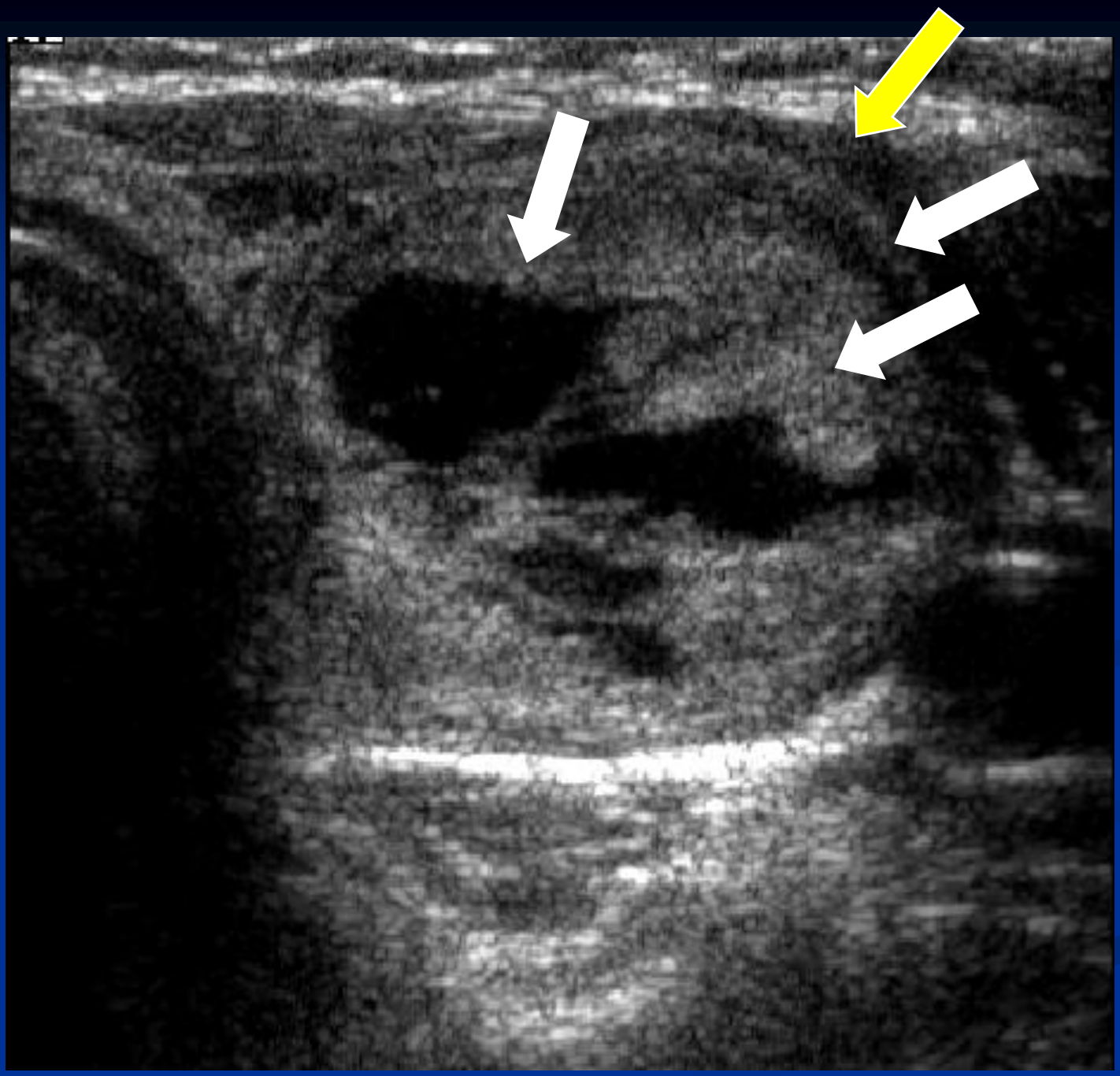
Thyroid Nodules

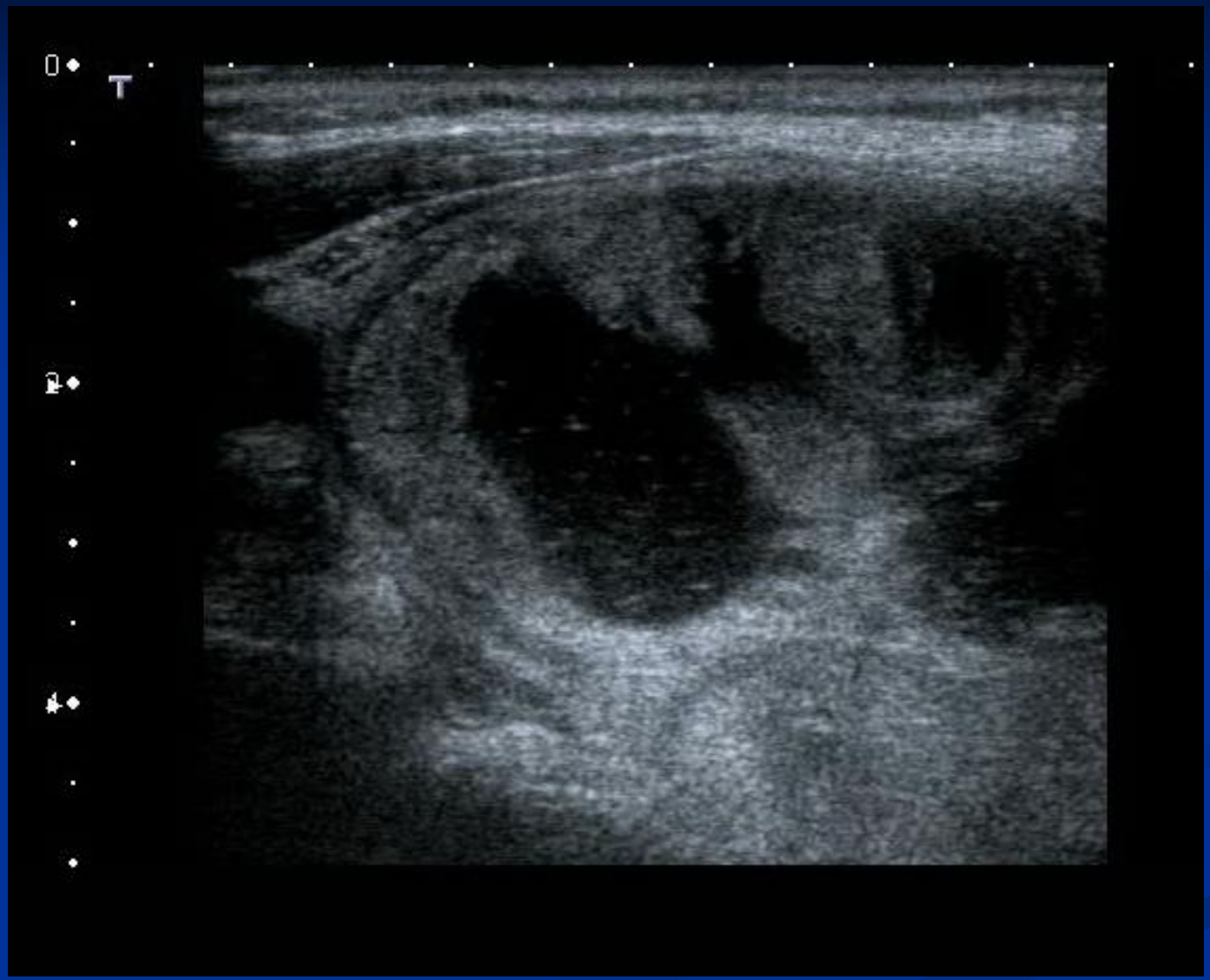


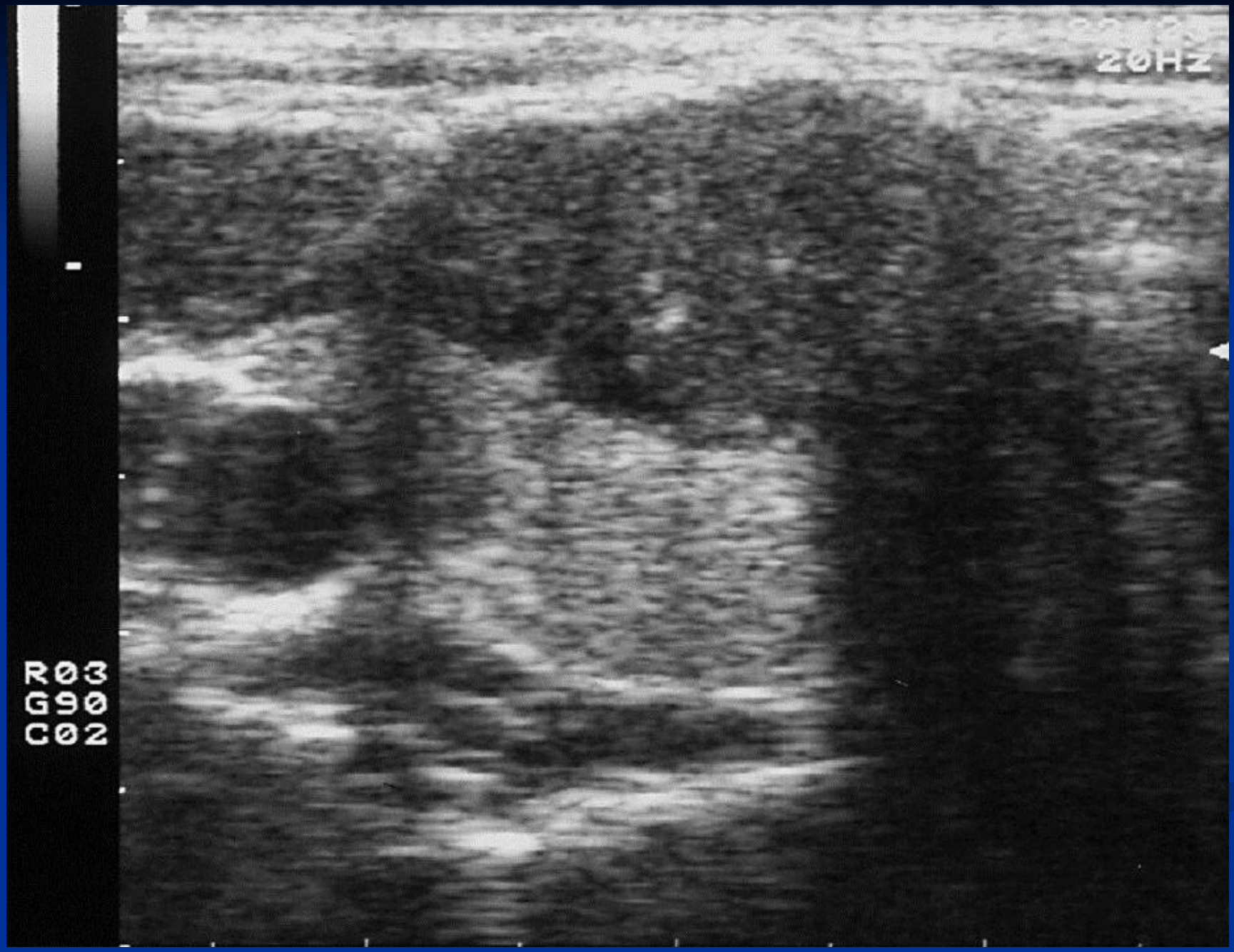
Thyroid nodules.

- Problem.
- Solution?
- Ultrasound.





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R03
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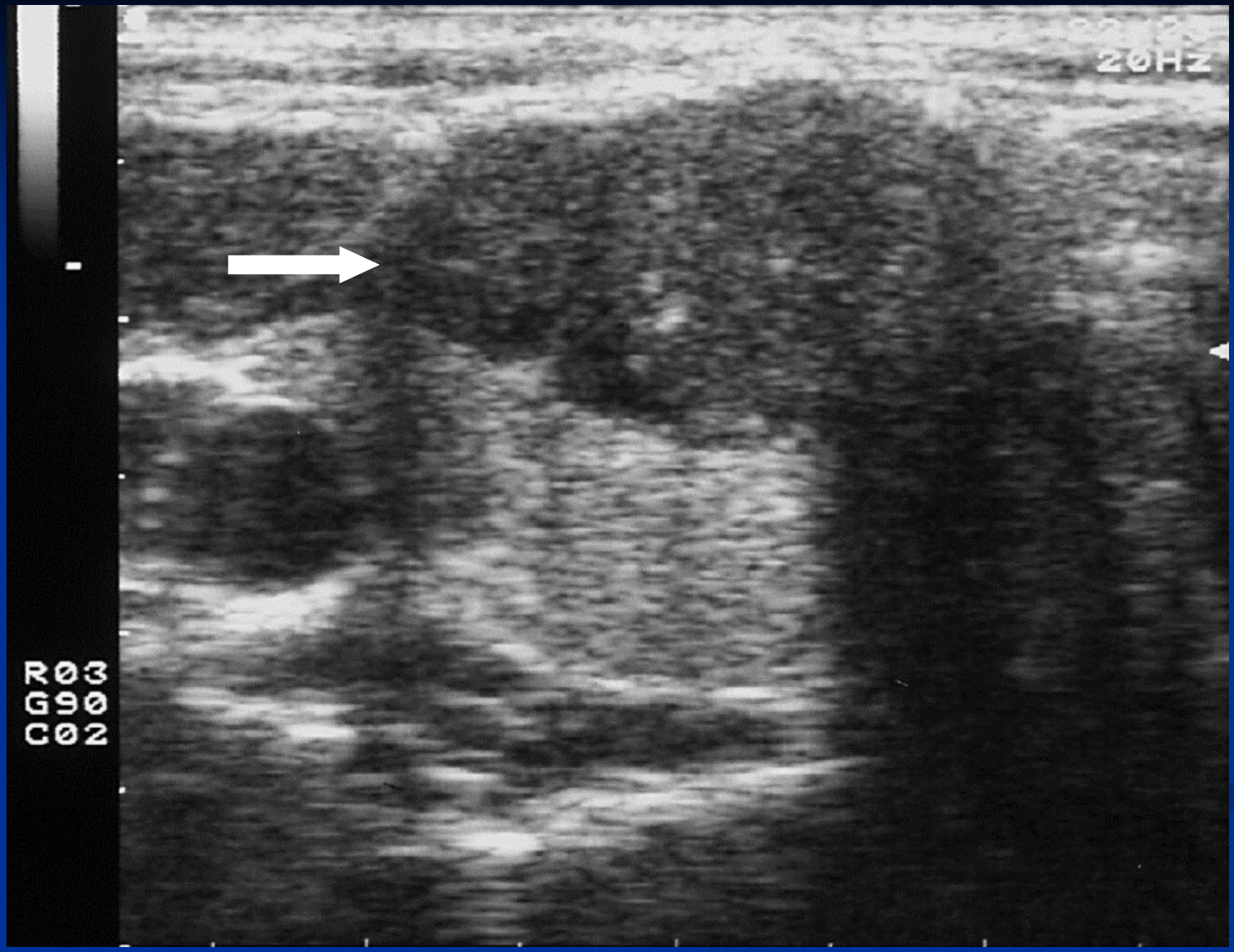
C02


20Hz
R03
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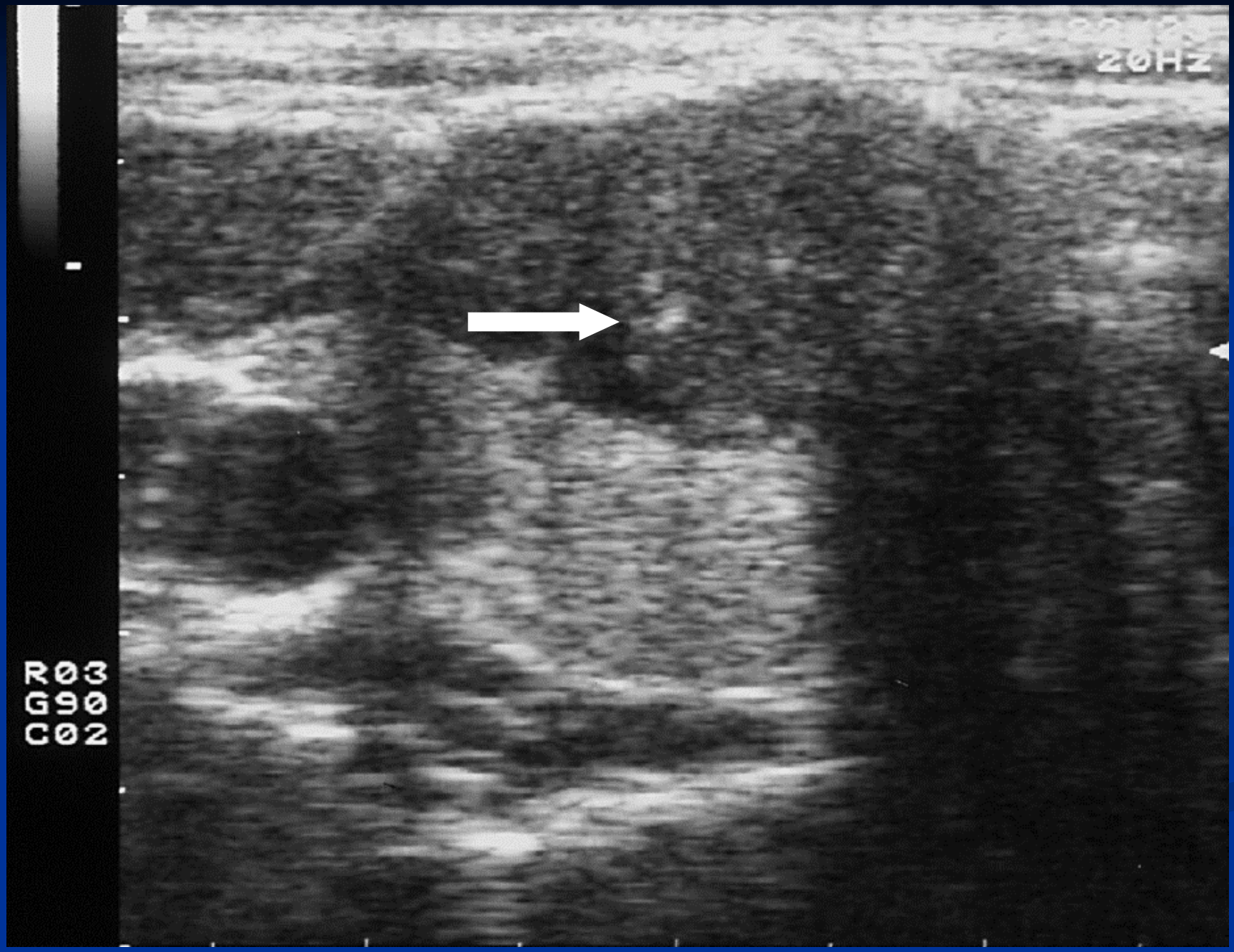

20Hz
R03
G90
C02

Incidence of Papillary carcinoma?

- 6,499 patients:US and FNAC
- 164 cases(incidence : 2.52%) of malignancy :

116 Papillary Ca

23 Follicular Ca

6 Medullary Ca

7 Anaplastic Ca

8 Hurthle Cell Ca

4 Lymphomas

Lin et al,Acta Cytol,1997;41:687-691.

Occult Incidence.

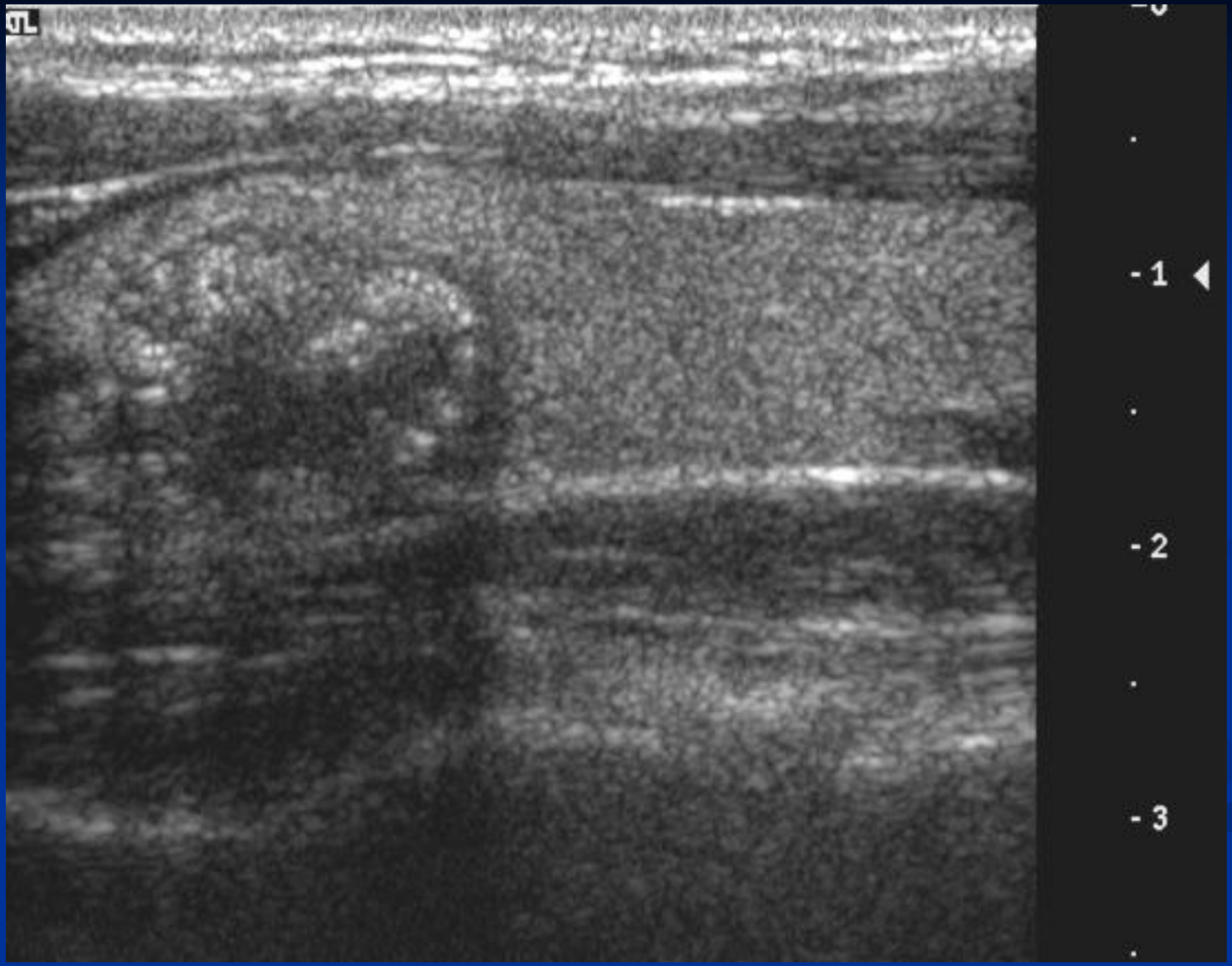
- Autopsy series.
- Small (less than 1cm) papillary tumours : “micro-carcinomas”.
- Reported incidence : 10-30%.
- Recent reported incidence : 50%

Signs:papillary carcinoma?

- 259 pathologically verified thyroid nodules
- **Microcalcification**:

Accuracy	76%
Specificity	93%
PPV	70%
Sensitivity	36%

Takashima et al,J Clin US;1995,23(3),179-184.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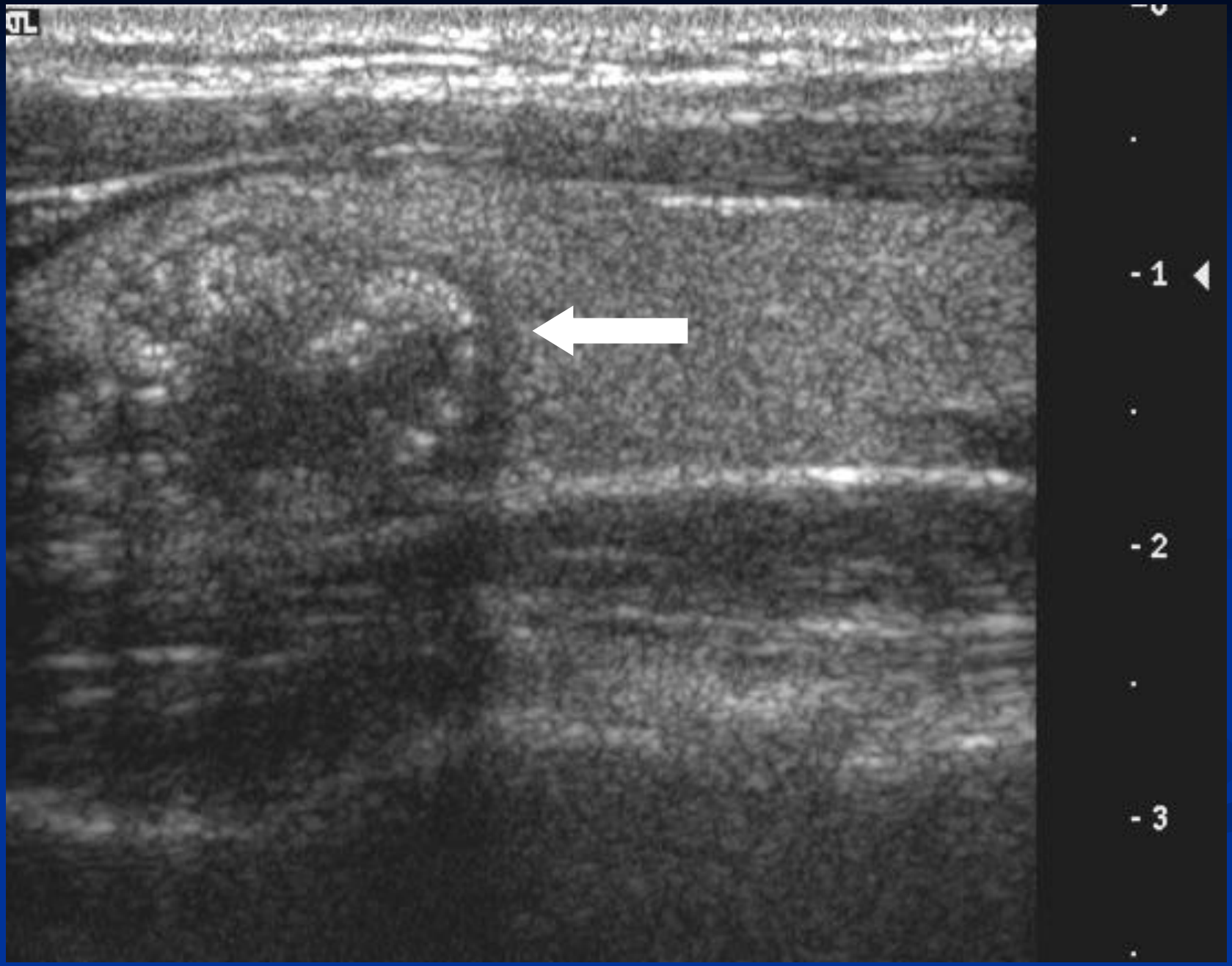
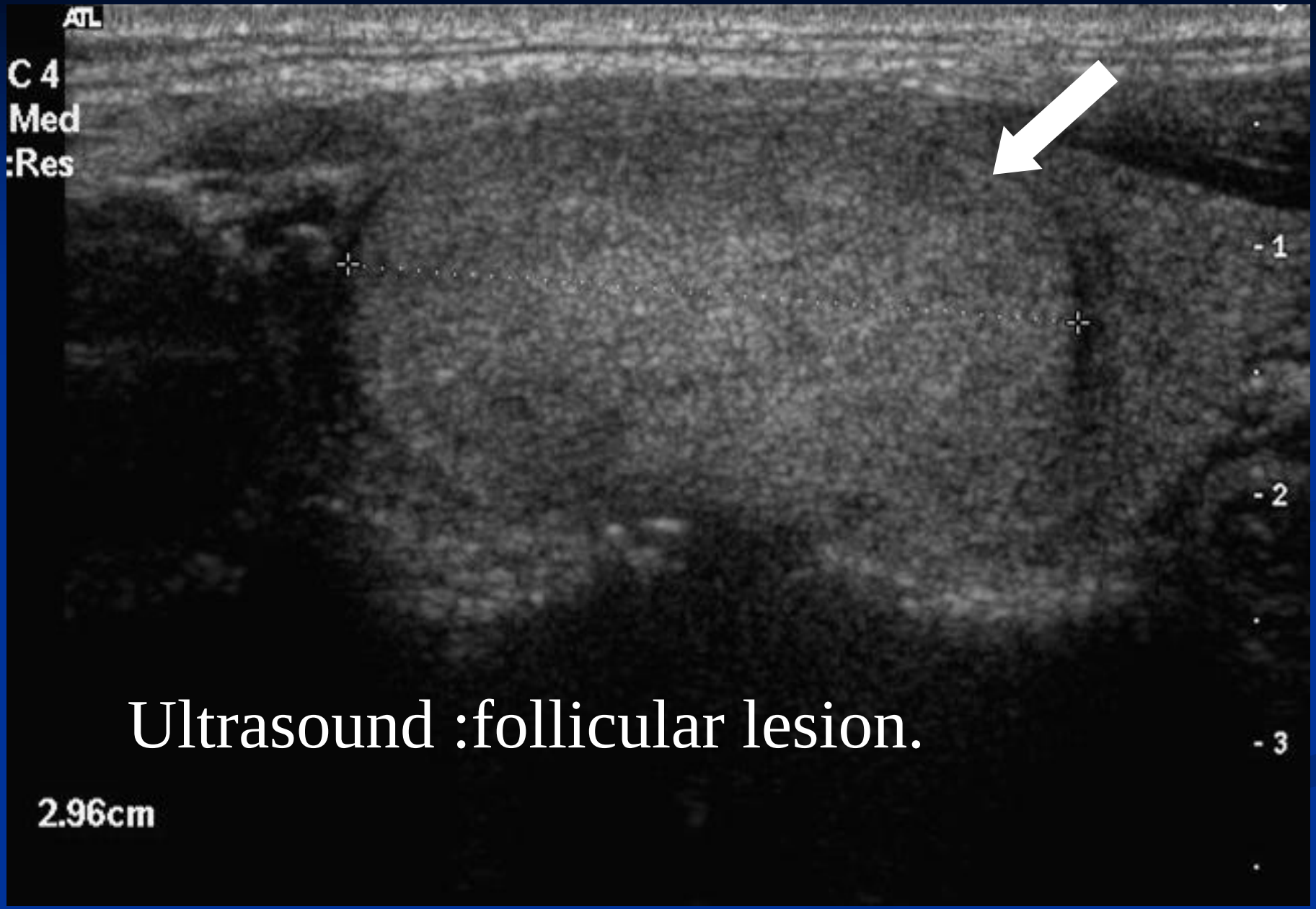
- 2
- 3


- 1
- 2
- 3

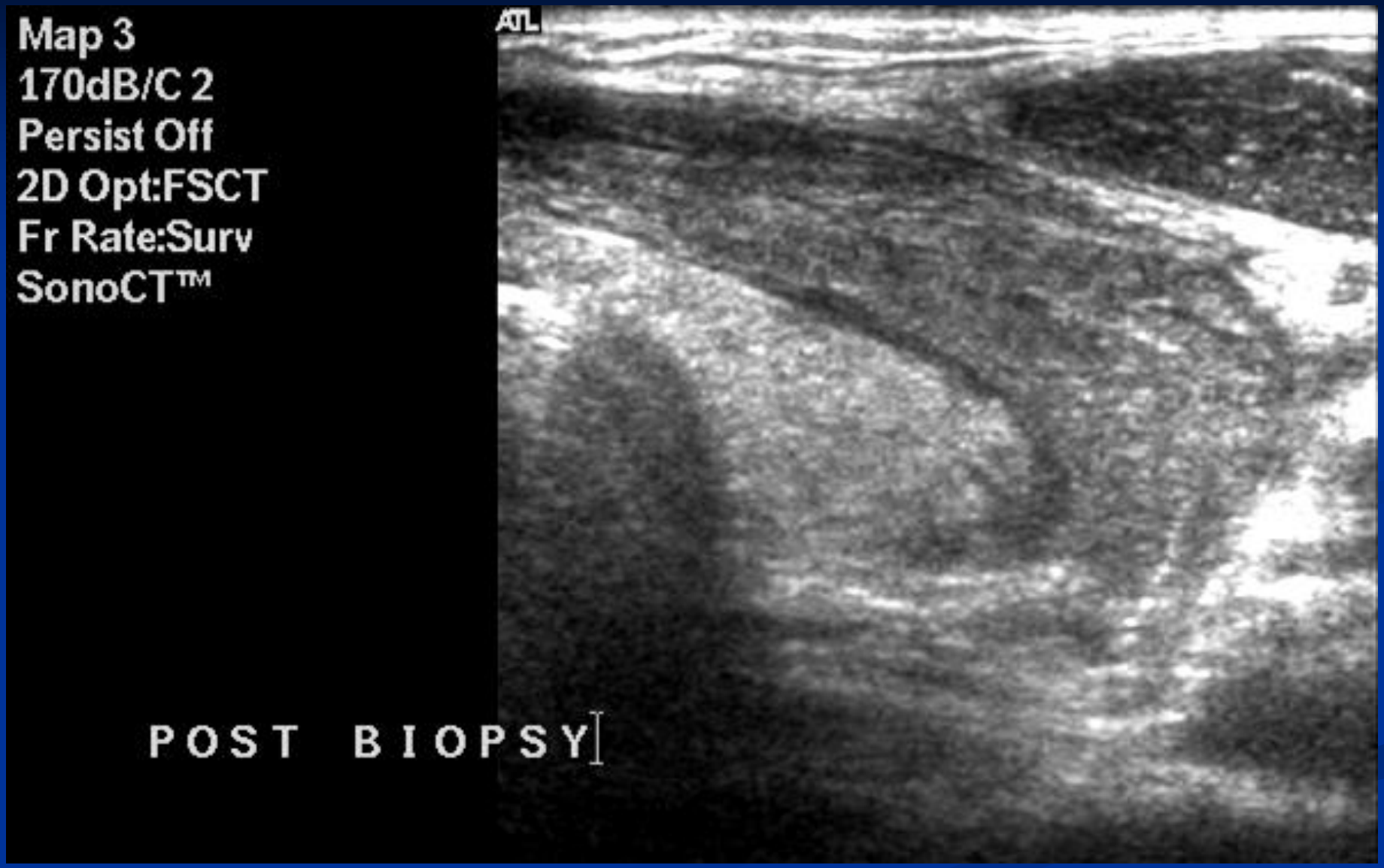
Follicular lesions.

- Spectrum from adenoma to carcinoma.
- 80% will be benign
- Follicular carcinoma – 10-15% of all thyroid Ca.
- Cytology of no use.
- Histology of no use in differentiation.
- Surgical specimen : vascular and capsular invasion – follicular carcinoma.



Ultrasound :follicular lesion.

CBX:follicular lesion.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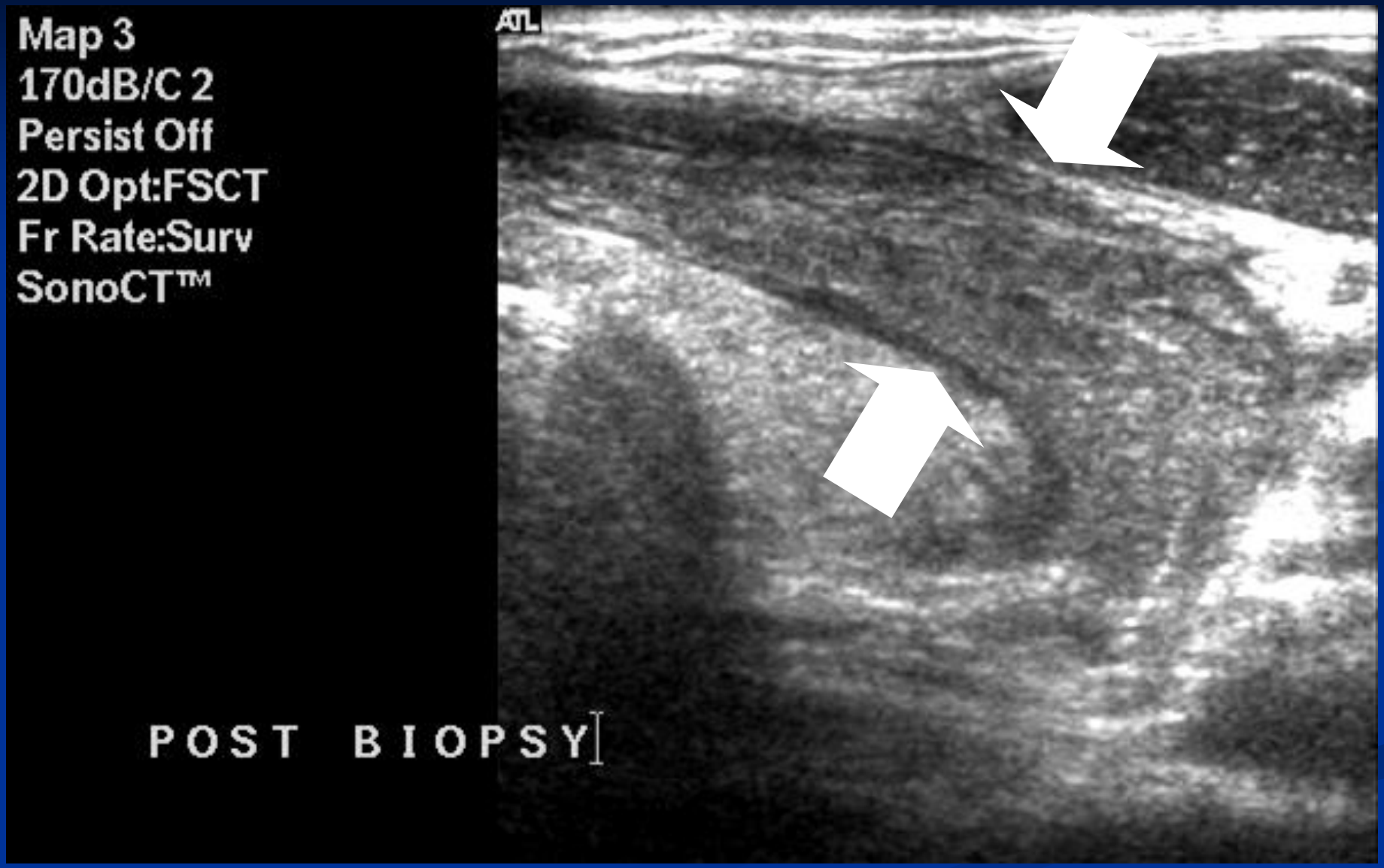
Persist Off
2D Opt:FSCT
Fr Rate:Surv
SonoCT™
ATL
POST BIOPSY


Map 3
170dB/C 2
Persist Off
2D Opt:FSCT
Fr Rate:Surv
SonoCT™
ATL
POST BIOPSY

Follicular lesions.

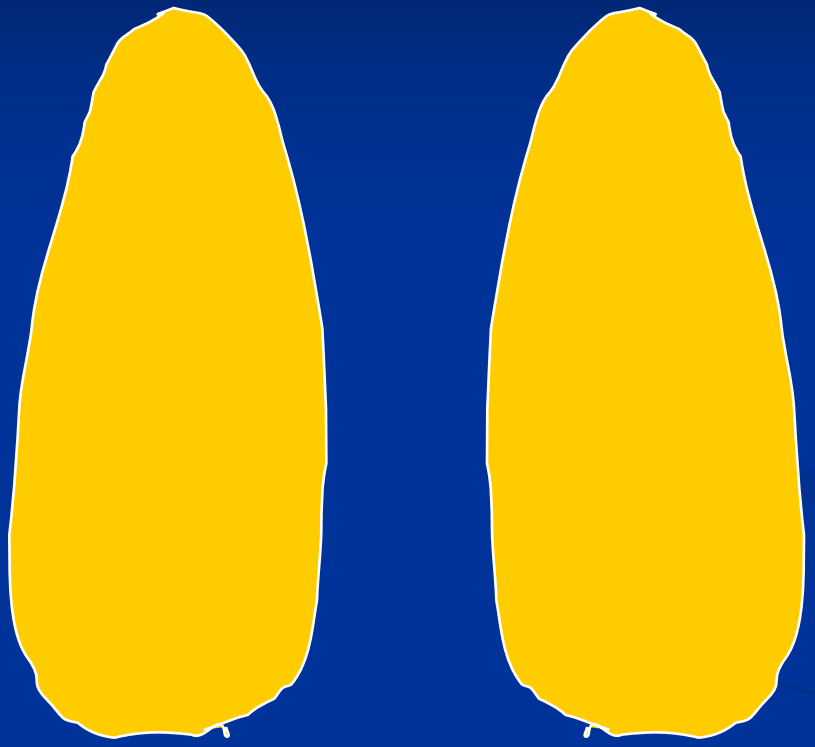
- Adenomas : solid,homogenous,iso/hyper-echoic.
- Well defined halo.
- Carcinoma : solid ,hypo-echoic areas within.

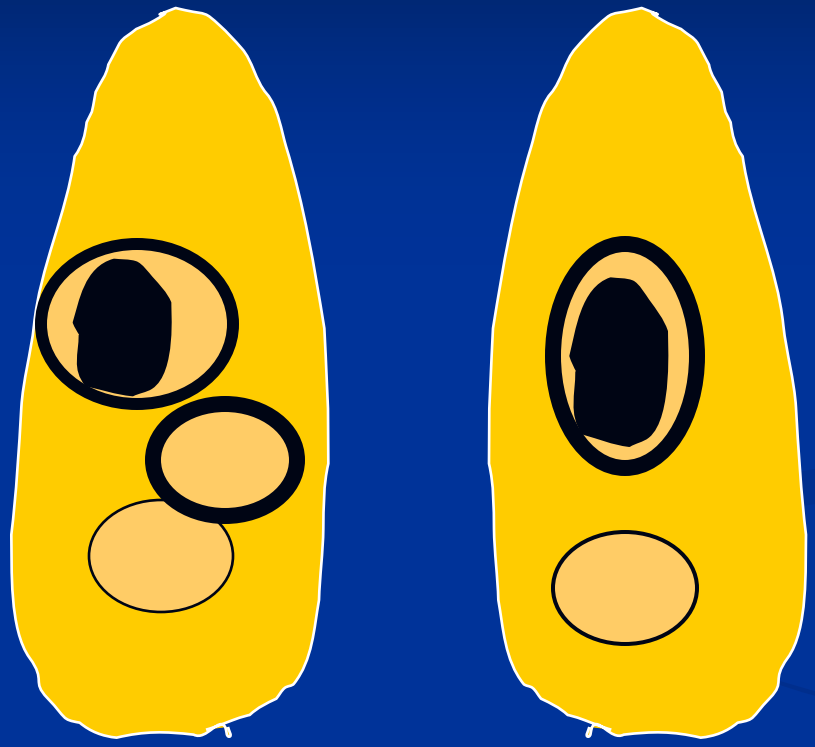
Medullary carcinoma.

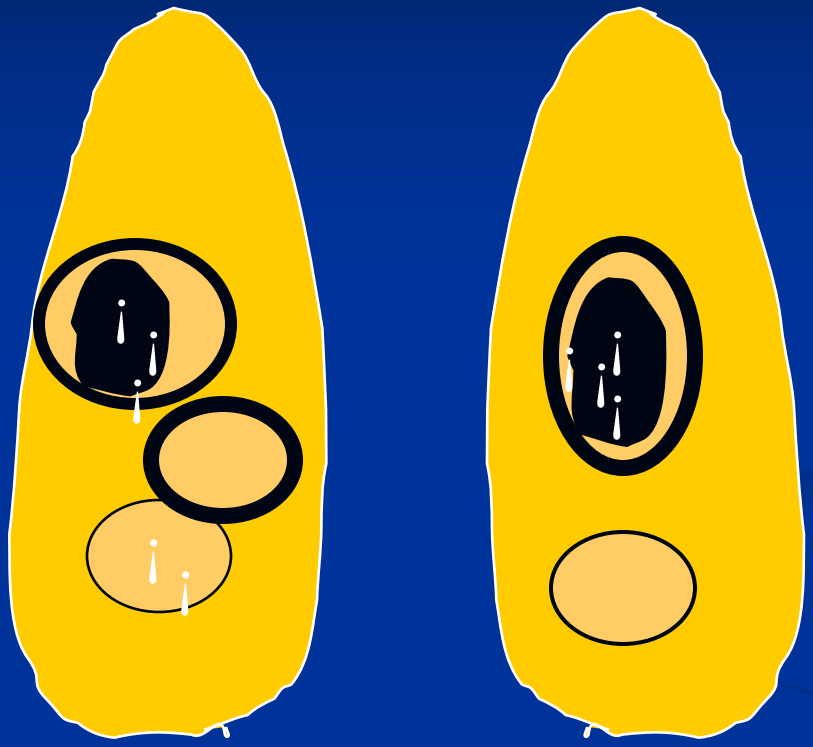
Medullary Carcinoma Thyroid

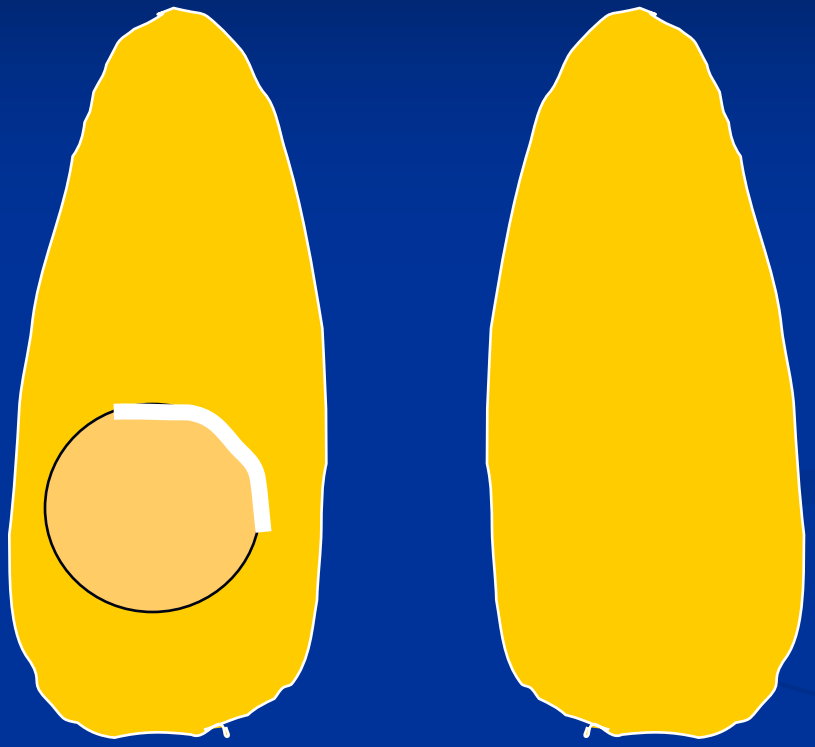
- Typically hypo-echoic.
- Contains calcification.
- Calcification more “globular”.
- “Calcification” may be amyloid.

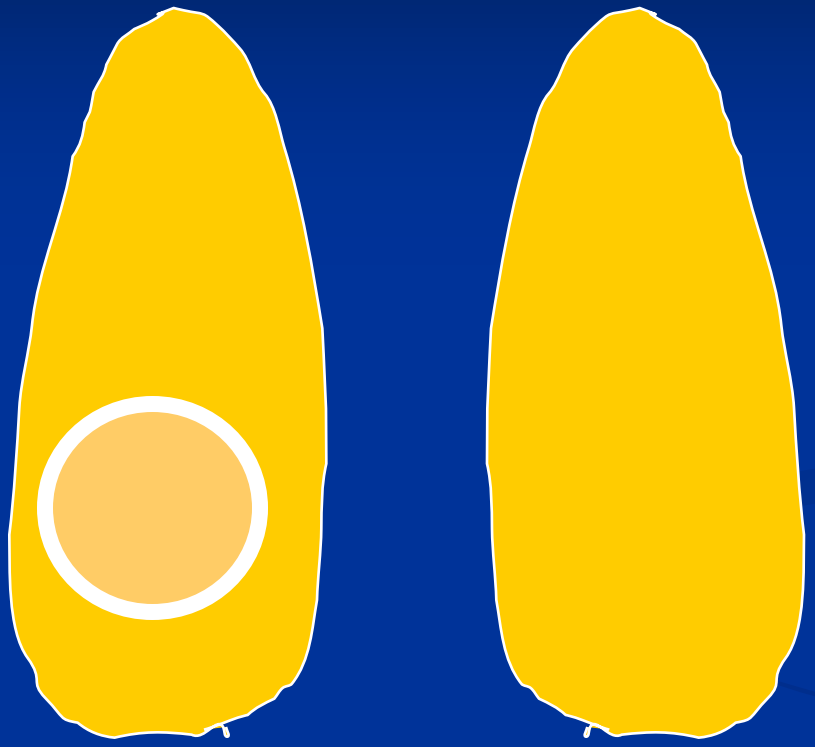
Signs?

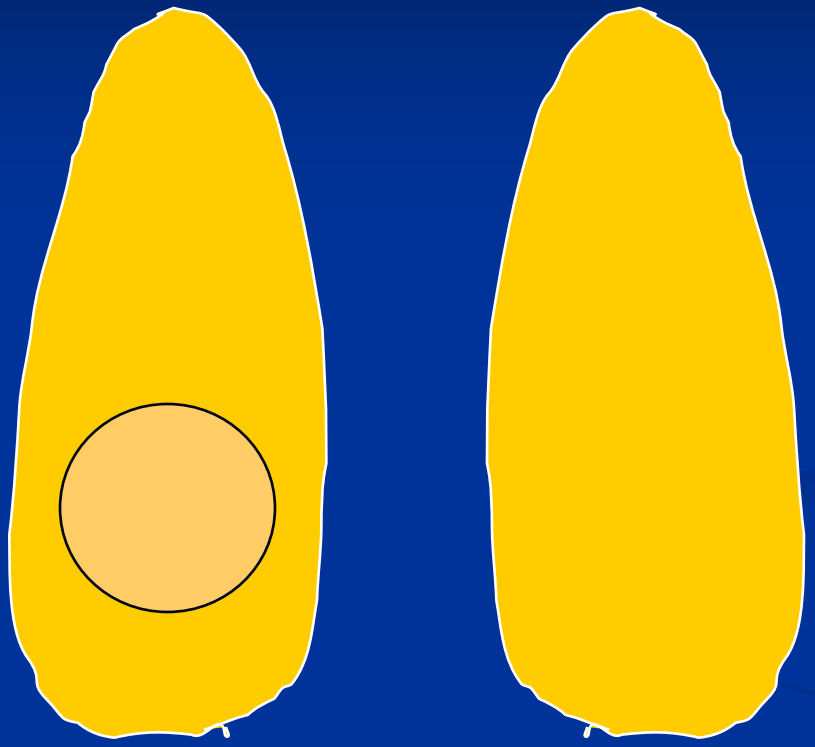


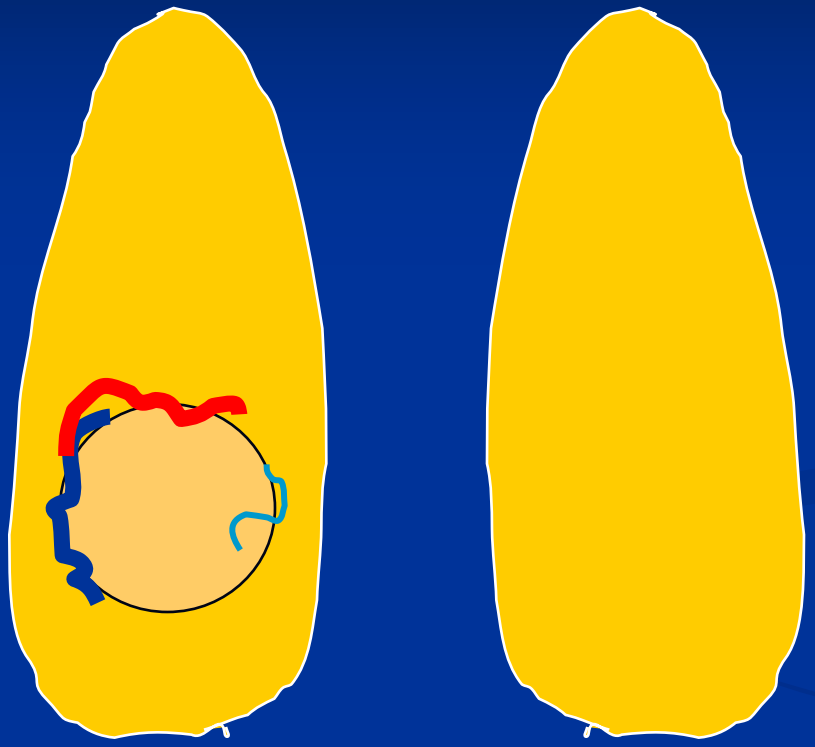


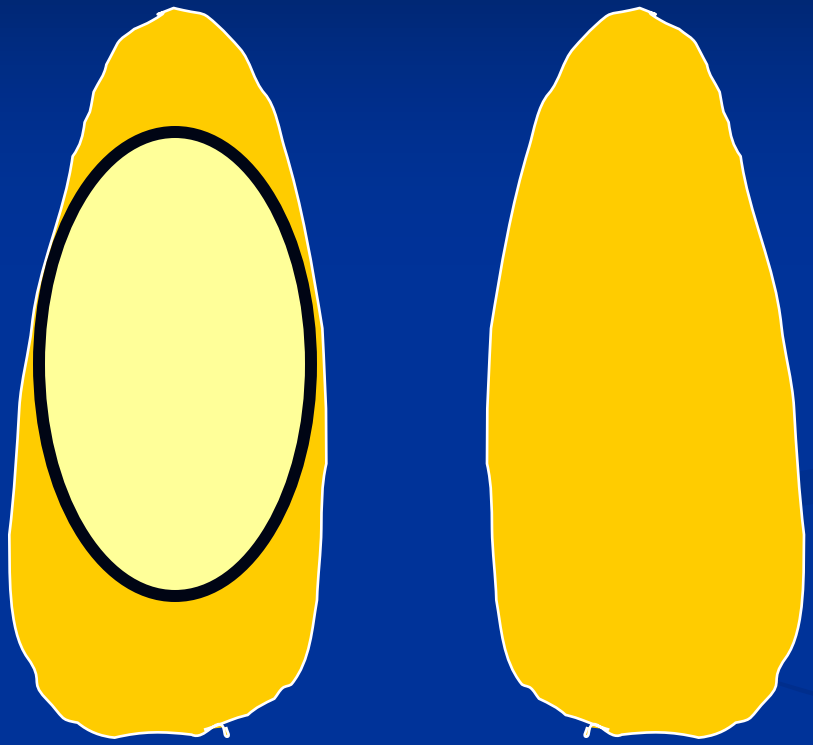


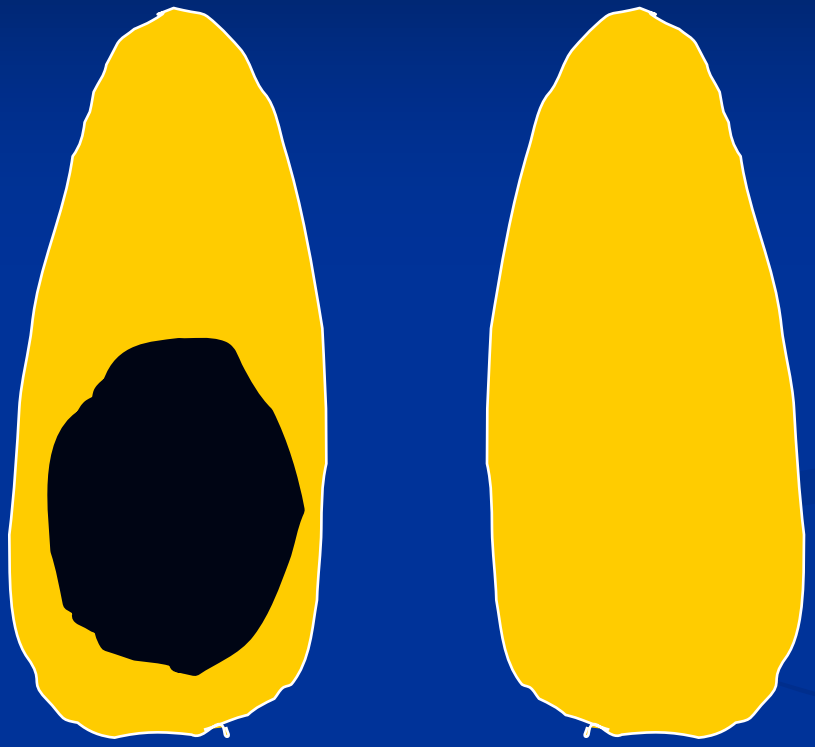


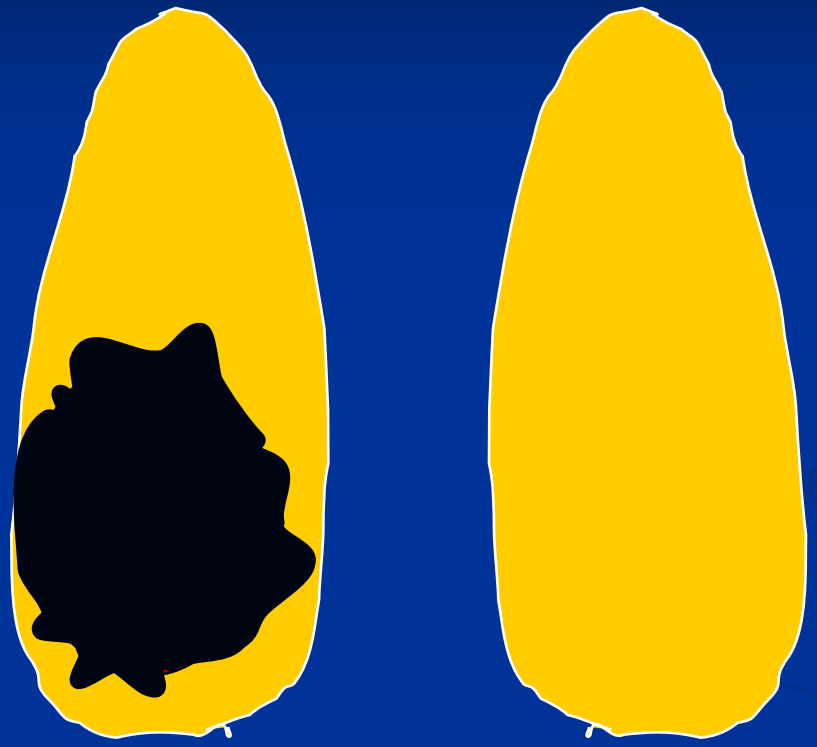


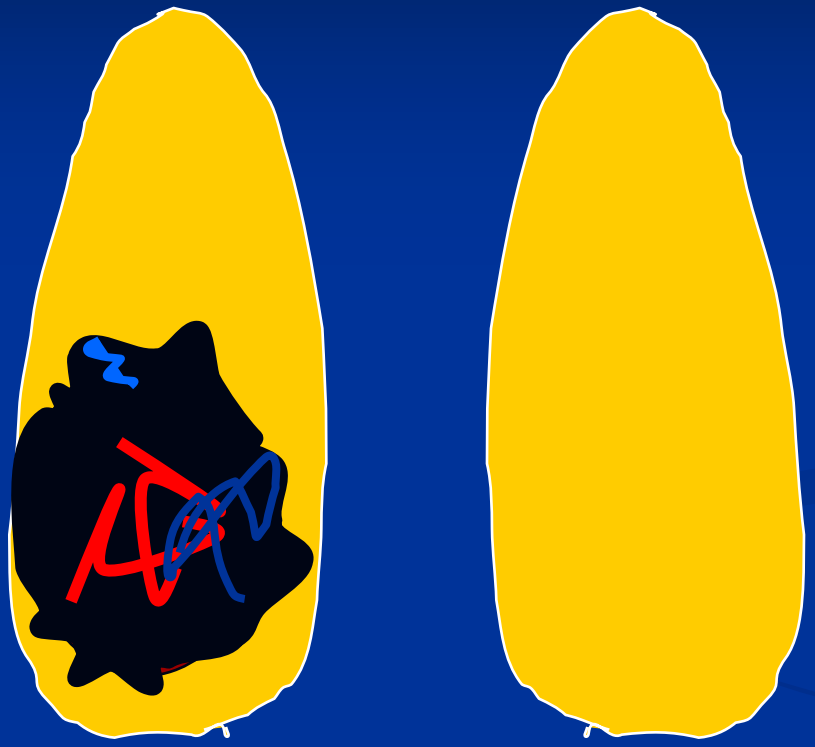


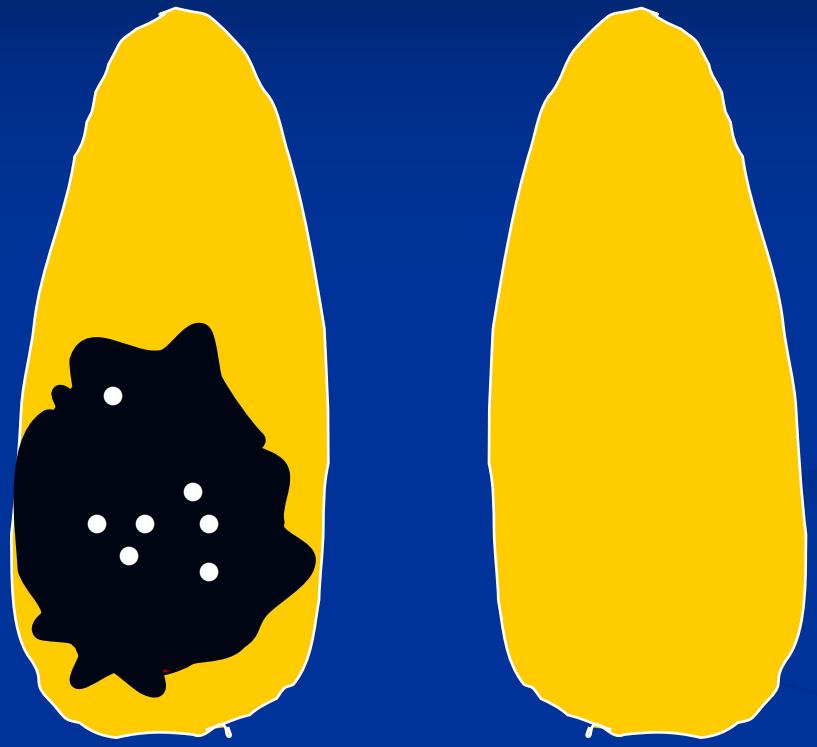


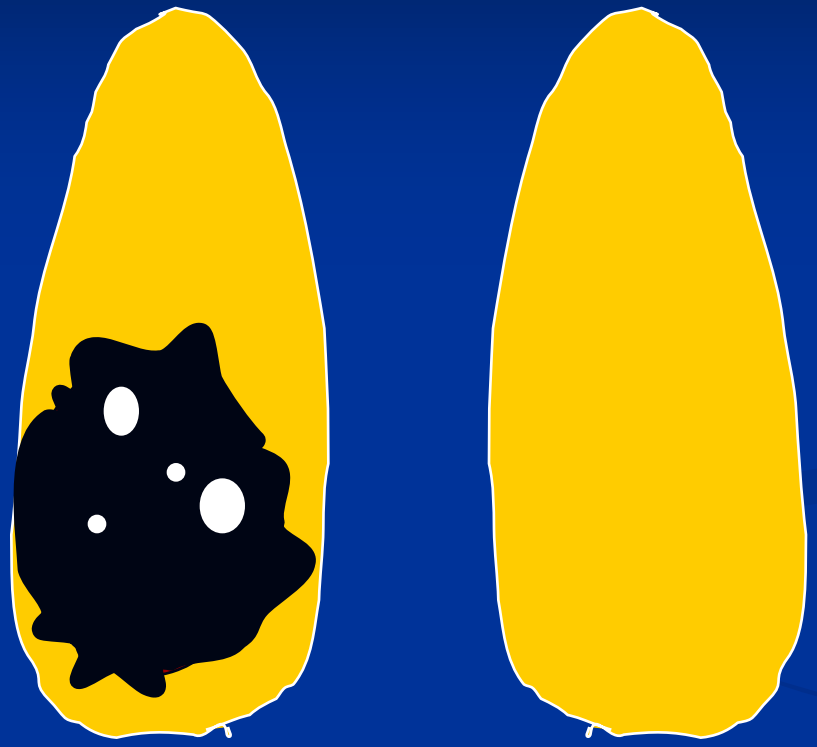










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Predictors of Cancer.

	Sensitivity	Specificity
Micro-calcifications	40%	90%
Absence of halo	66%	46%
Irregular margins	64%	84%
Hypo-echoic	83%	49%
Intra-nodular flow	70%	65%
MicroCa. & irreg m.	30%	95%
MicroCa. & hypoechoic	28%	95%
Solid & hypoechoic	73%	69%

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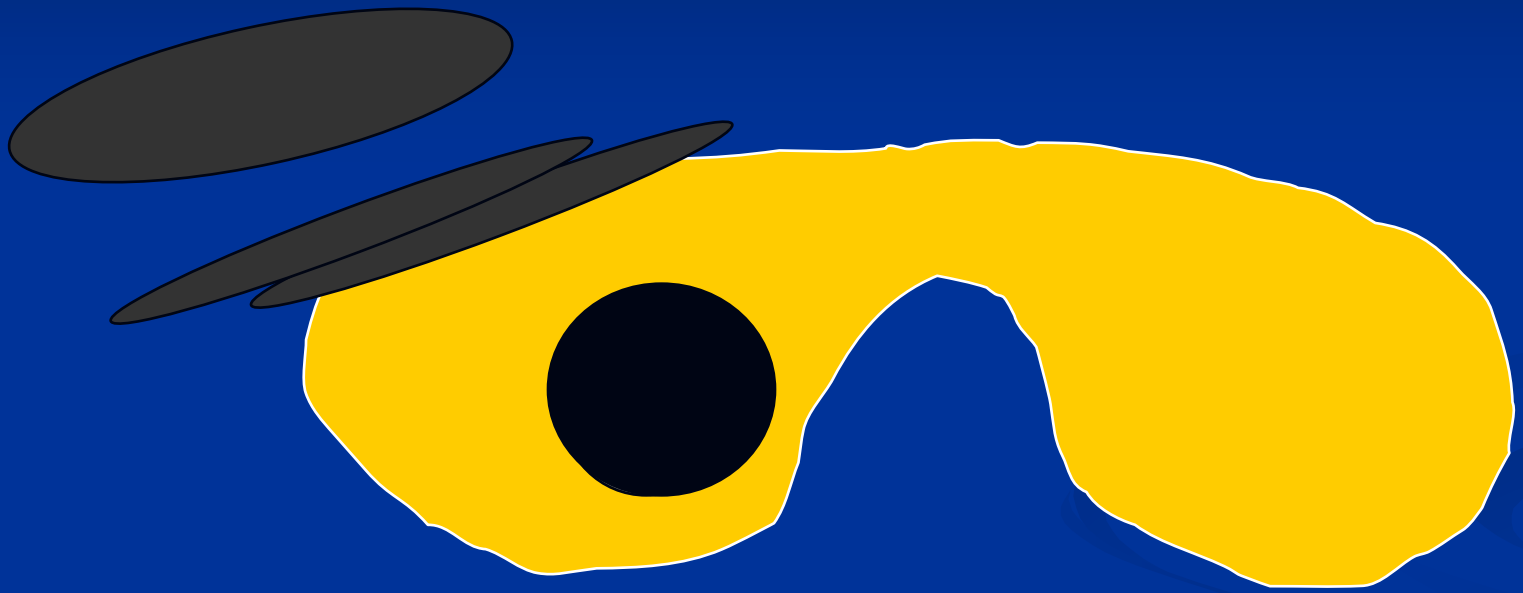
Current thinking?

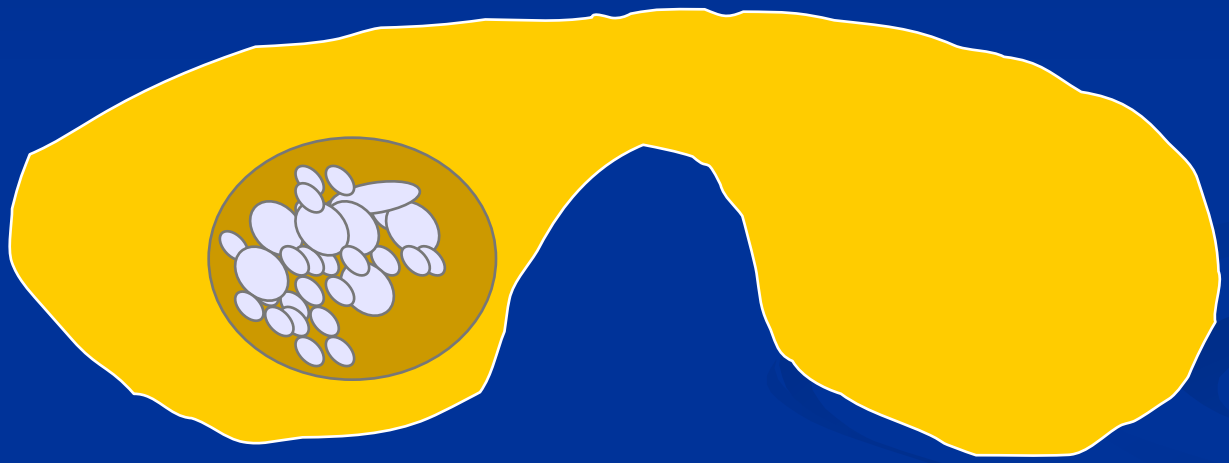
- Moon et al ,2008
- Benign and Malignant thyroid nodules ;US differentiation- multicenter retrospective study.
- Definition hypo- echoic
- Spongiform sign
- Taller than wide – shape
- Definition micro-calcification

Radiology 2008,247(3)762 -770



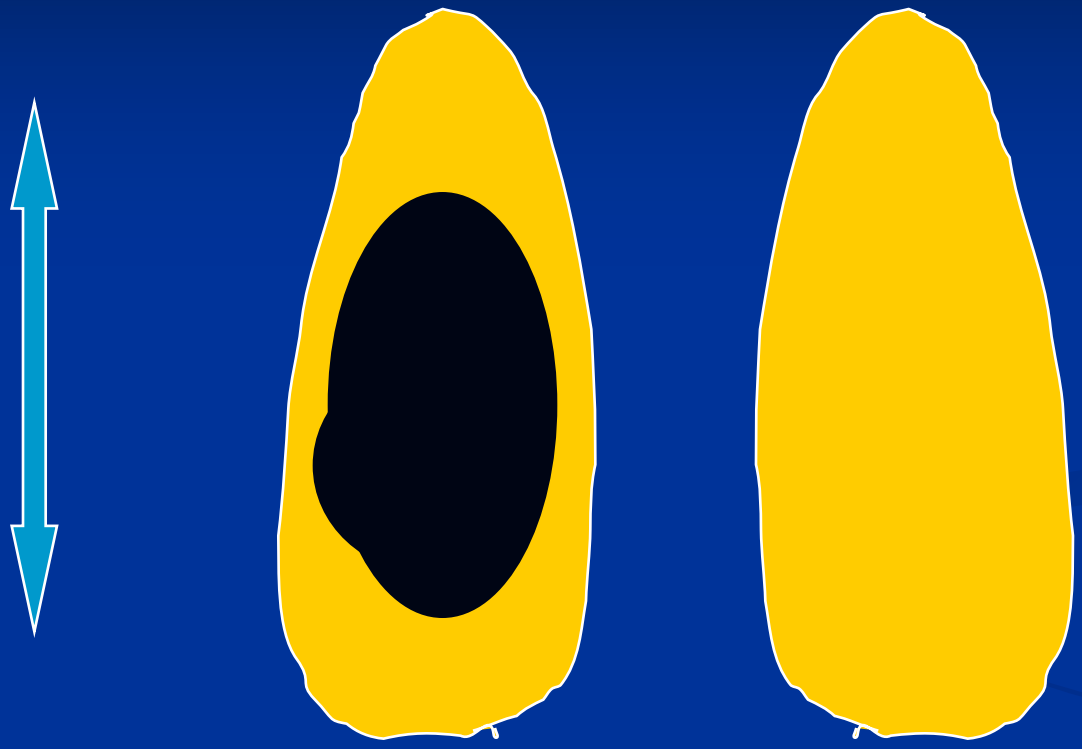
Spongiform appearance

Spongiform appearance



Spongiform :microcystic components >50% nodule volume – Benign.

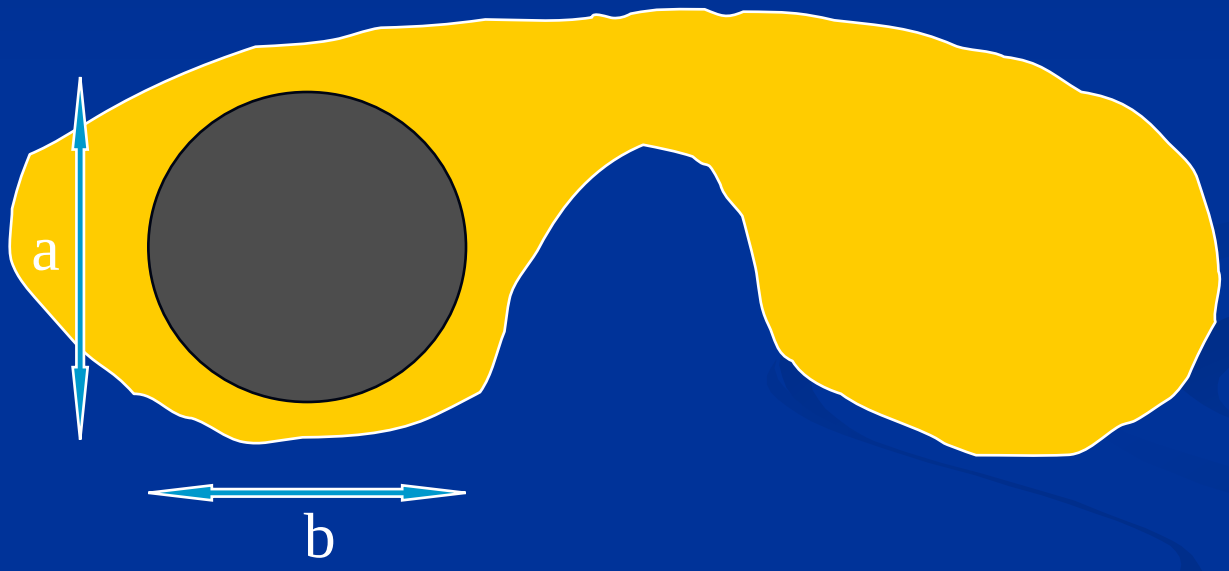
Taller than wide sign – shape of nodule



?

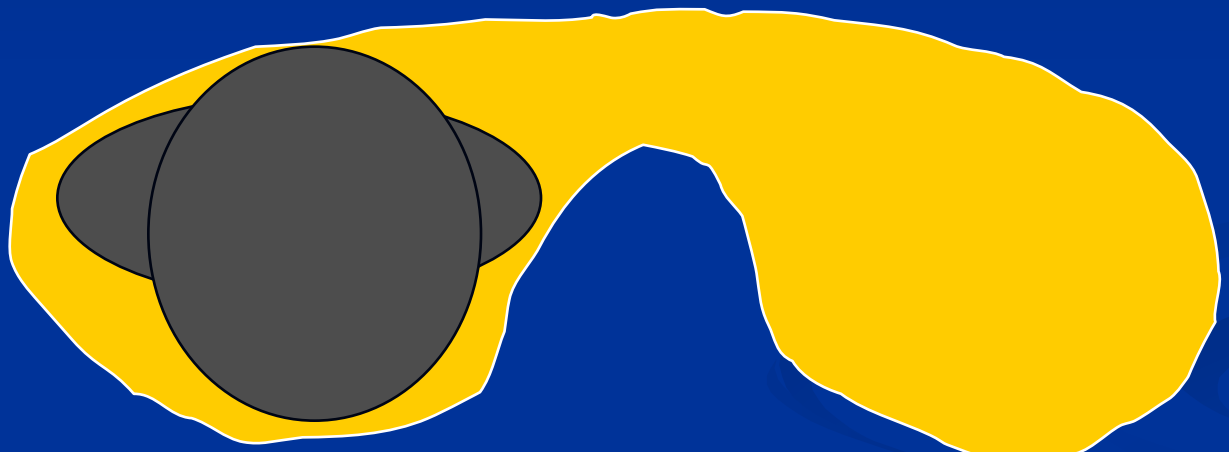
Not in long axis

Taller than wide sign – shape of nodule

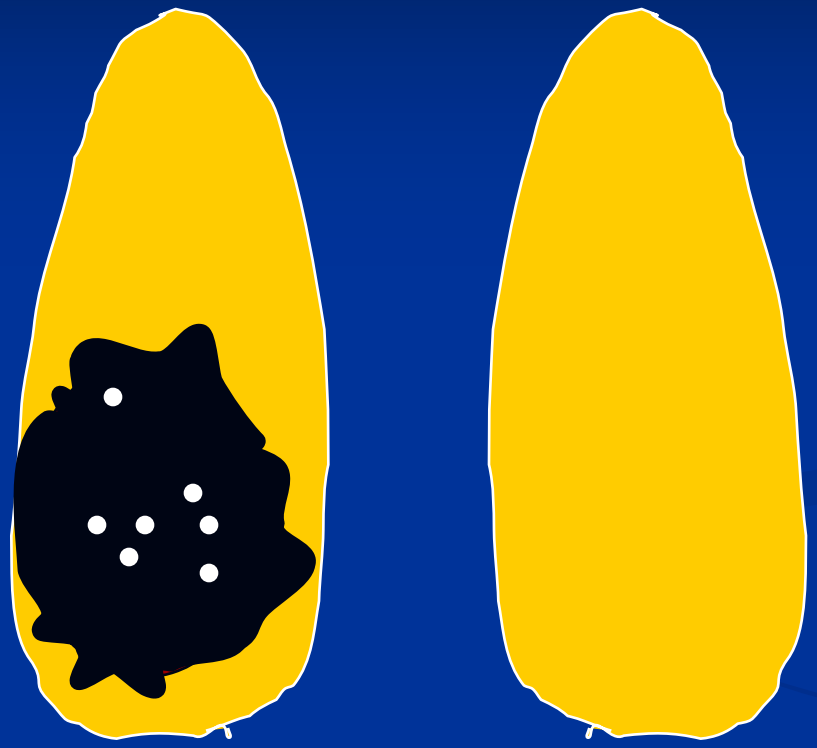


a/b > 1 : malignant . a/b < 1 :benign (Kim)

Taller than wide sign – shape of nodule

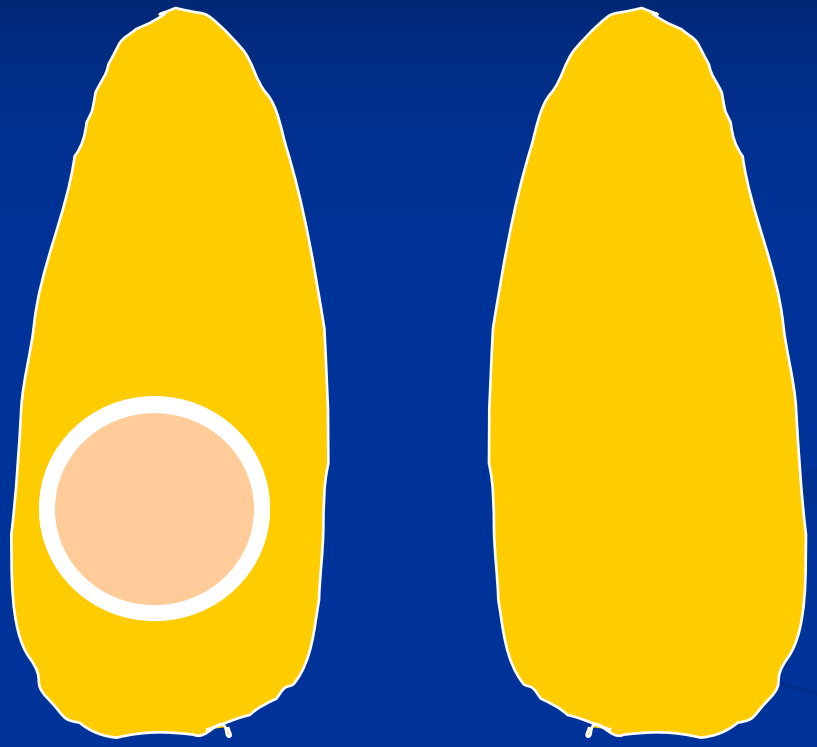


Micro-calcification

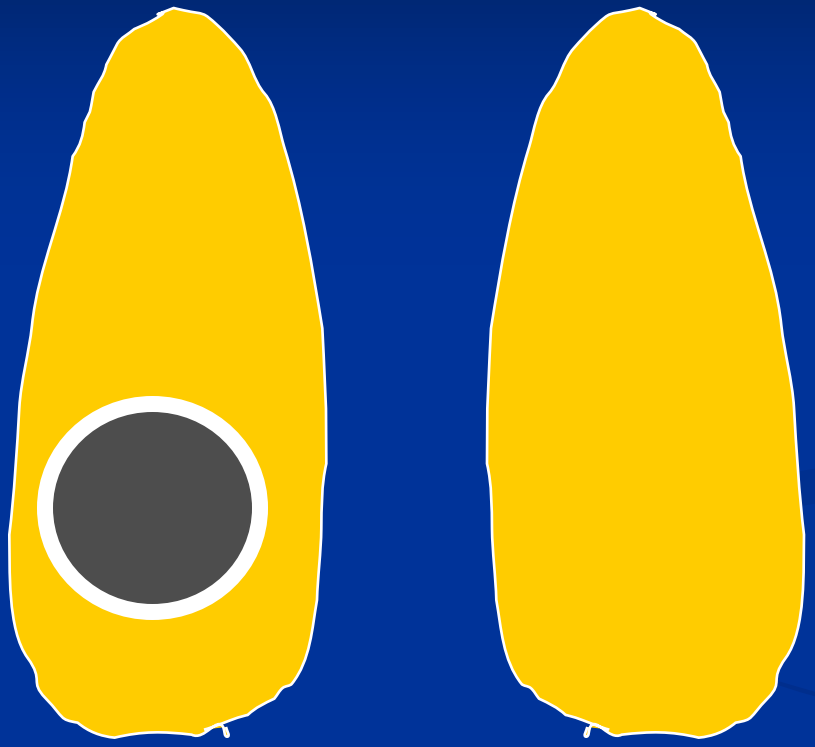


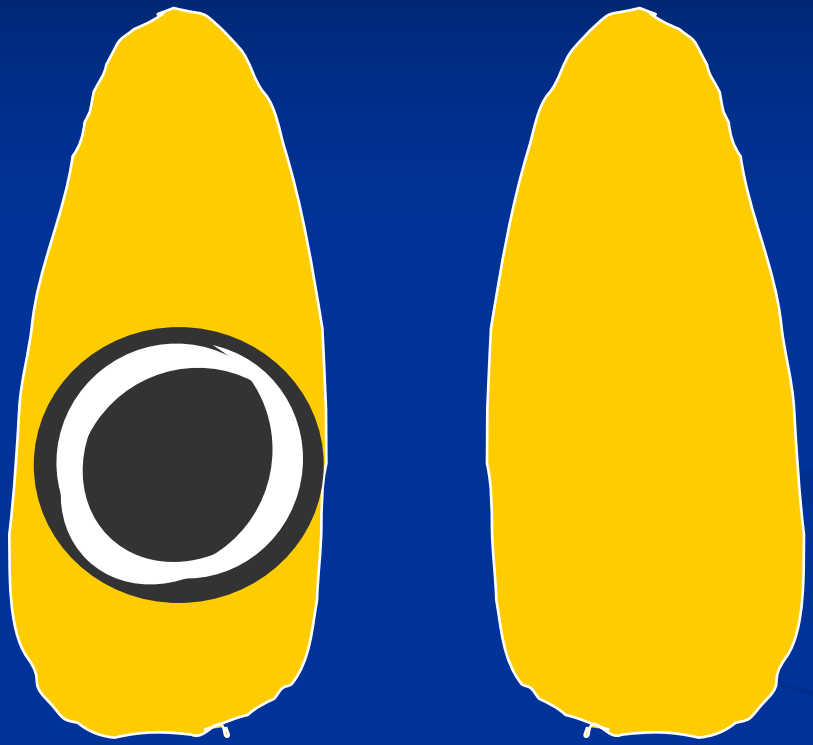
1 – 2mm ,may or may not shadow

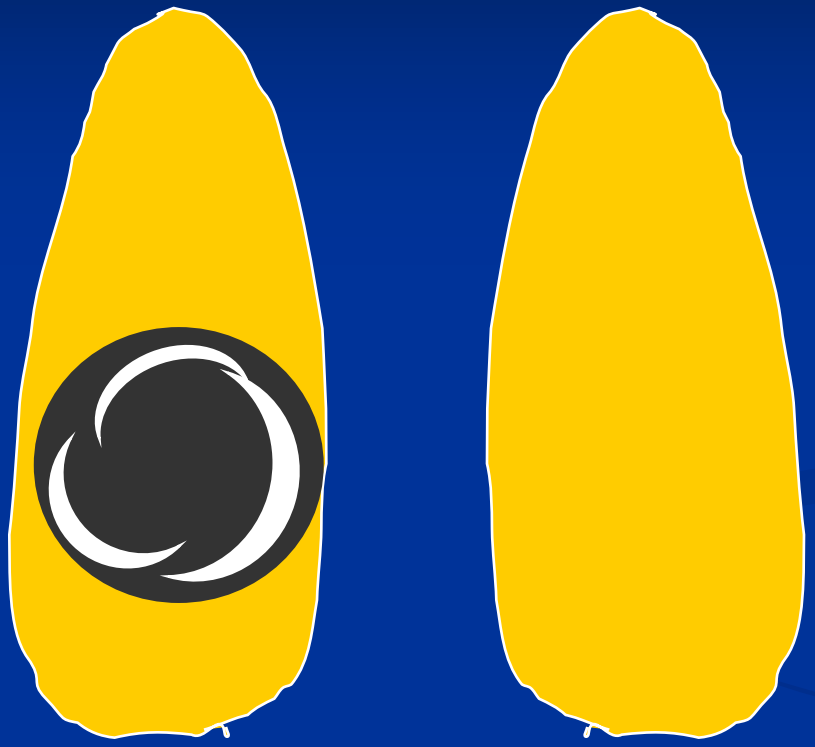
Eggshell calcification



Byung et al,Ultrasound 2008







Elastography?

- If cystic change is present – it doesn't work.
- Solid nodules – it can help.
- Does not appear as yet to be of value in follicular lesions.
- Low elasticity – good indicator of benign nodule
- Will add an element of confidence in future

Thyroid nodules.

- Sorting out nodules.
- Learn from others – Breast Radiologists.
- R Classification.
- Cytological classification(1 -5)
- Clinical scenario.
- Correctly manage patient.

Nodules – R classification……thyroid?

R

1 : Normal.

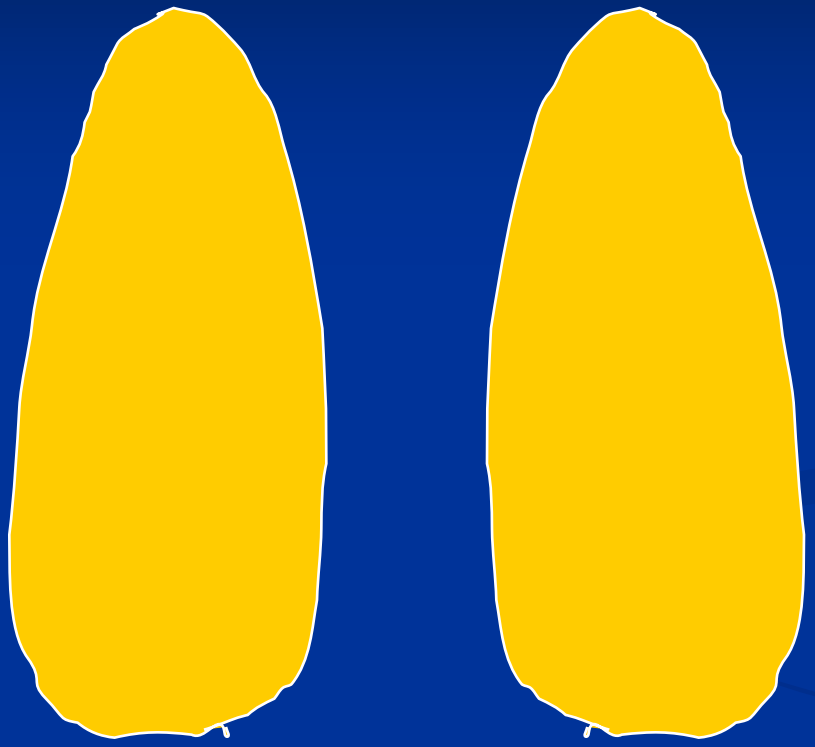
2 : Benign.

3 : Indeterminate.

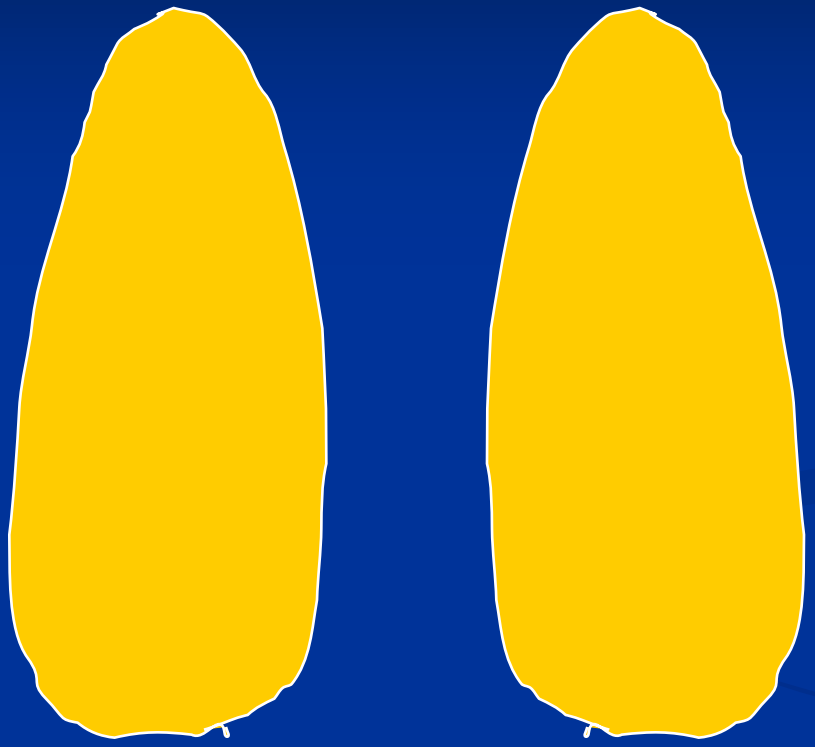
4 : Suspicious.

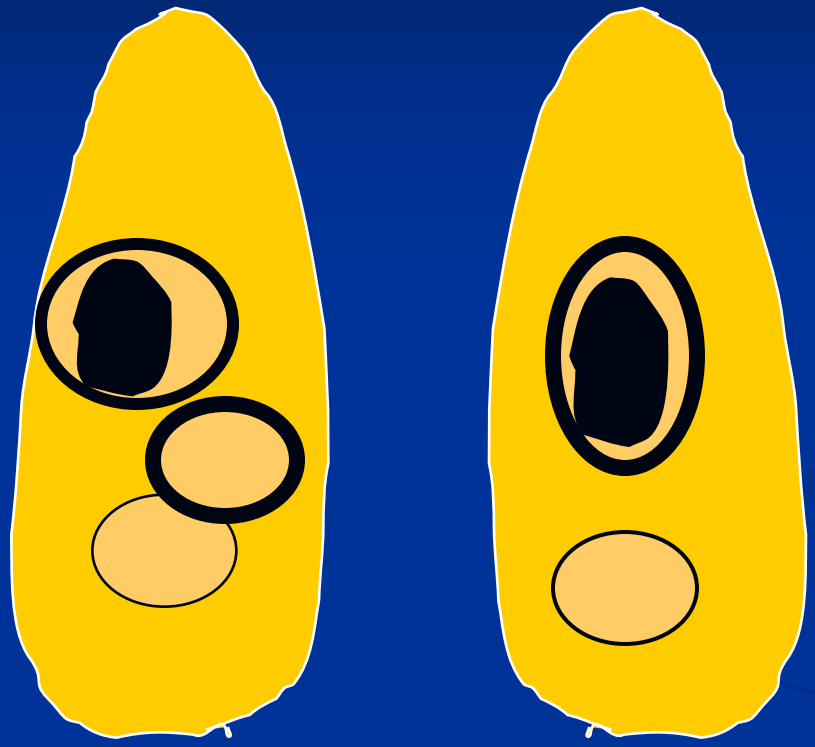
5 : Malignant

BMUS Manchester 2006

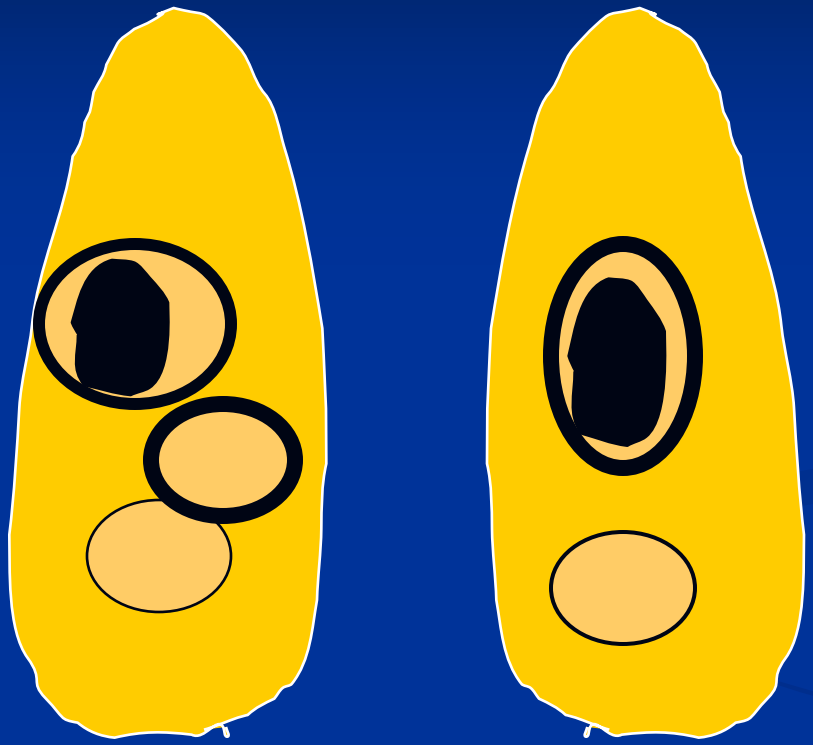


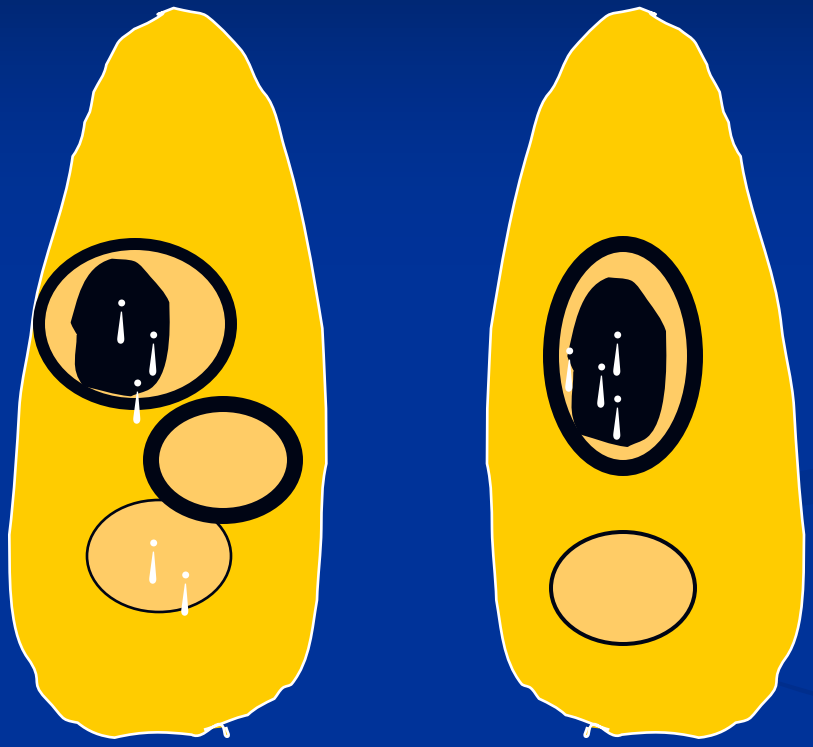
R 1





R 2





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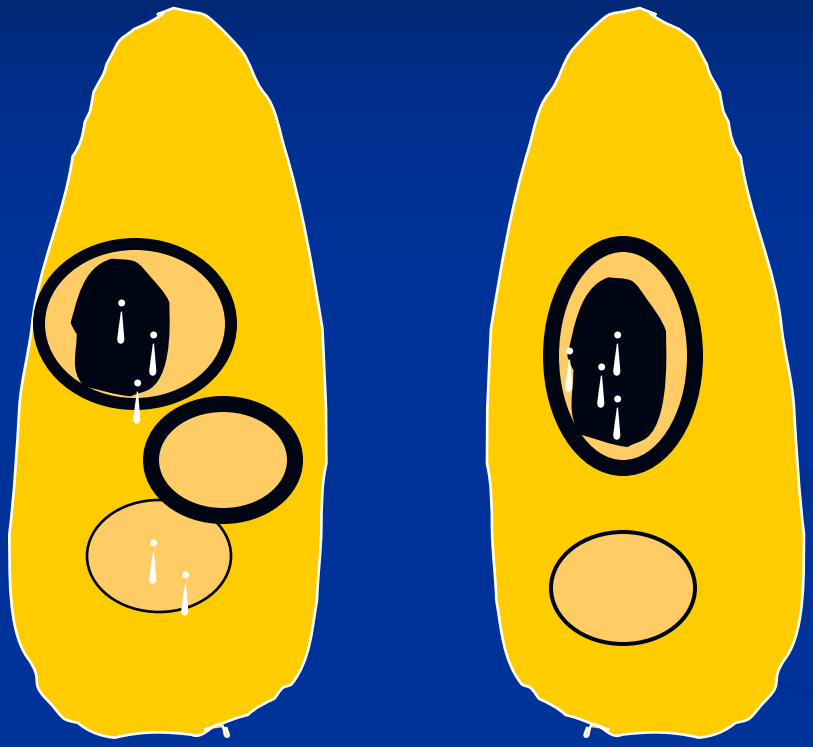

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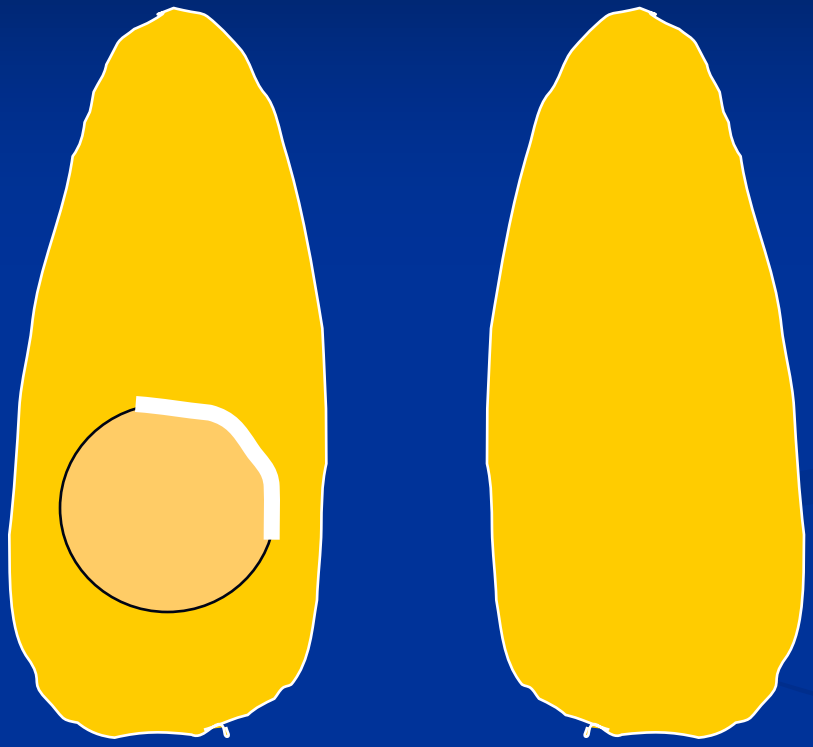

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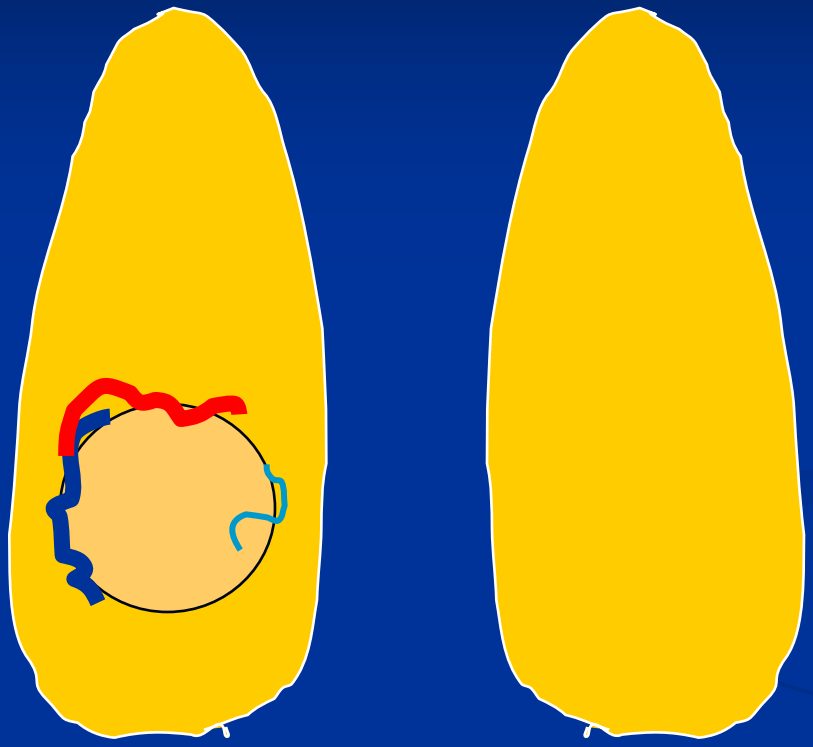

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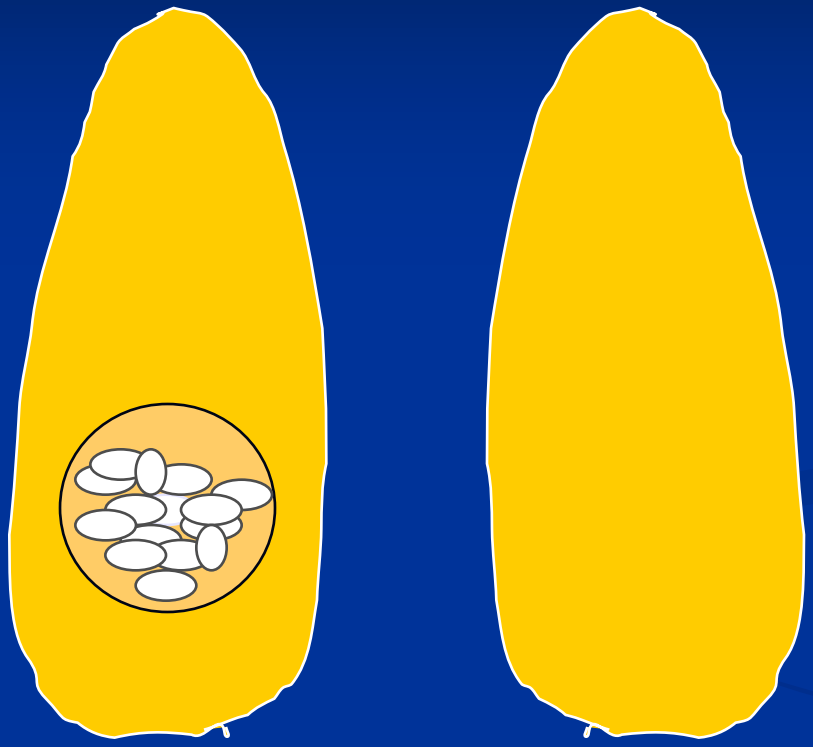
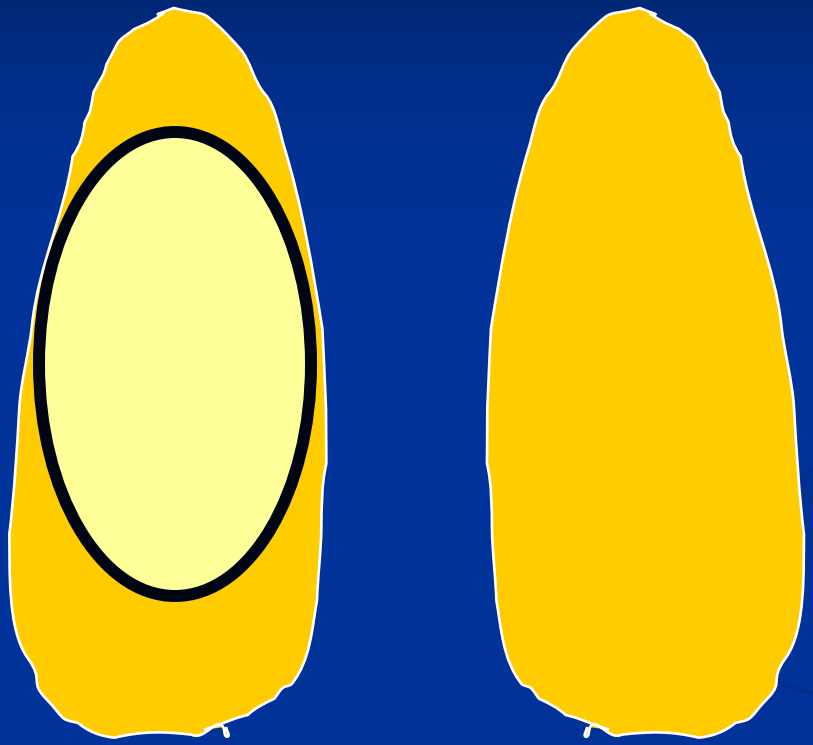
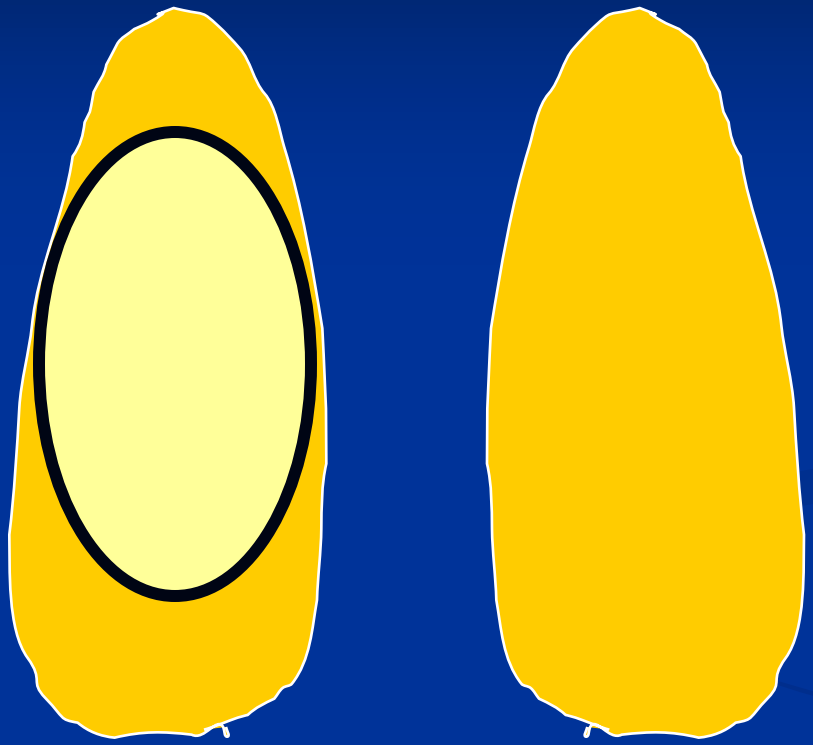
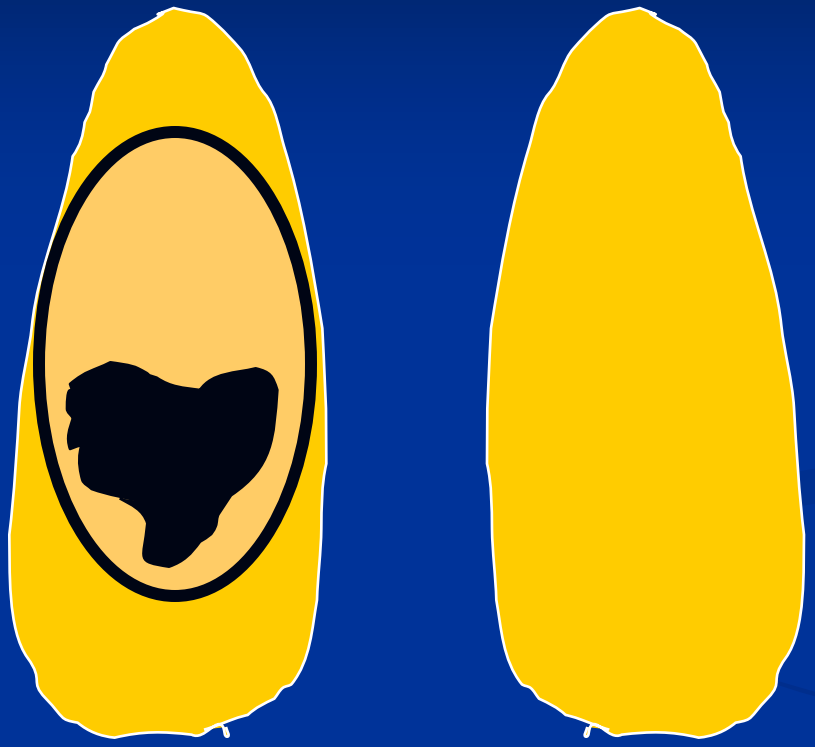


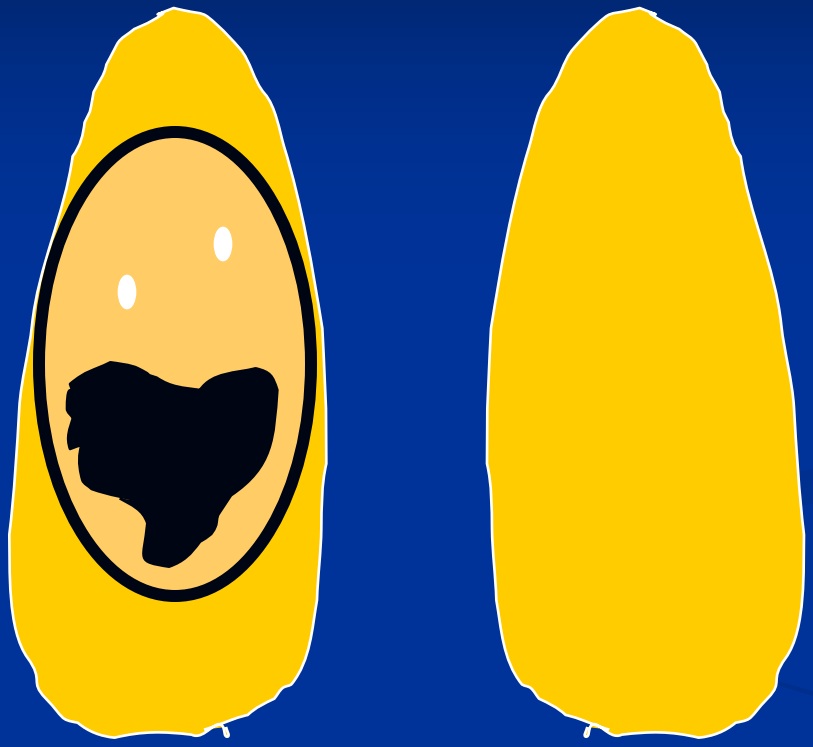


R 3

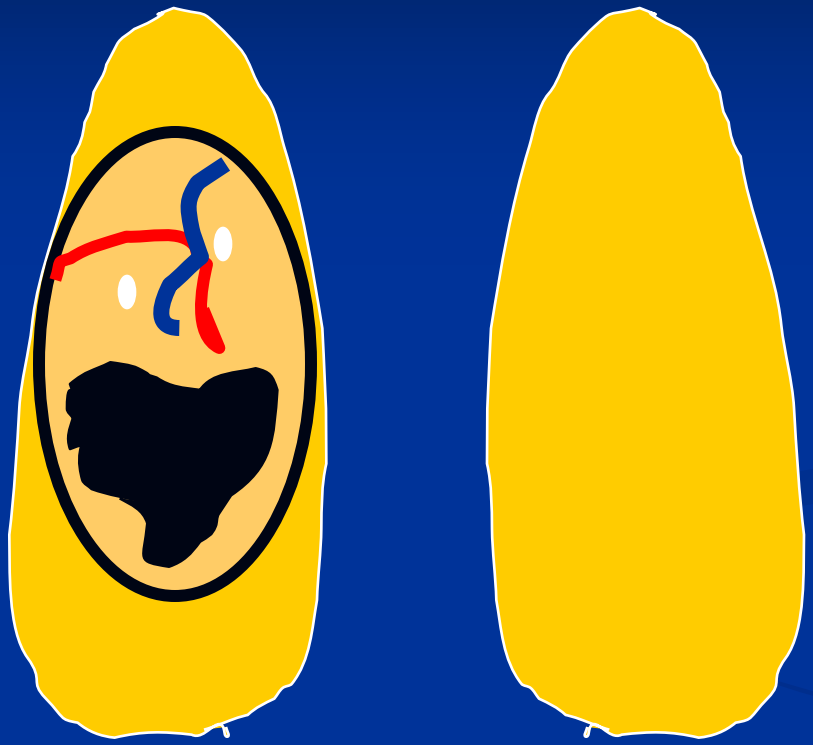




R ?



R ?



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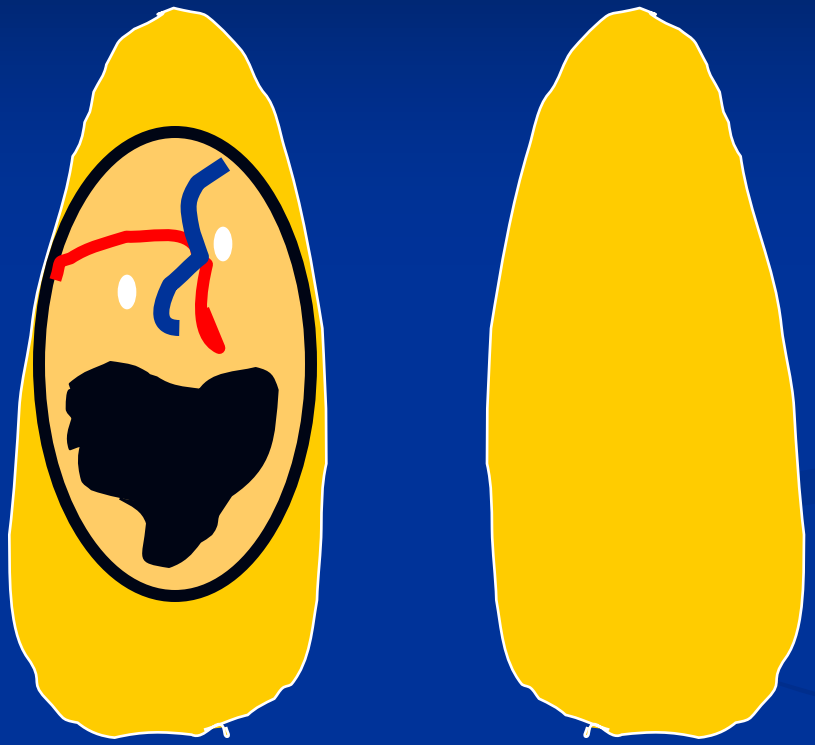
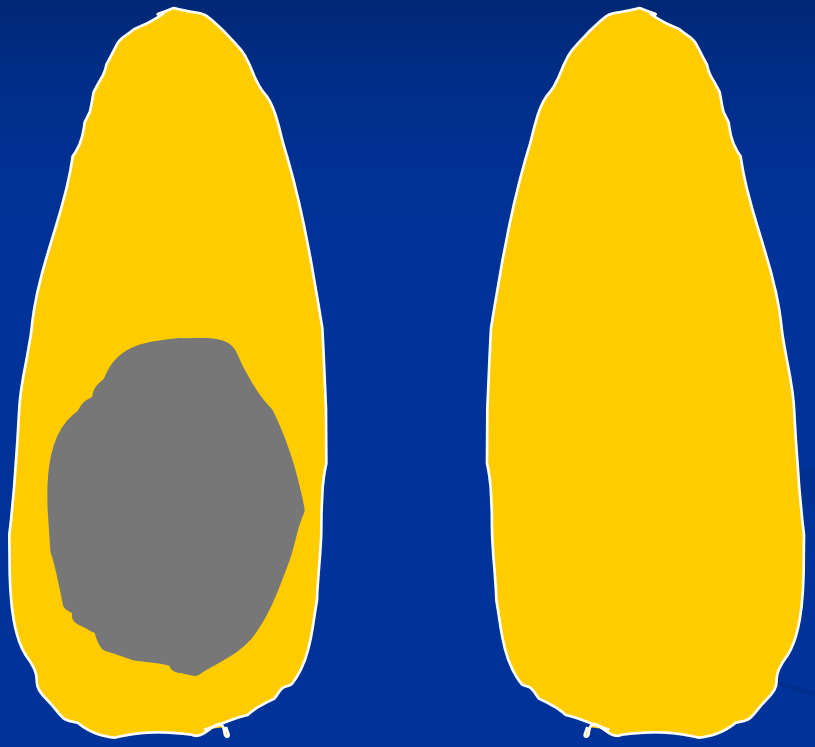
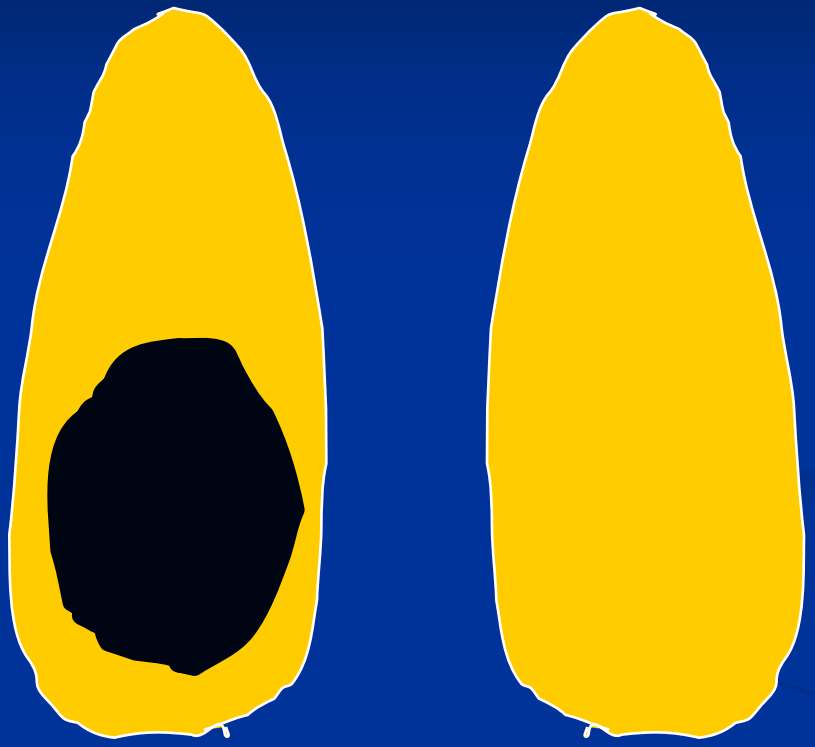
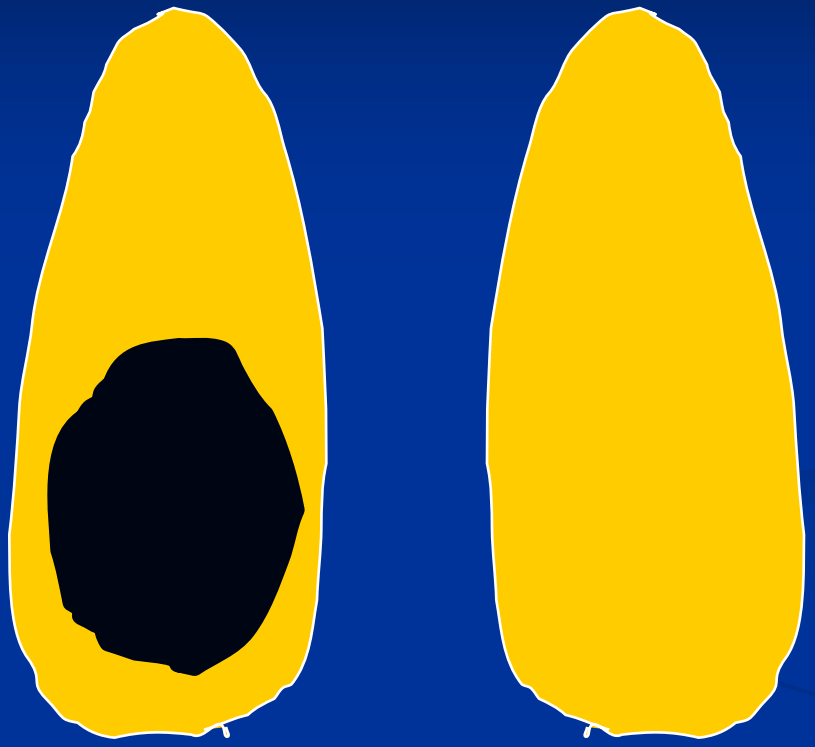


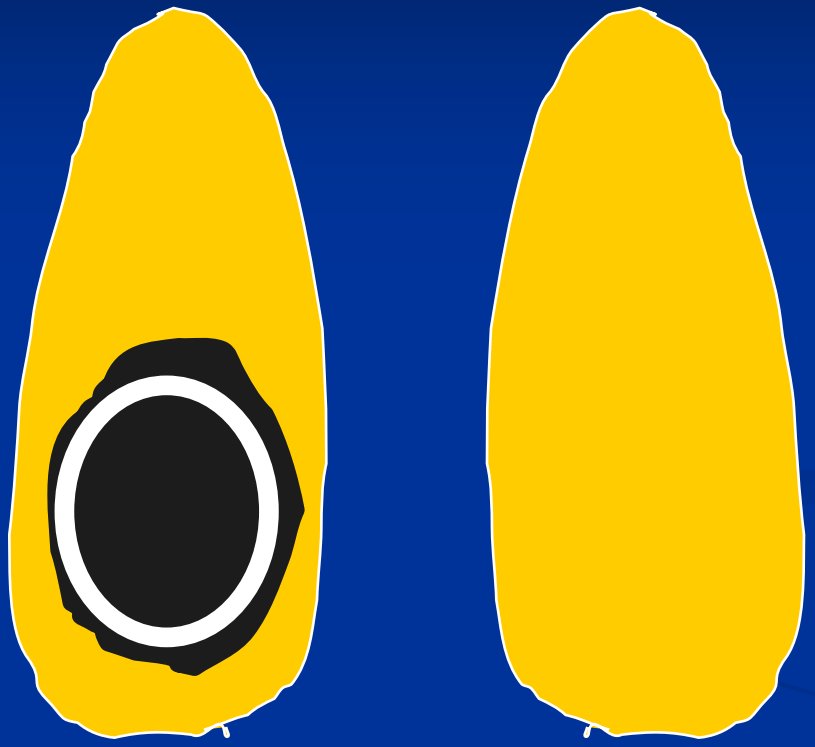


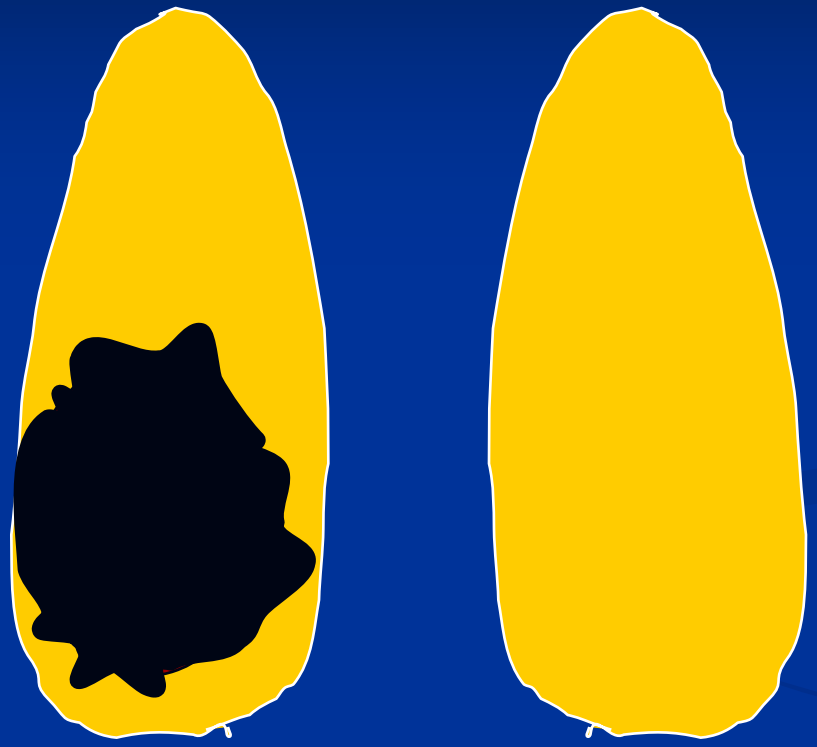


R 4

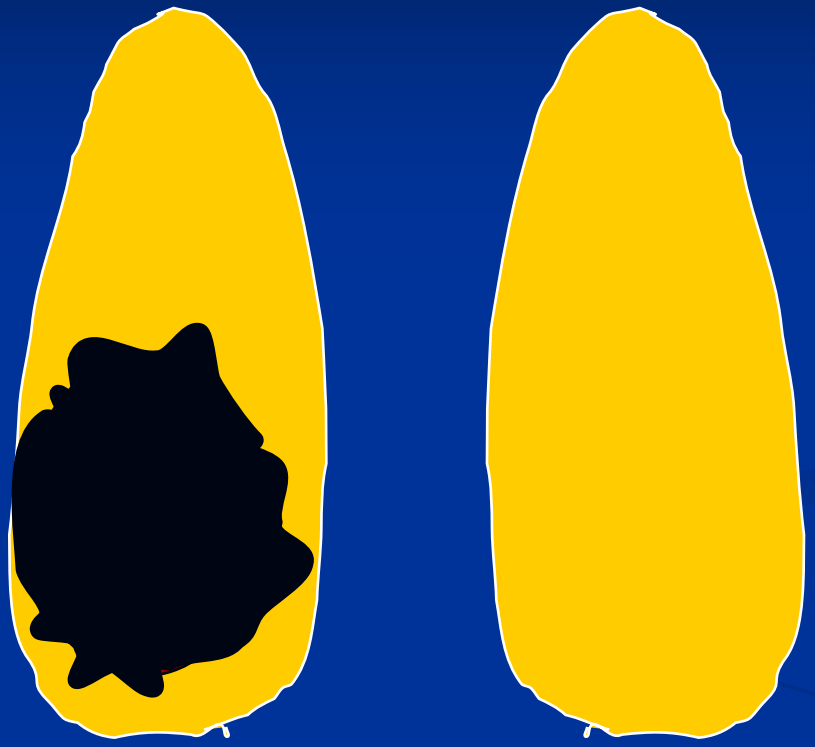


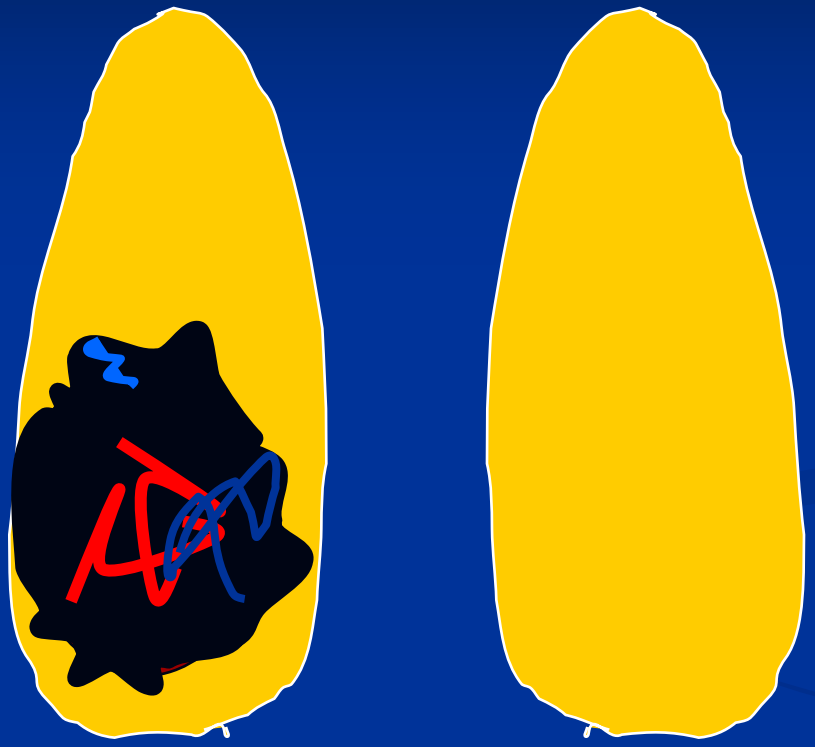
R 4



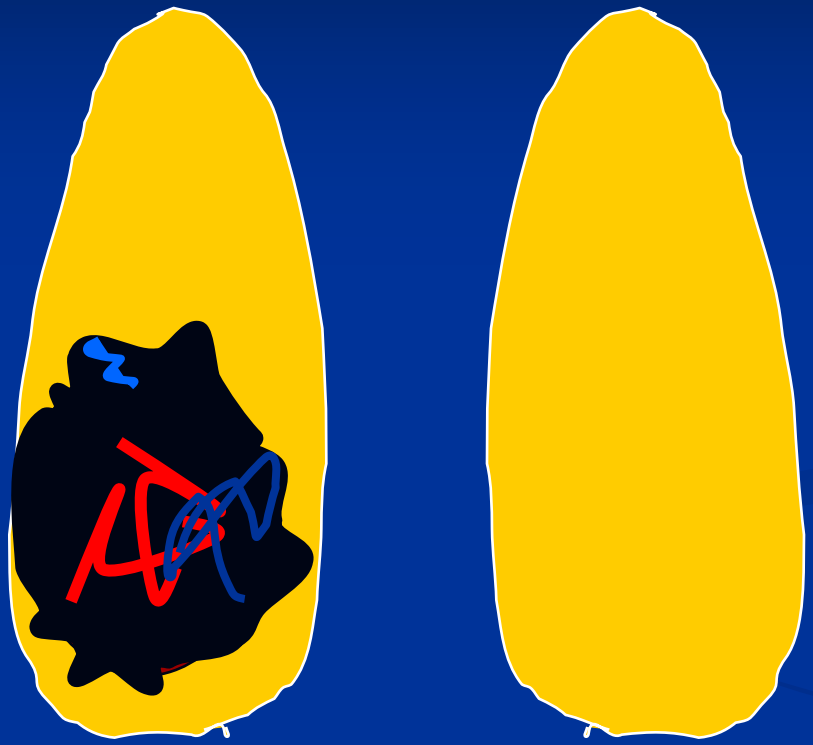


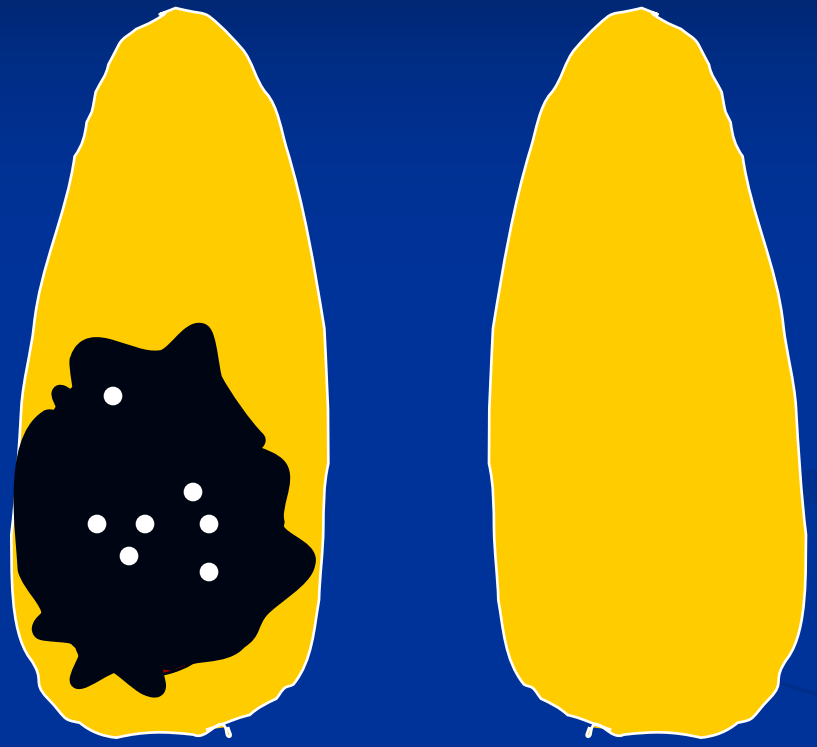
R 4/5



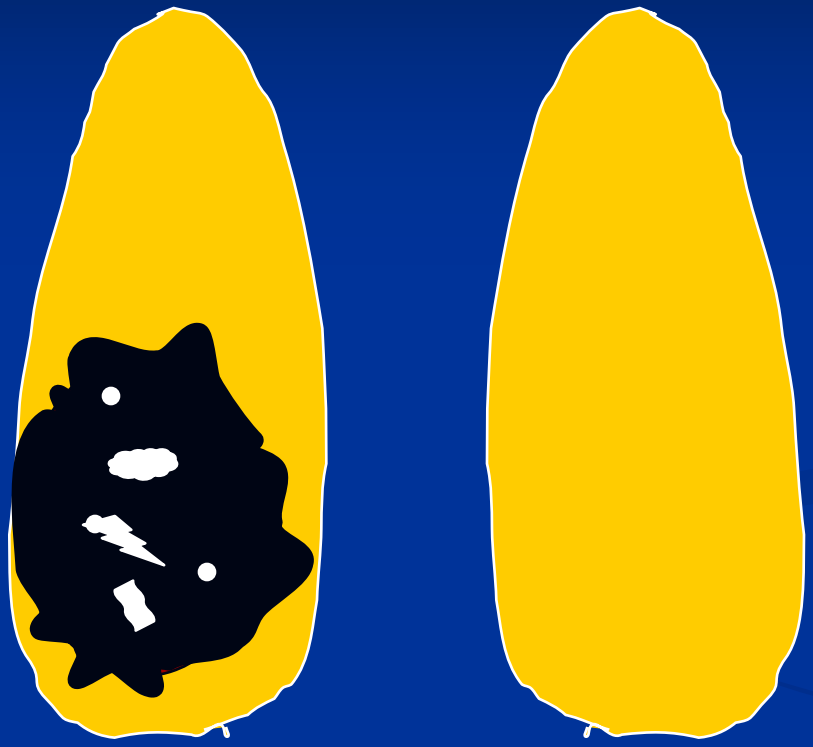


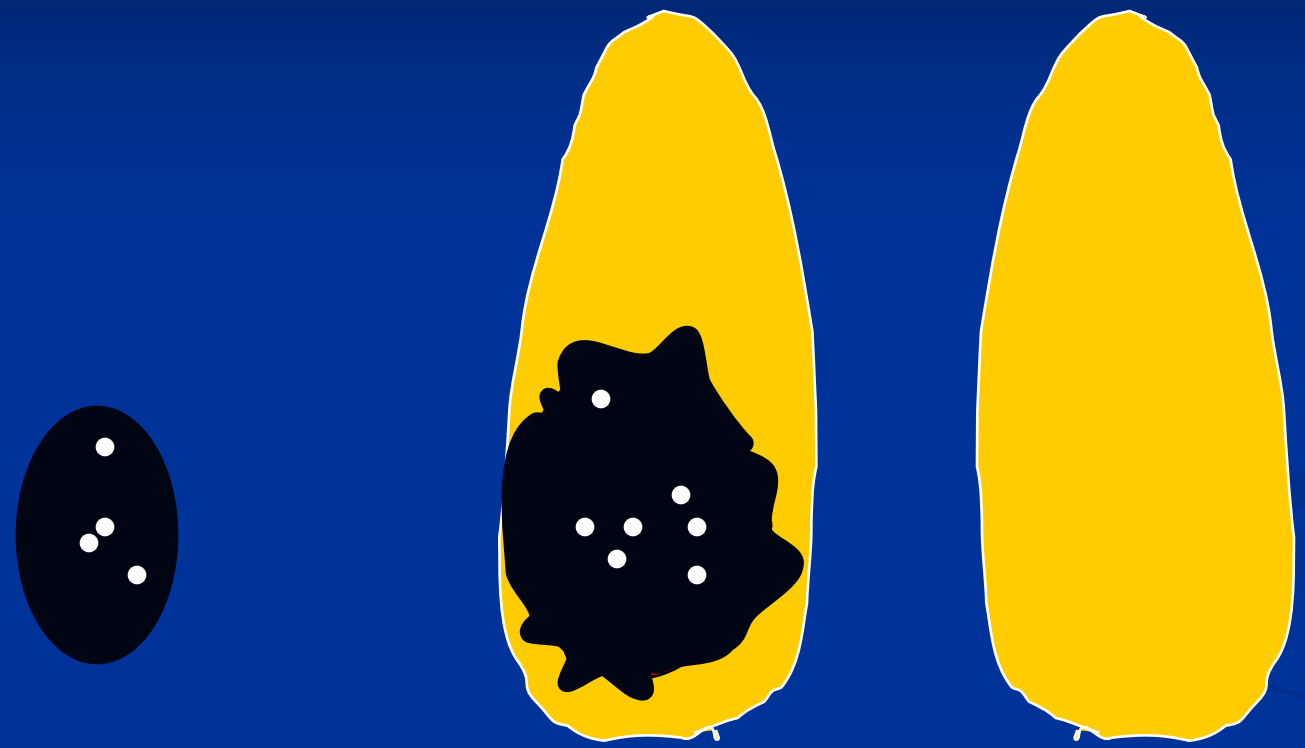
R 5





R 5

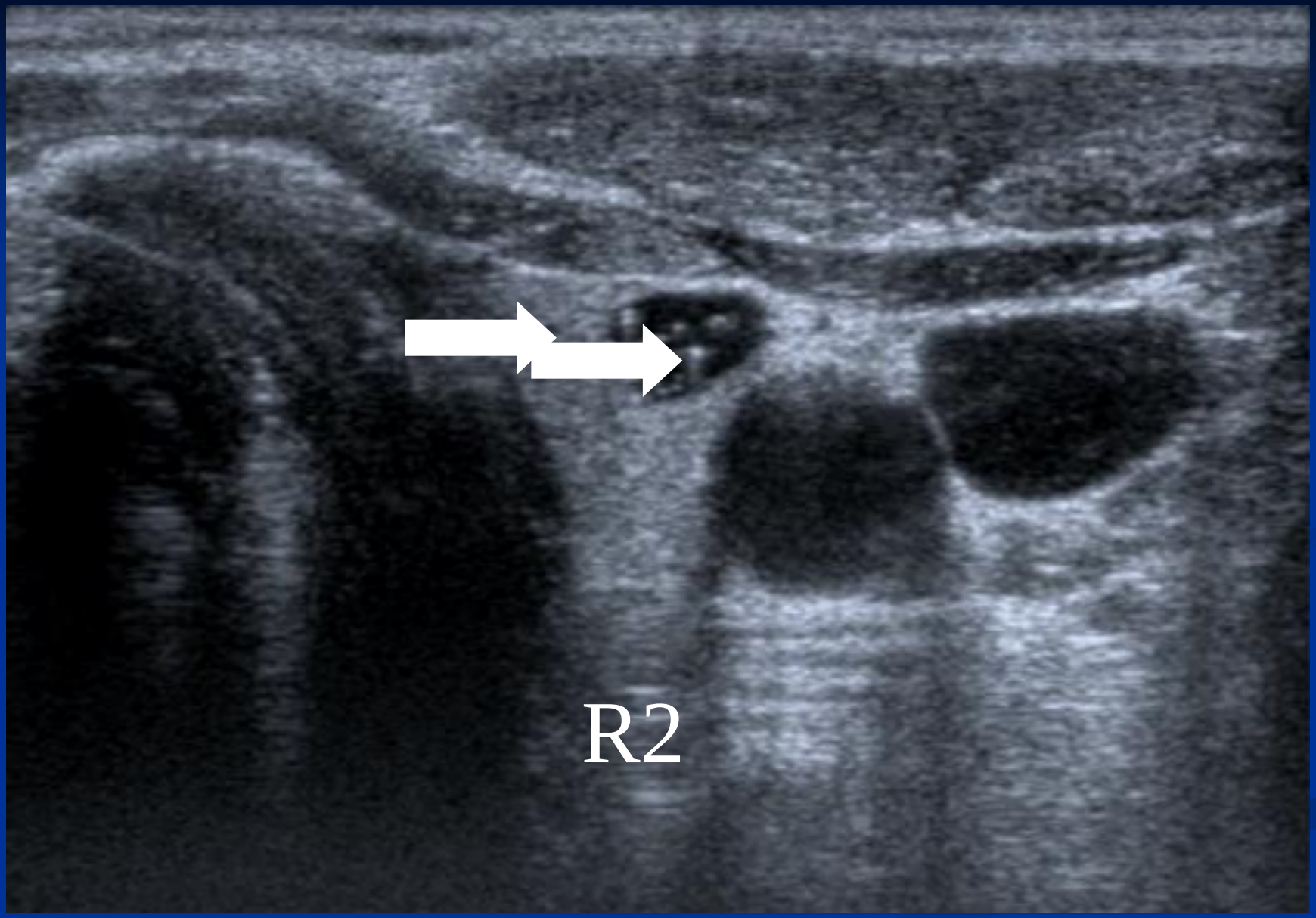




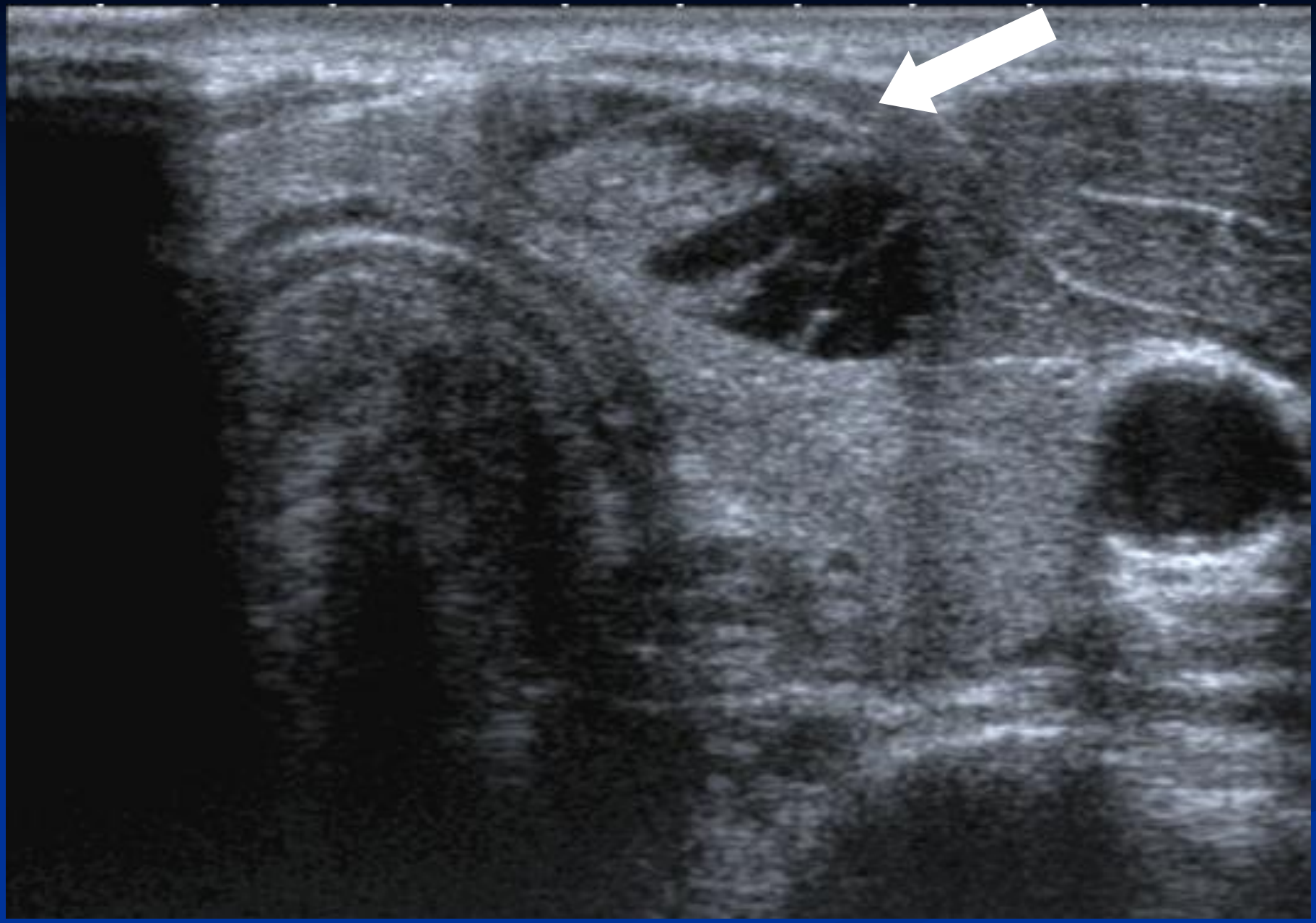
Thyroid nodules.

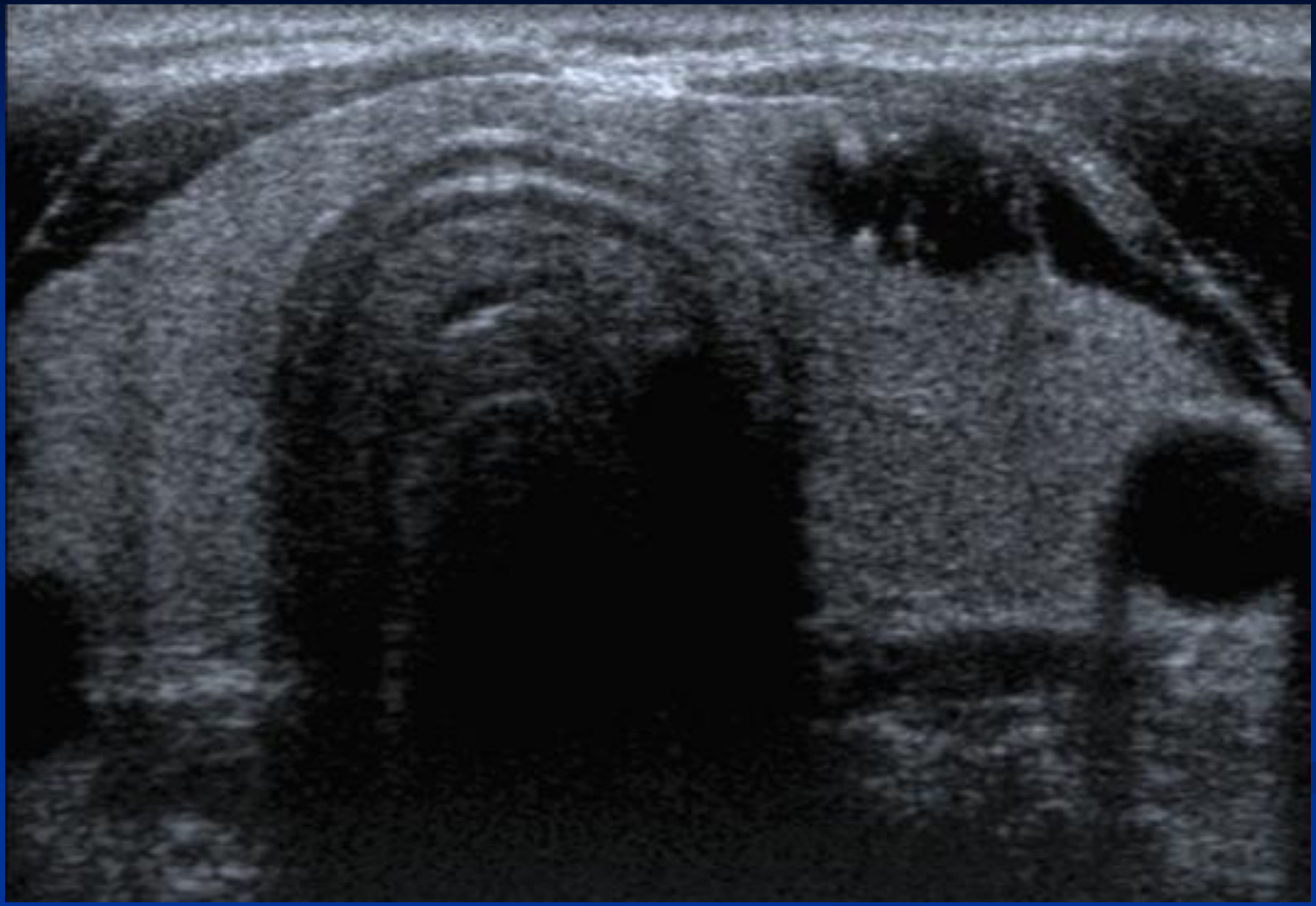
- R Classification.
- Cytological classification(1 -5)
- Clinical scenario.
- Correctly manage patient.
- Practice?

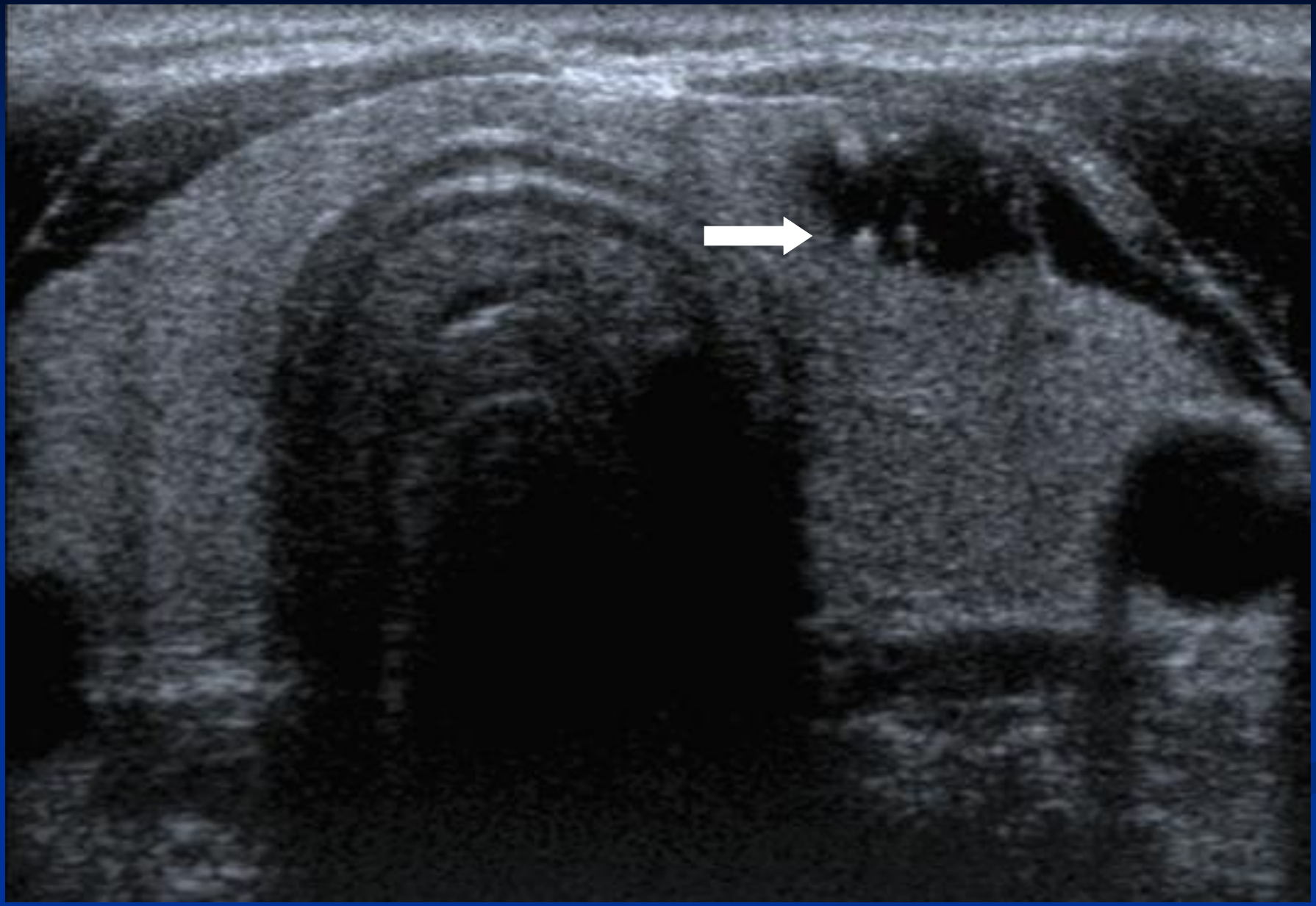
Case 1.

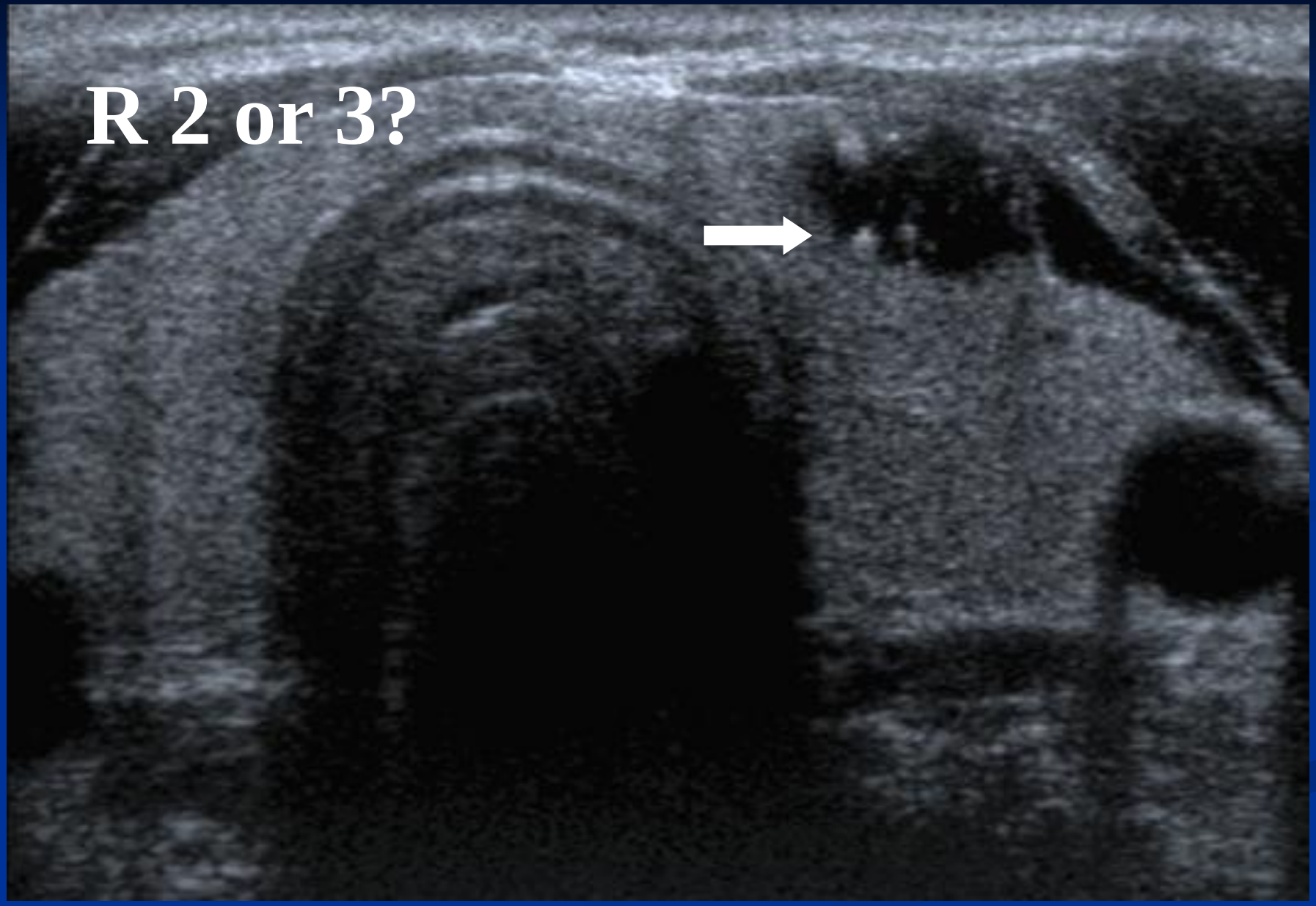

R2

Case 2.



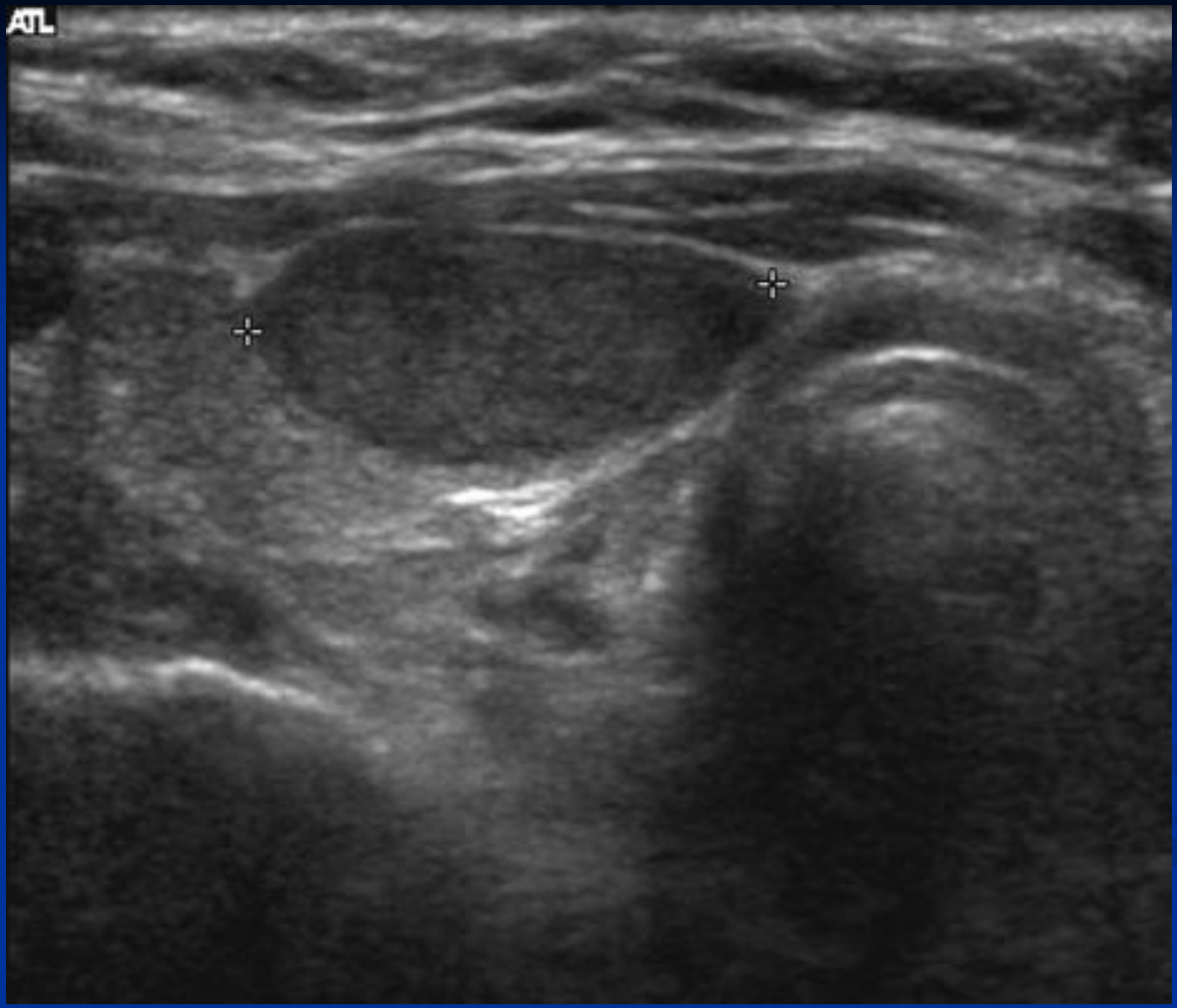


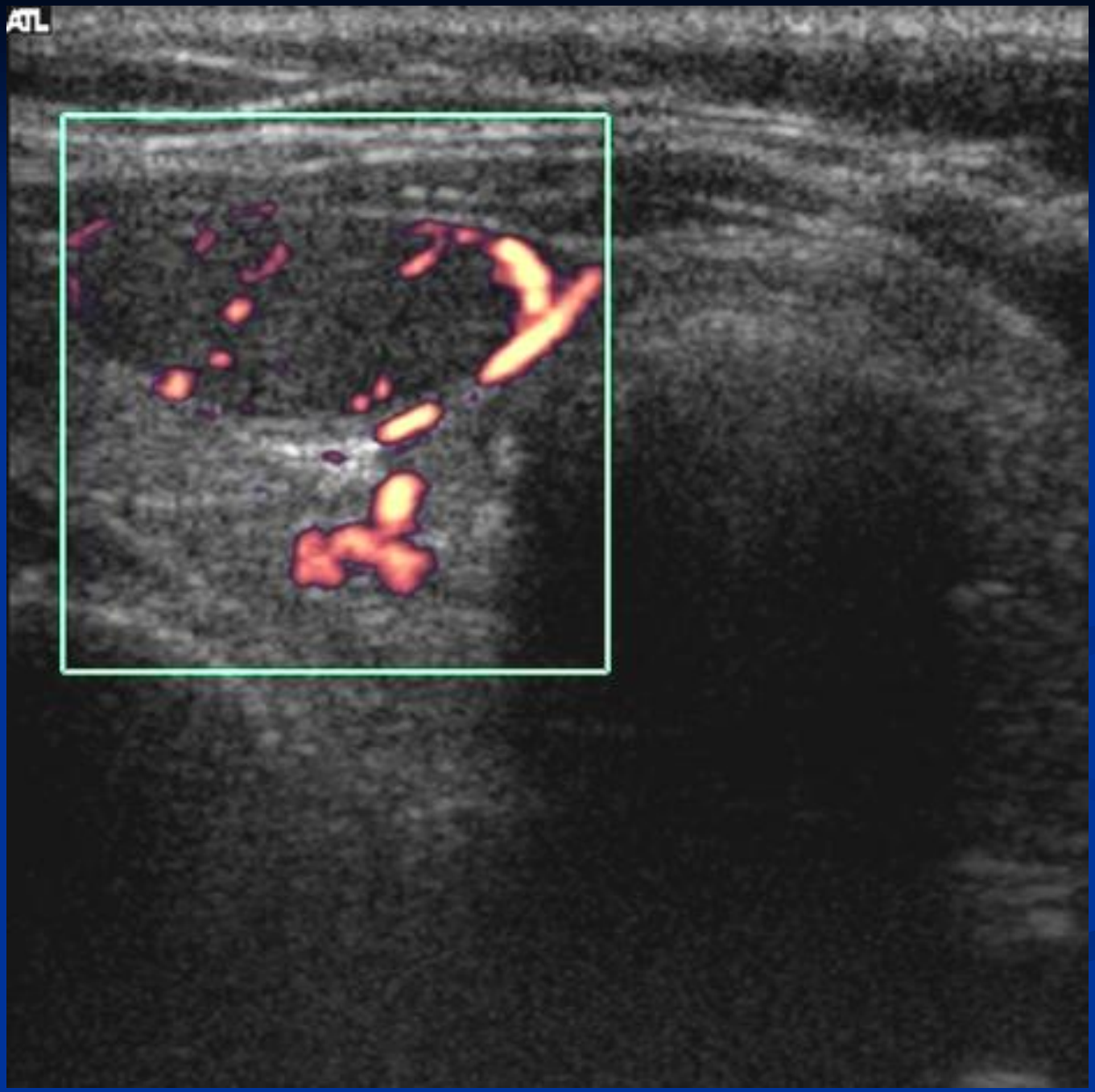


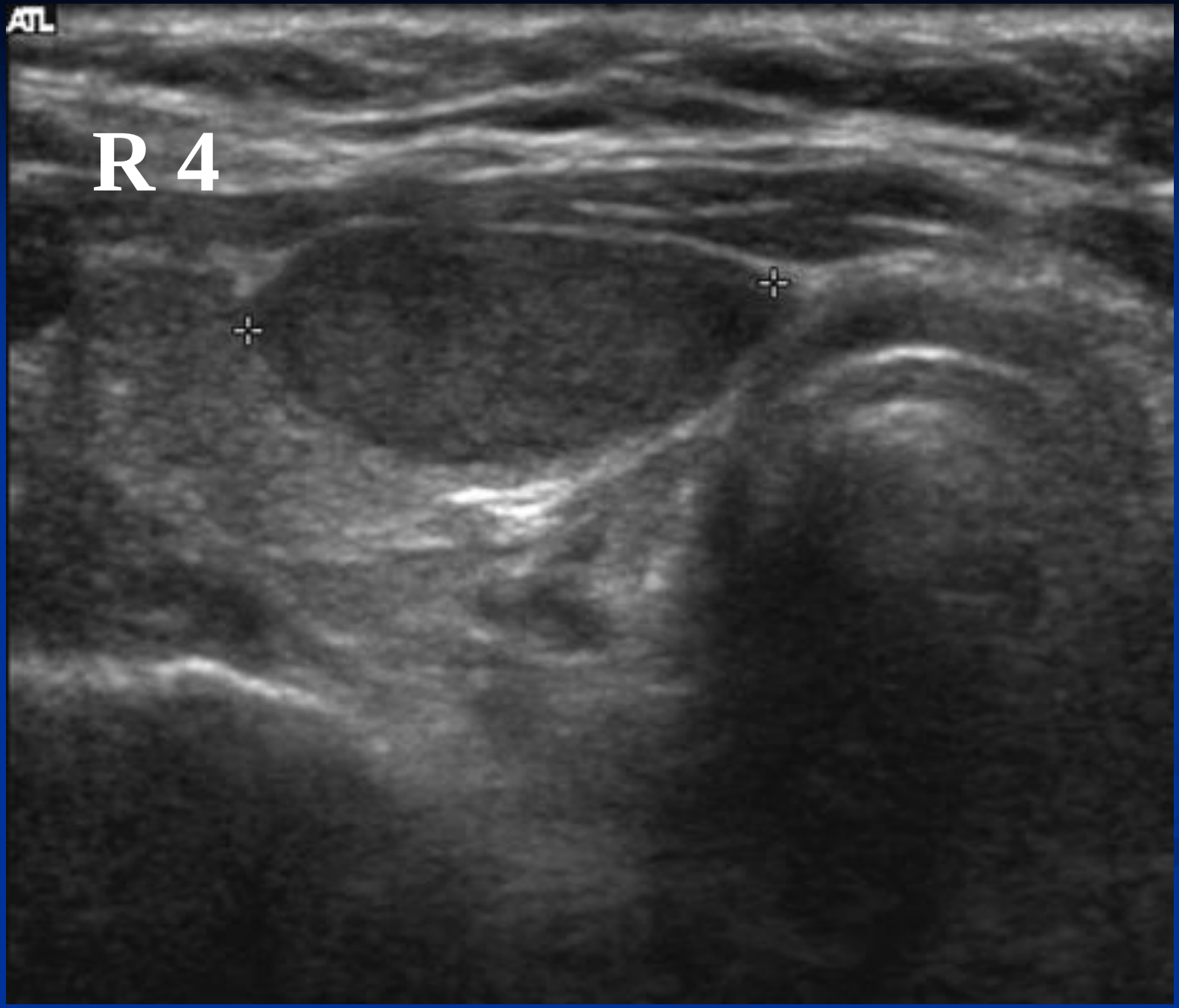

R 2 or 3?

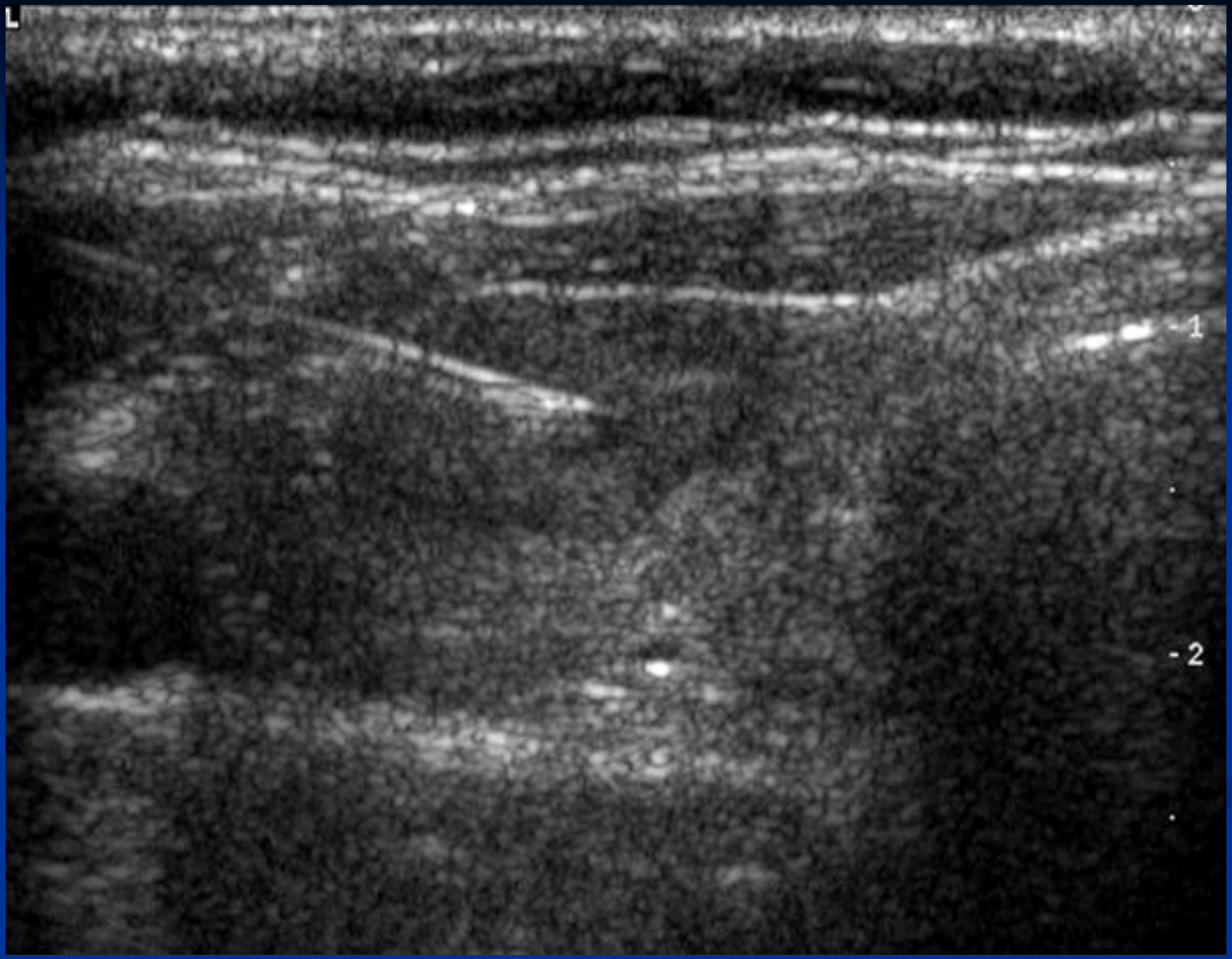

TOSHIBA
SINGLETON HOSPITAL - SS - THYROID 1 11:26:06 AM
T
0
1
2
3
4
MI:1.6
2DG
93
DR
70
12L5
T9.0
33 fps
HDD:58% Free

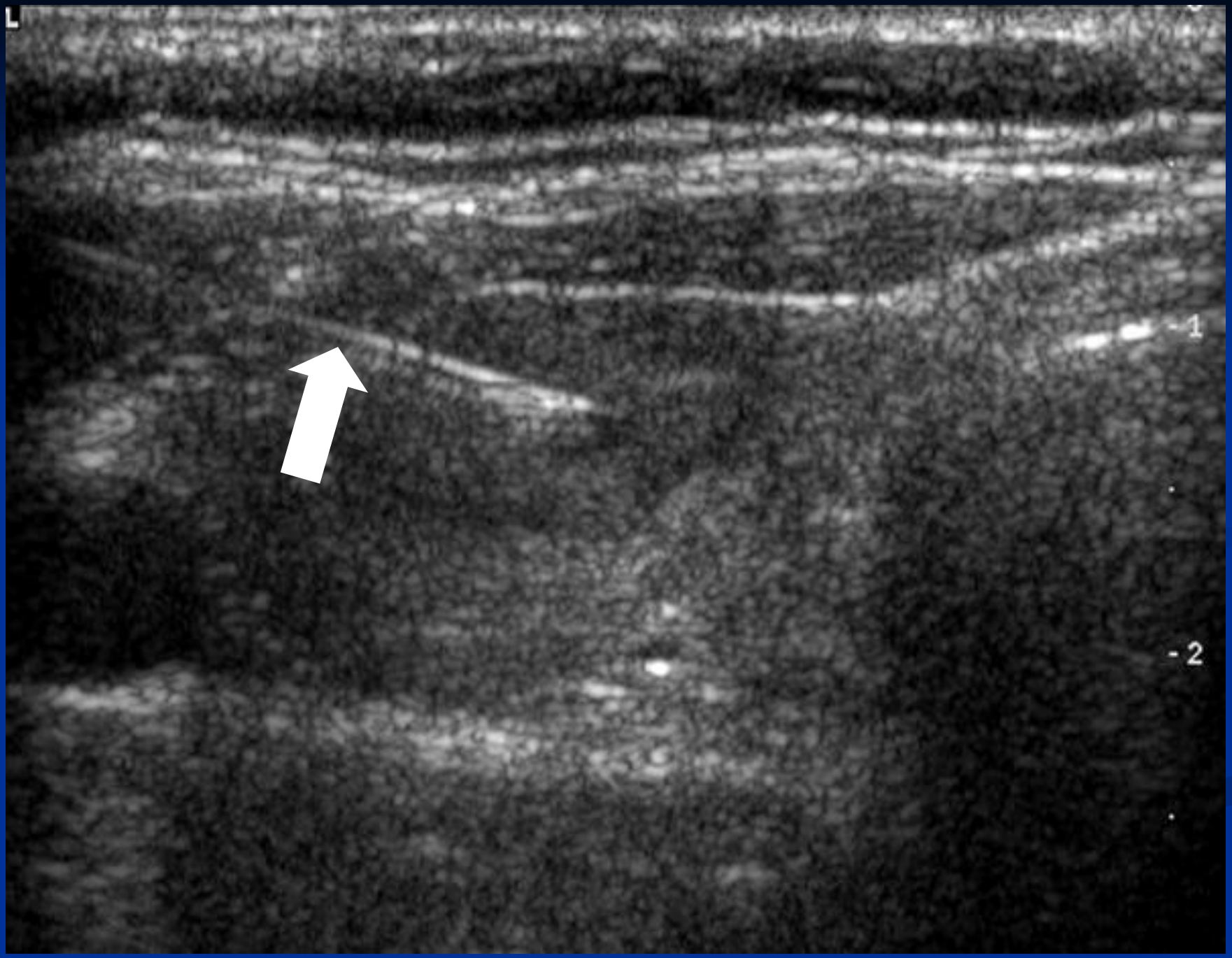
Case 3.

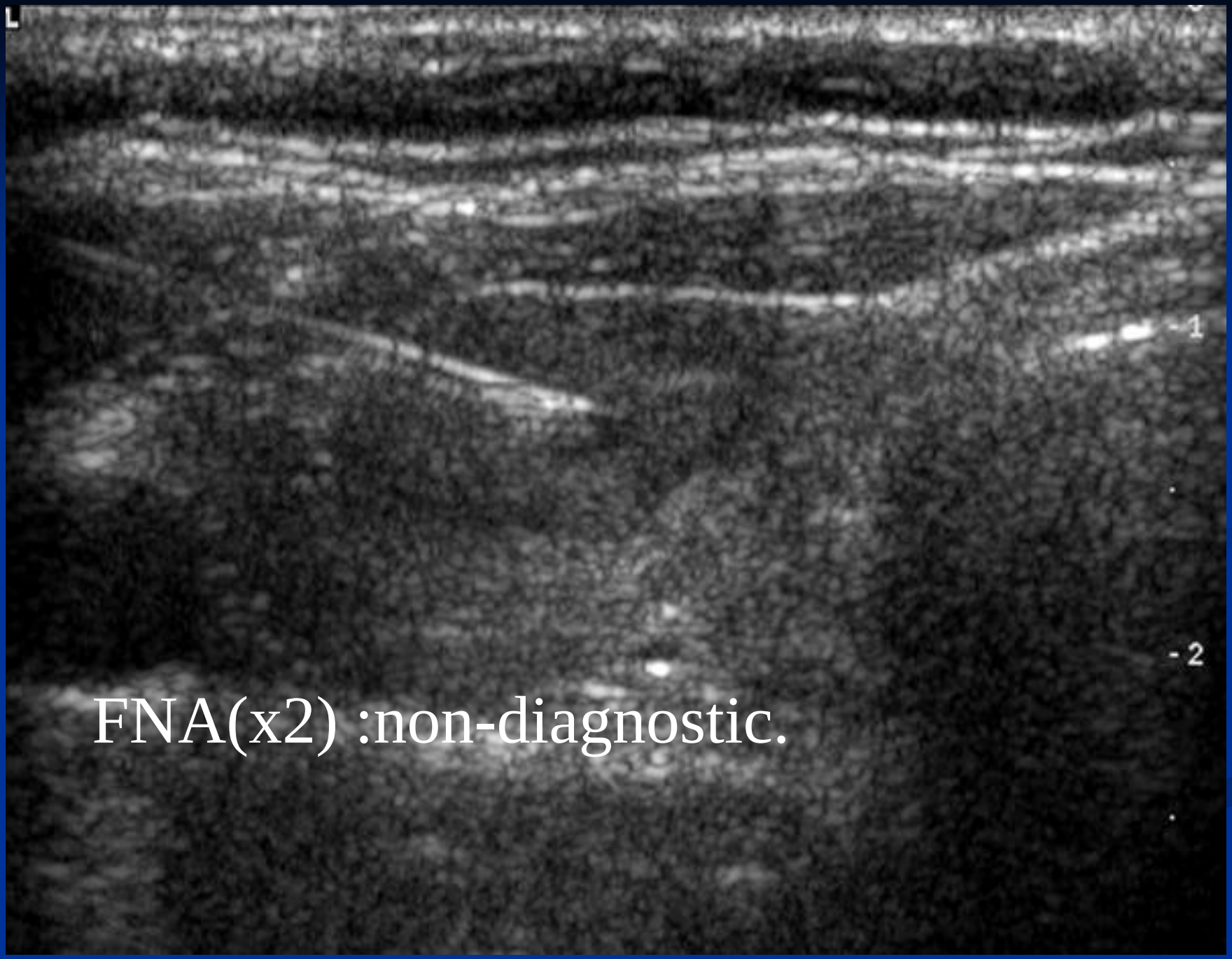

ATL


ATL


ATL
R 4

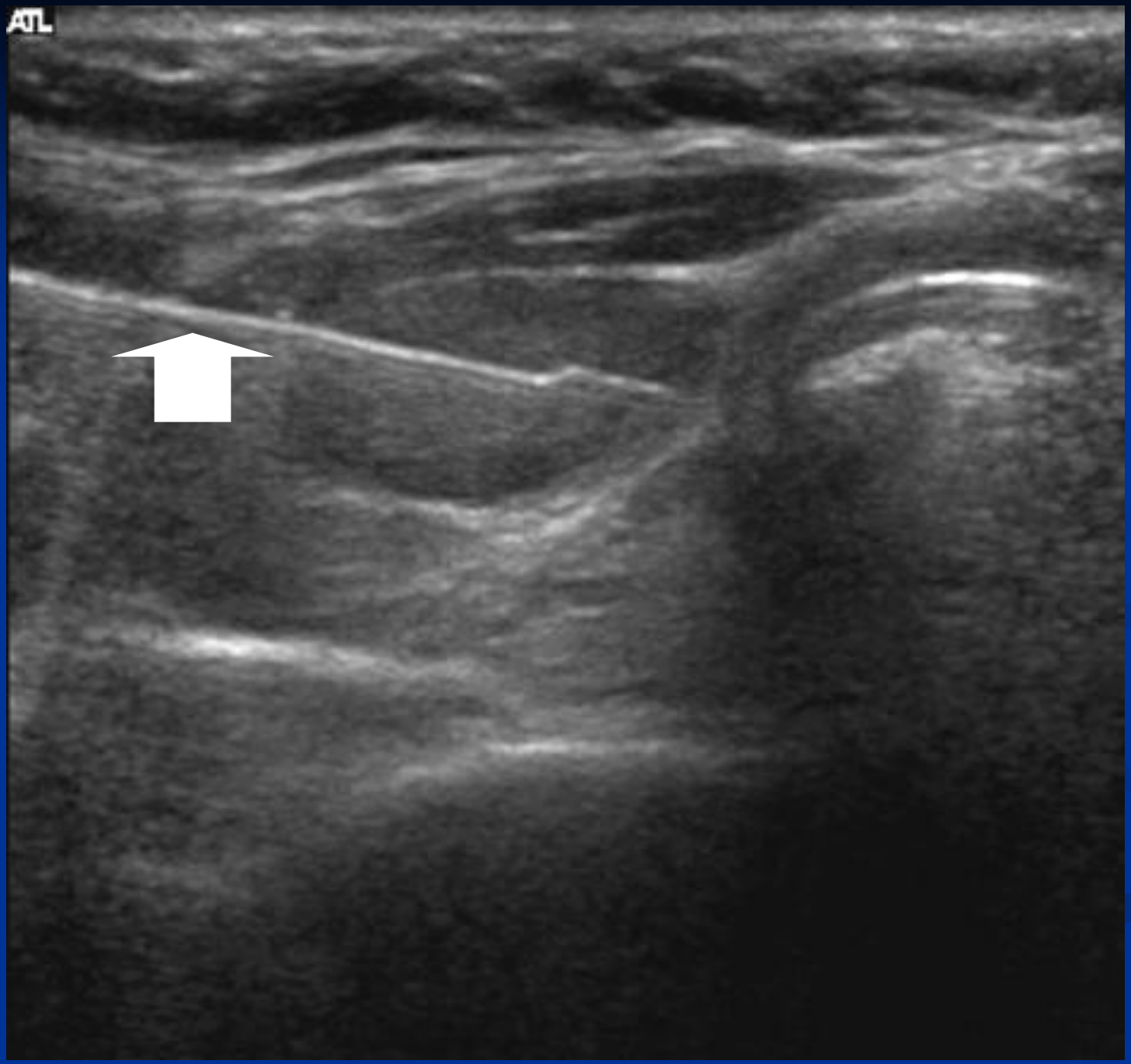

L
1
2

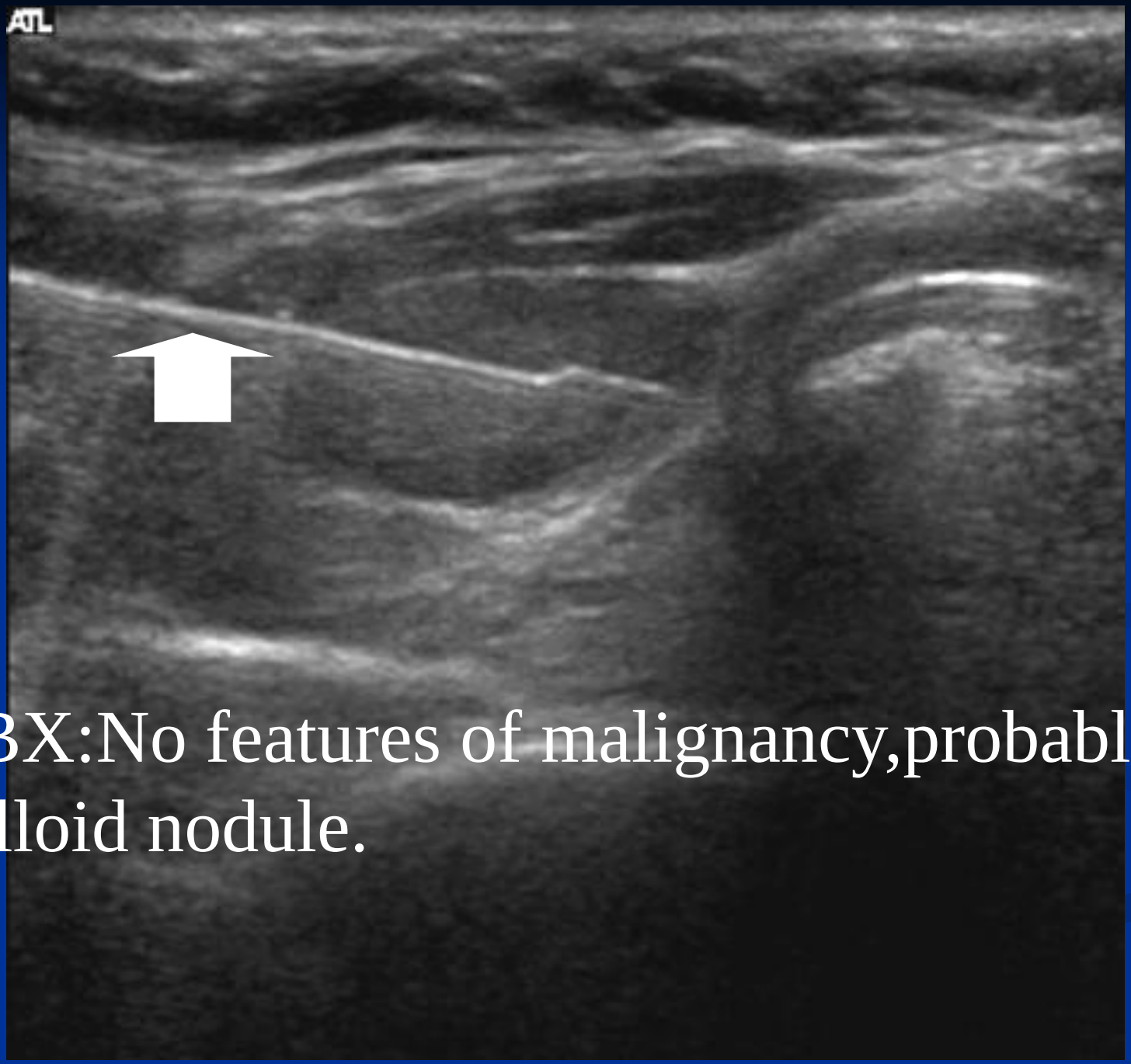

L
1
2



FNA(x2) :non-diagnostic.


ATL

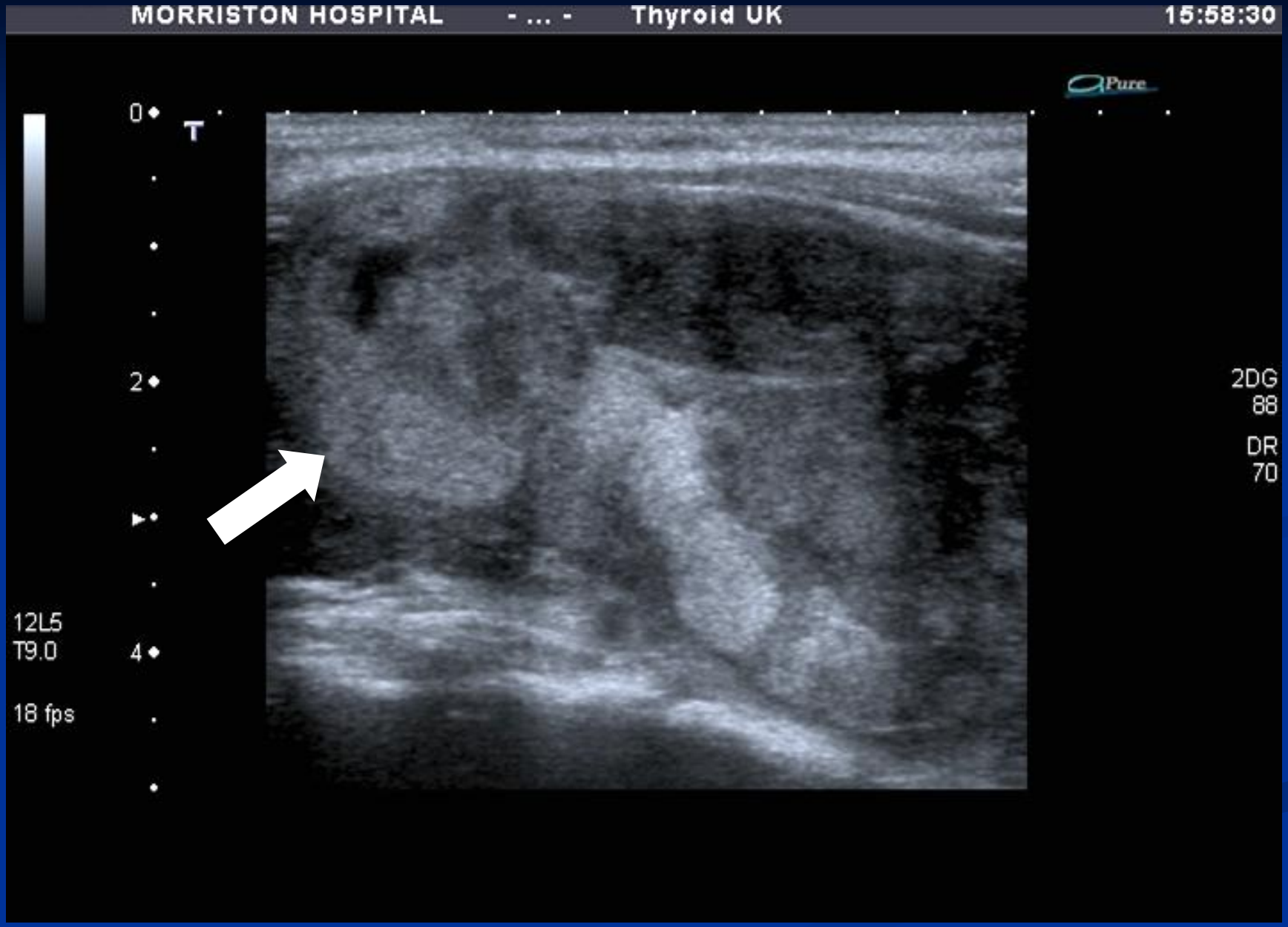

ATL

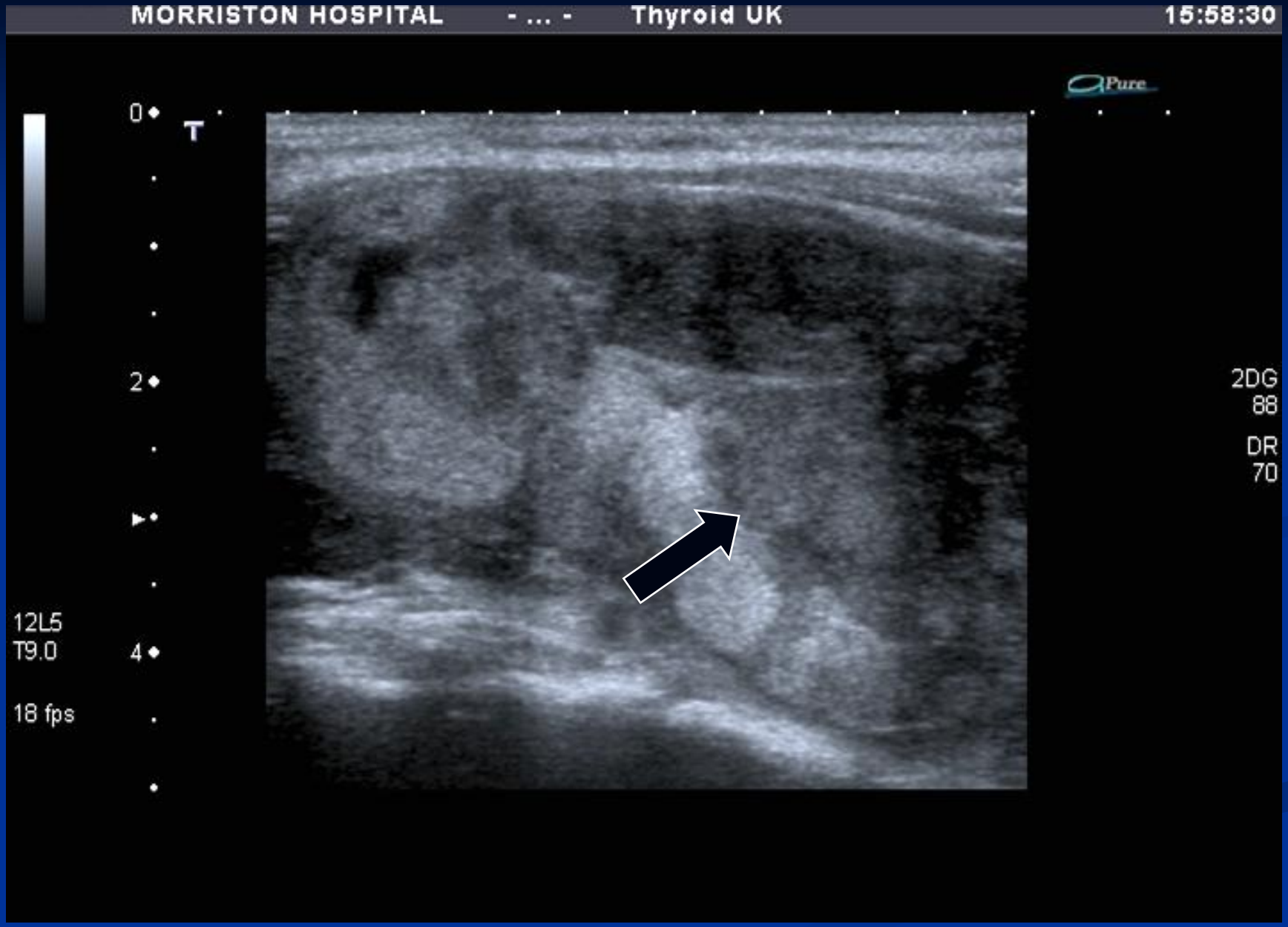


CBX:No features of malignancy,probable colloid nodule.

Case 4.

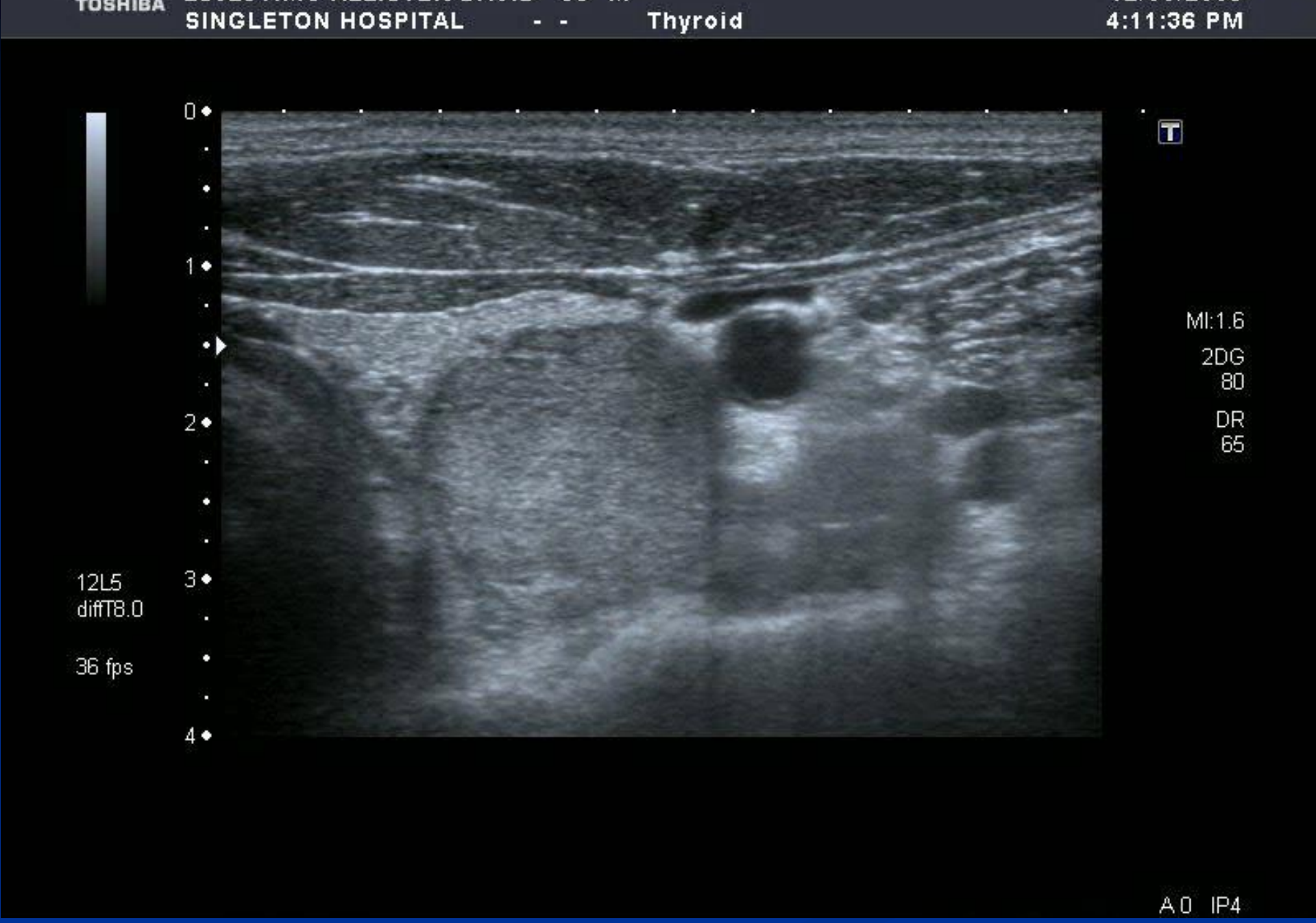

MORRISTON HOSPITAL - ... - Thyroid UK 15:58:30
Pure
0
T
2
4
12L5
T9.0
18 fps
2DG
88
DR
70

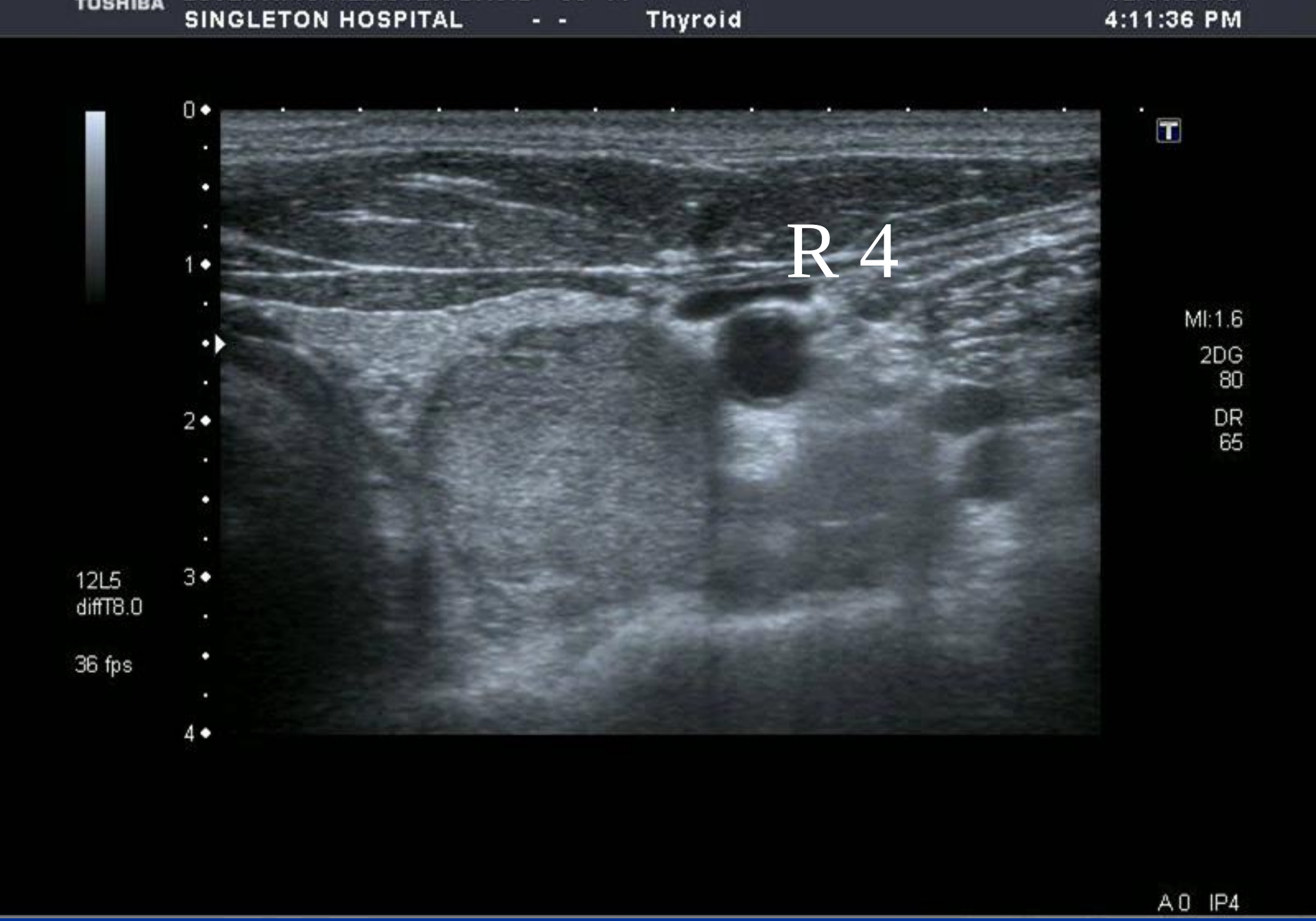

MORRISTON HOSPITAL - ... - Thyroid UK 15:58:30
Pure
0
T
2
4
12L5
T9.0
18 fps
2DG
88
DR
70


MORRISTON HOSPITAL - ... - Thyroid UK 15:58:30
Pure
0
T
2
4
12L5
T9.0
18 fps
2DG
88
DR
70


TOSHIBA
MORRISTON HOSPITAL
- ... -
Thyroid UK
15:58:17
5.8
0
T
2
4
12L5
T9.0
CF 5.3
5 fps
Pure
R 4
2DG
88
DR
70
CG
40
PRF
10.9k
Filter
5

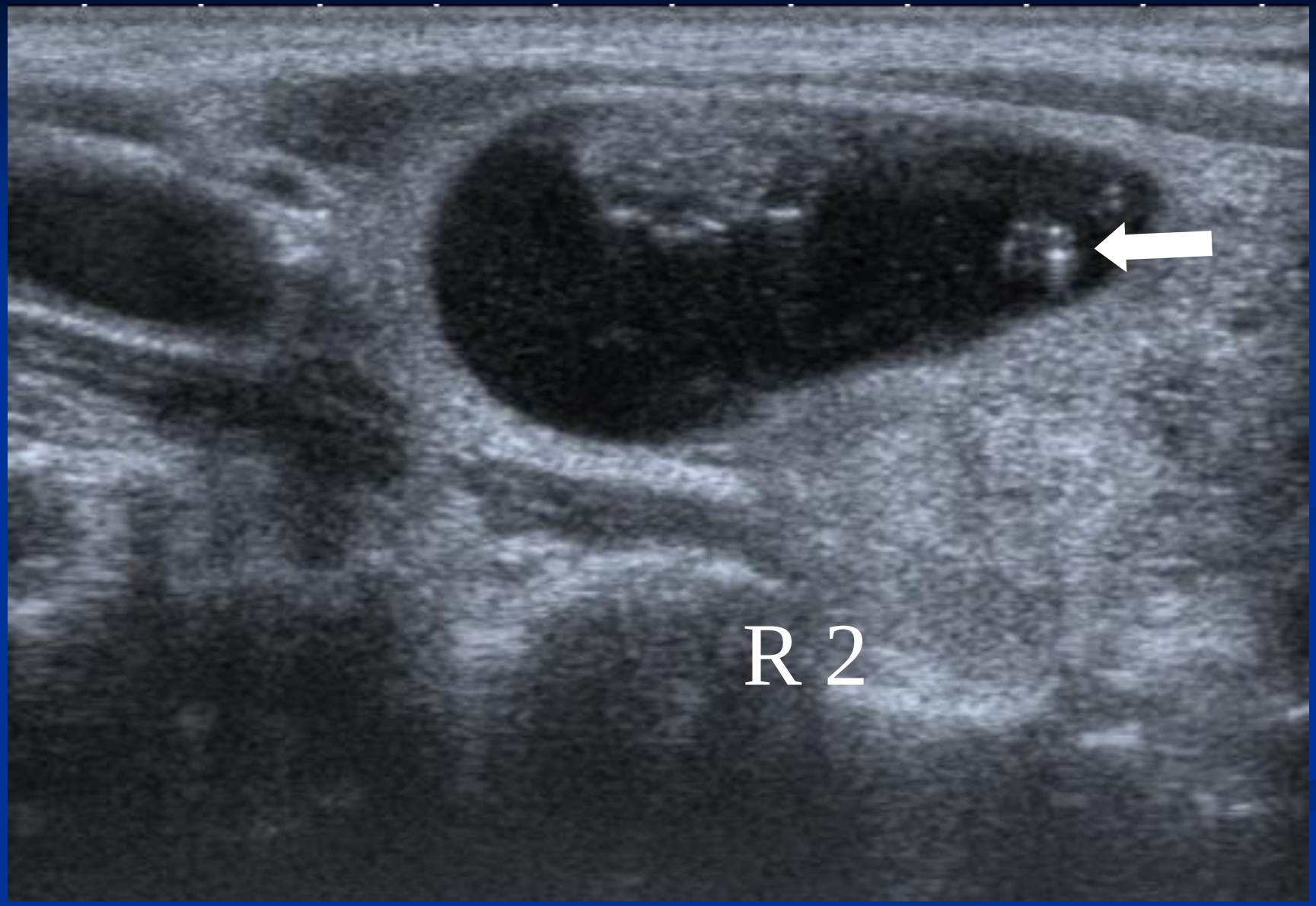
Case 5.


TOSHIBA
SINGLETON HOSPITAL - - Thyroid
4:11:36 PM
0
1
2
3
4
T
MI:1.6
2DG
80
DR
65
12L5
diffT8.0
36 fps
A 0 IP4


TOSHIBA
SINGLETON HOSPITAL
Thyroid
4:11:36 PM
R 4
MI:1.6
2DG
80
DR
65
12L5
diffT8.0
36 fps
A 0 IP4


TOSHIBA
SINGLETON HOSPITAL - - Thyroid
4:13:02 PM
0
1
2
3
4
T
MI:1.6
2DG
80
DR
65
12L5
diffT8.0
36 fps
A 0 IP4

Case 6.


R 2

Case 7.


YSTRADGYNLAIS
- OPE -
Thyroid 2
11:28:32 AM
0
1
2
3
MI:1.4
2DG
80
DR
65
14L7
diffT13.0
25 fps
IP4
HDD:63% Free


YSTRADGYNLAIS
- OPE -
Thyroid 2
11:35:42 AM
0
1
2
3
MI:1.4
2DG
80
DR
65
14L7
diffT13.0
25 fps
IP4
HDD:63% Free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Guidelines?

- Comparison guidelines.
- Kim : nodule should have one of hypoechogenicity,irregular margins,micro-calcification,length>width.
- High sensitivity

- Am Assn Clin Endocrin : hypoechoic with one additional feature – irregular margins,length>width or microcalcification
- High specificity

Ahn & Kim,AJR,2010,194(1)31-37.

Guidelines?

- Soc.Rad in US – least accurate
- Kim criteria – high sensitivity
- Am Ass Clin Endoc. – high specificity
- Guidelines?

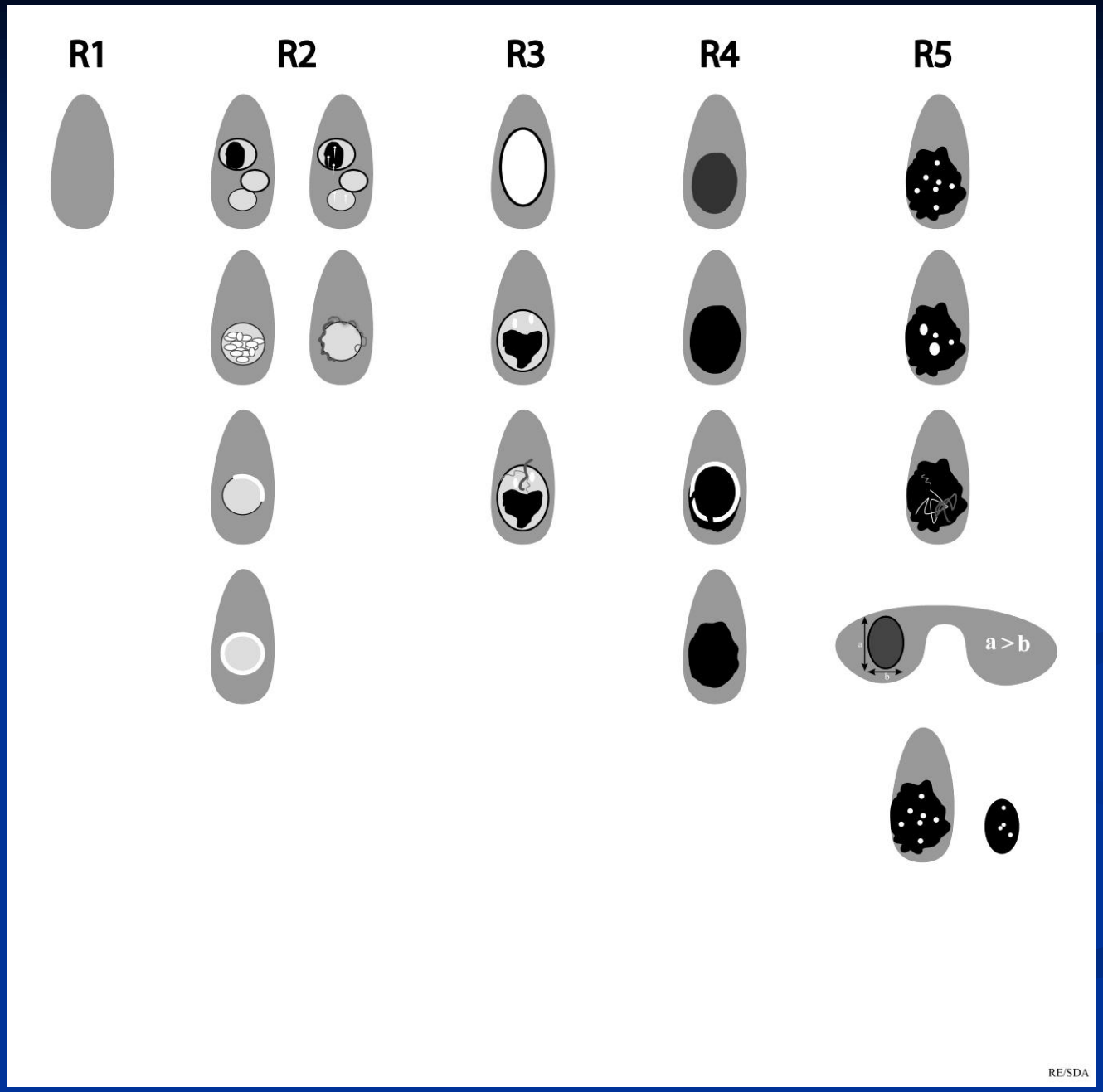
Implementation of evidence based guidelines for thyroid nodule biopsy :a model for establishment of practice standards

- Evidence based signs
- Five categories – predict need for biopsy
- Seven radiologists – 101 nodules(51 malignant)
- Category 1 - 4% malignant
- Category 5 – 96% malignant

Hambly et al,AJR 2011

Guidelines

BTA?


R1
R2
R3
R4
R5
a > b
RE/SDA

Managing the epidemic?

Are we doing any good?

From: **Increasing Incidence of Thyroid Cancer in the United States, 1973-2002**

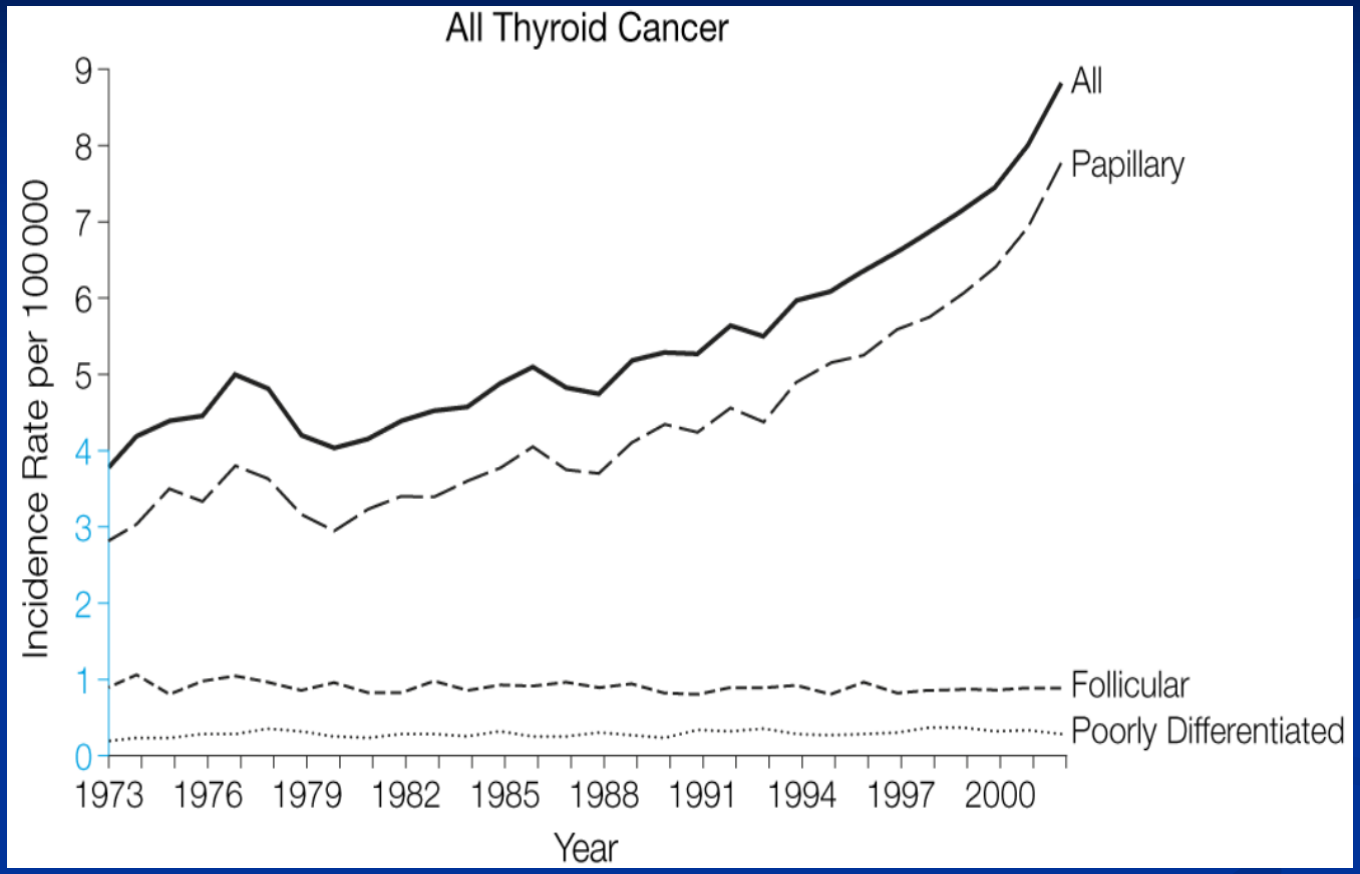
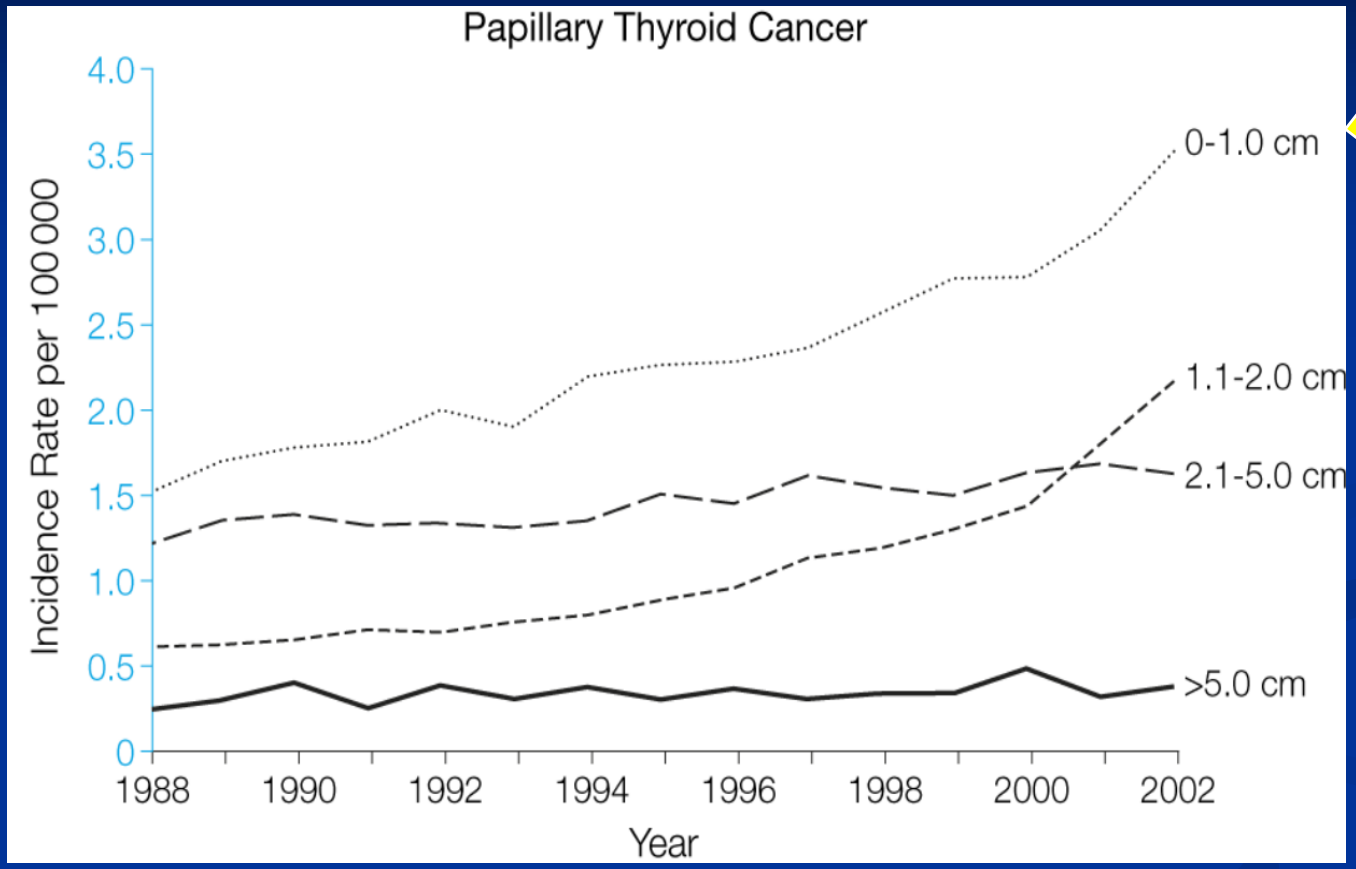


Figure Legend:

Poorly differentiated indicates anaplastic and medullary cancers.

From: **Increasing Incidence of Thyroid Cancer in the United States, 1973-2002**



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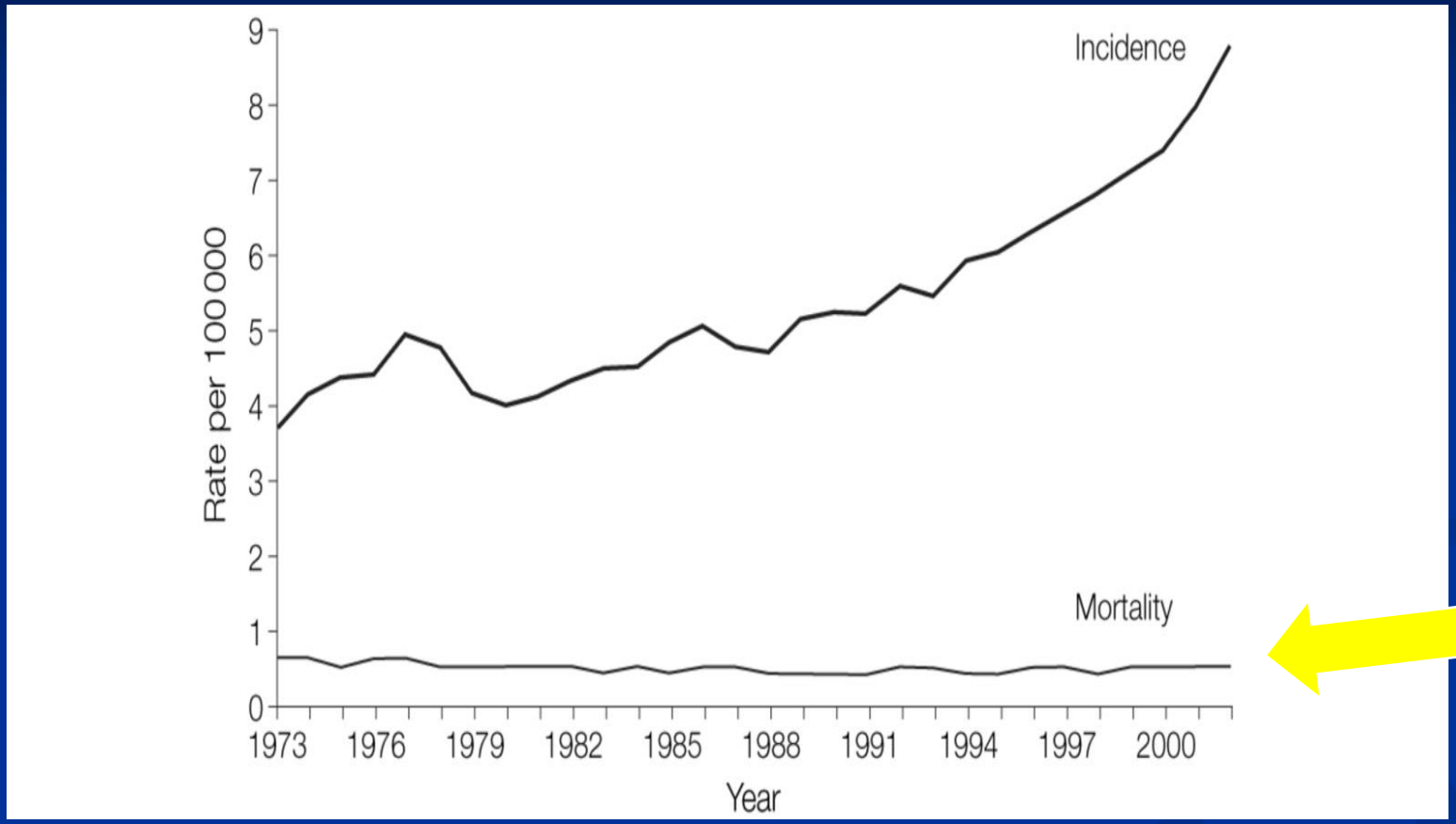

Figure Legend:

Thyroid Nodules – managing an epidemic.

- Thyroid nodules are the norm.
- Thyroid cancer is rare.
- Specific Ultrasound signs for carcinoma.
- Use the signs to classify nodules Radiologically.
- Manage the patient,correctly.


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