

# Conflitti di interesse

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Ai sensi dell'art. 3.3 sul conflitto di interessi, pag 17 del Regolamento Applicativo Stato-Regioni del 5/11/2009, dichiaro che negli ultimi 2 anni non ho avuto rapporti diretti di finanziamento con soggetti portatori di interessi commerciali in campo sanitario

**16° Congresso Nazionale AME**  
**Joint Meeting with AACE Italian Chapter**  
**Update in Endocrinologia Clinica**



**RF thermal ablation of  
a “hot” thyroid nodule:  
smooth procedure,  
unexpected complication  
and happy ending**

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SC Endocrinologia  
ASMN Reggio Emilia**

# Clinical case: Luana, age 41

- TSH  $<0.01$ , fT4  $18 \mu\text{U/ml}$ , fT3  $3.3 \mu\text{U/ml}$  under methimazole  $2.5 \text{ mg}$  daily.
- “Hot” nodule in right thyroid lobe





ITALIAN CHAPTER



LUANA, ID: PRE-RF,

23 APR 2015 10:27

B	RIS-B	G	57%
P	30mm	XV	C3
PRC	9/5/2	PRS	3
PST	1	C	2

6 18  
AGOASPIR

LA435







ITALIAN CHAPTER

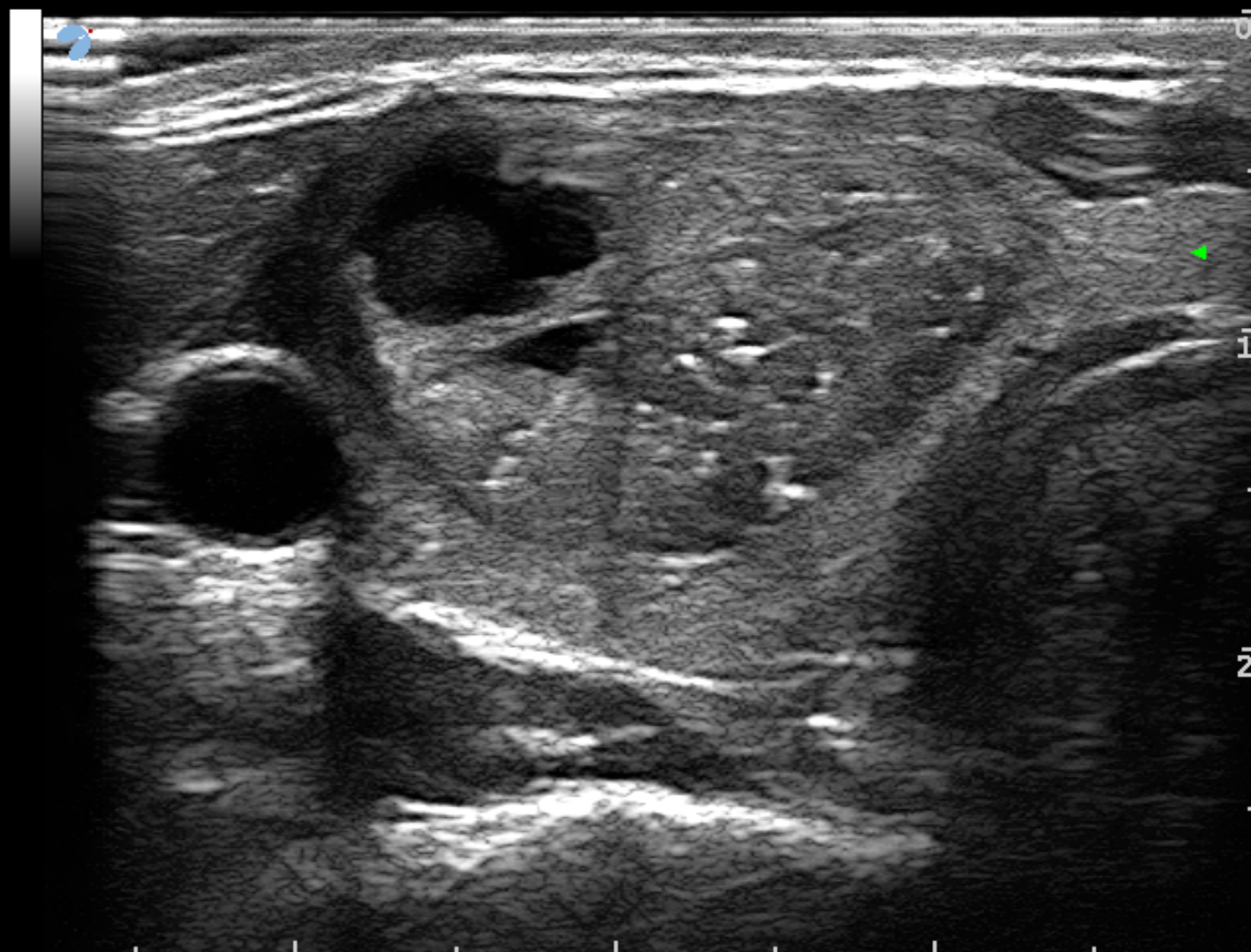
, LUANA, ID: PRE-RF,

23 APR 2015 10:27

B	RIS-B	G	57%
P	30mm	XV	C3
PRC	9/5/2	PRS	3
PST	1	C	2

6 18  
AGOASPIR

LA435





ITALIAN CHAPTER



I, LUANA, ID: PRE-RF,

23 APR 2015 10:28

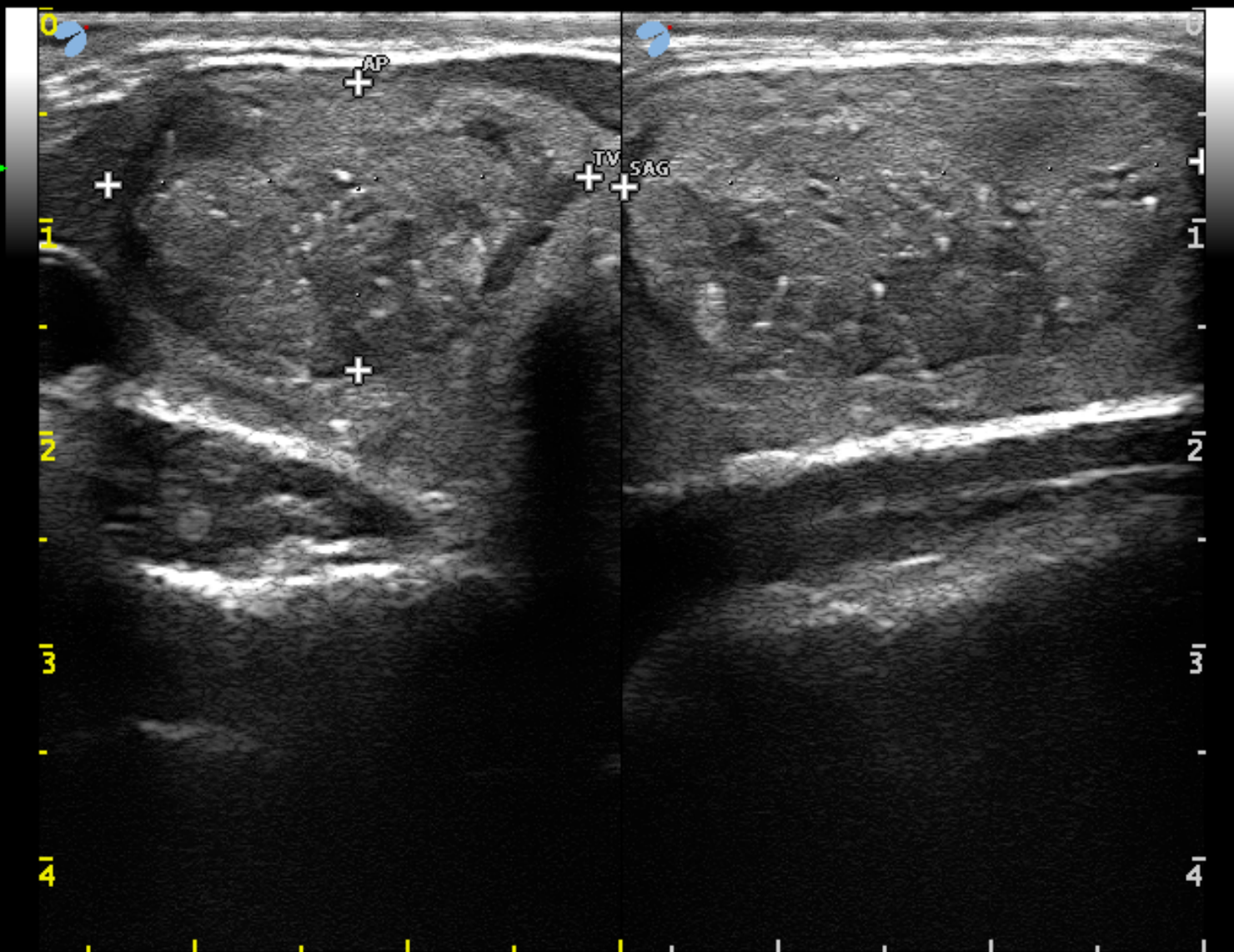
B RIS-B G 57%  
 P 44mm XV C3  
 PRC 9/5/2 PRS 3  
 PST 1 C 2

6  
AGOASPIR 18

LA435

**NOD 1**

AP	1.35	cm
TV	2.25	cm
SAG	2.71	cm
V	4.3	ml





ITALIAN CHAPTER



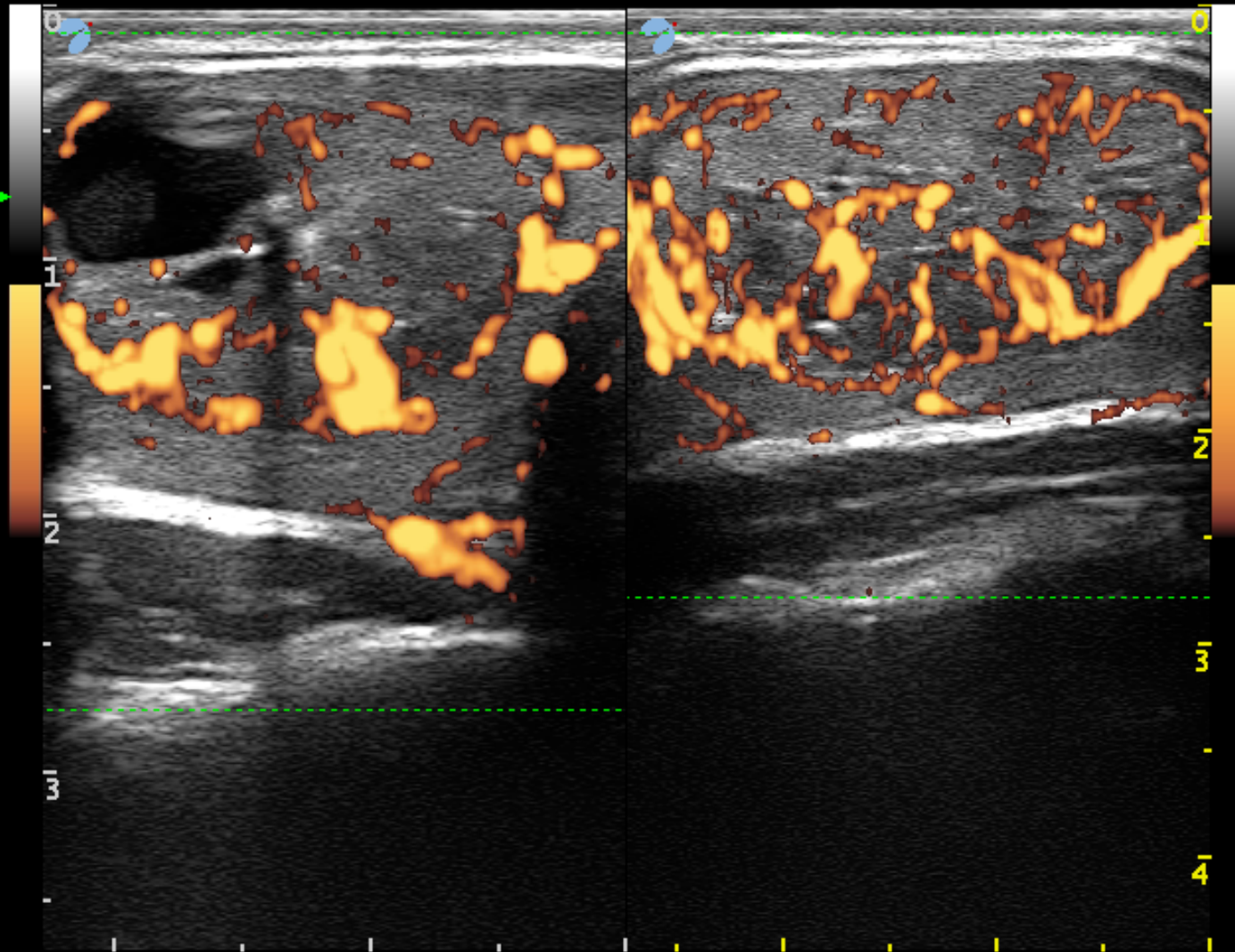
LUANA, ID: PRE-RF,

23 APR 2015 10:28

B	RIS-B	G	57%	CFM	F	6.3	MHZ	G	48%
P	44mm	XV	C3		PRF	1.5	KHZ		
PRC	9/5/2	PRS	3		PRC	M/ 2		PRS	4
PST	1	C	2		FP	3			

6 18  
AGOASPIR

LA435







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# RF thermal ablation: the technique

Procedure performed on an outpatient basis, prepared by conscious sedation (midazolam e.v.) and local anesthesia (lidocaine through subcutaneous pericapsular infiltration).

A straight, internally cooled, 7-cm, 18-gauge electrode needle with 7-10 mm active tips is generally used.

Different portions of the nodule are progressively treated by moving the electrode tip without retiring the needle from the nodule (“Moving shot” technique)

Ablation confirmed by the appearance of a hyperechogenic and the abrupt increase of impedance (the so-called break point) registered on the RF generator monitor



ITALIAN CHAPTER

# RF treatment: technical details

Needle	18 g, internally cooled, 10 mm active tip
Approach	Longitudinal (cranio-caudal)
N. sessions	1
Power (Max)	30 Watt
Energy delivered	4.71 Kcal (4573 Joule/ml)
Time	12 min 25 sec





ITALIAN CHAPTER



ECHOLASER

LUANA, ID: RFA DAY 1,

24 APR 2015 08:36

B	GEN-M	G	45%
P	44mm	XV	C
PRC	8/1/2	PRS	5
PST	1	C	0

# 24 hours after RF

4 13

TIROIDE

LA523

### NOD 1

AP	1.52	cm
TV	2.25	cm
SAG	---	cm
V	---	ml



0

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1

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ECHOLASER

LUANA, ID: RFA DAY 1,

24 APR 2015 08:36

B GEN-M G 45%  
 P 44mm XV C  
 PRC 8/1/2 PRS F  
 PST 1 C

# 24 hours after RF

4 13  
TIROIDE

LA523

**NOD 1**  
 AP 1.52 cm  
 TV 2.25 cm  
 SAG 2.48 cm  
 V 4.4 ml



0  
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ITALIAN CHAPTER



ECHOLASER

LUANA, ID: RFA DAY 1,

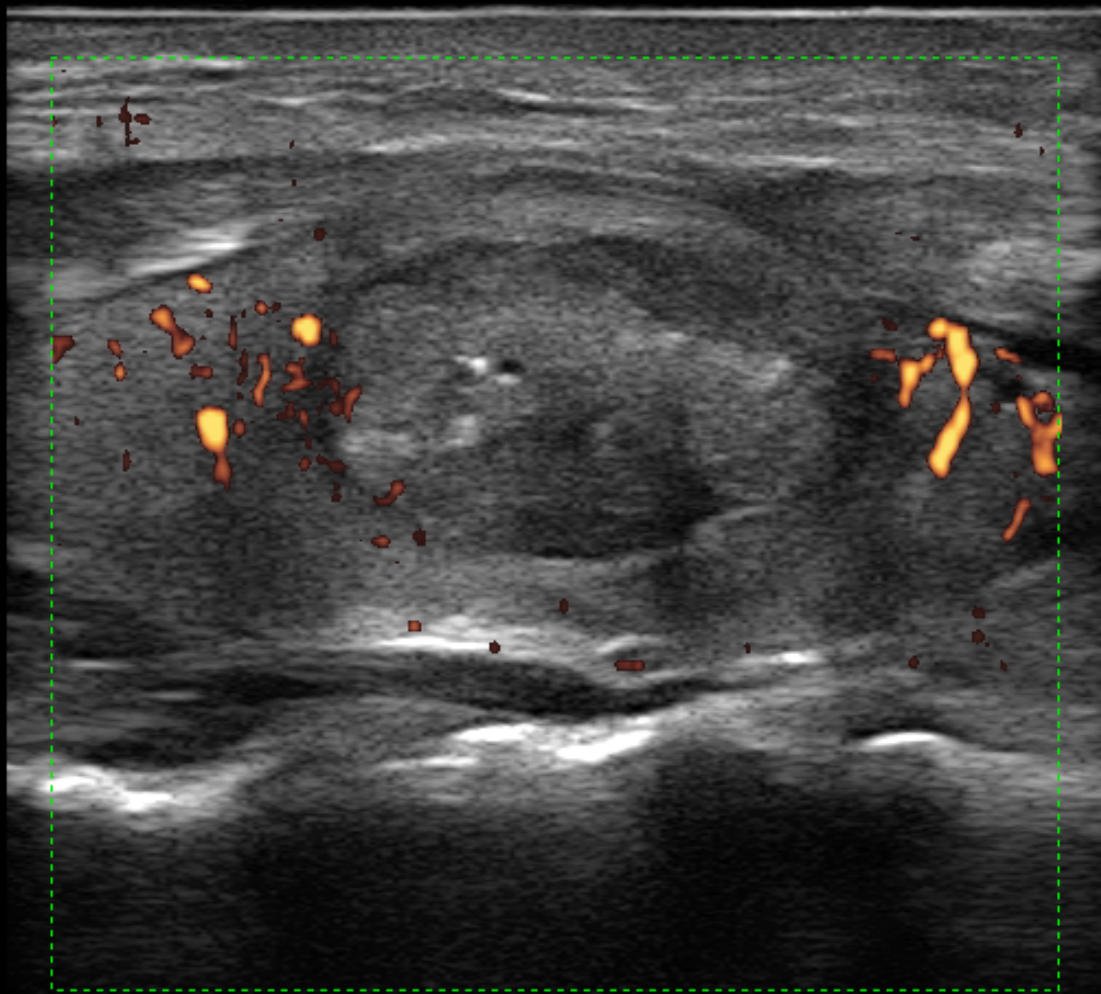
24 APR 2015 08:37

B GEN-M G 45% CFM F 5.6 MHz G 40%  
 P 44mm XV C3 PRF 1.3 KHZ  
 PRC 8/1/2 PRS 5 PRF M/2 PRS 3  
 PST 1 C FPI 4

# 24 hours after RF

4 TIROIDE 13

LA523



0  
1  
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4





ITALIAN CHAPTER



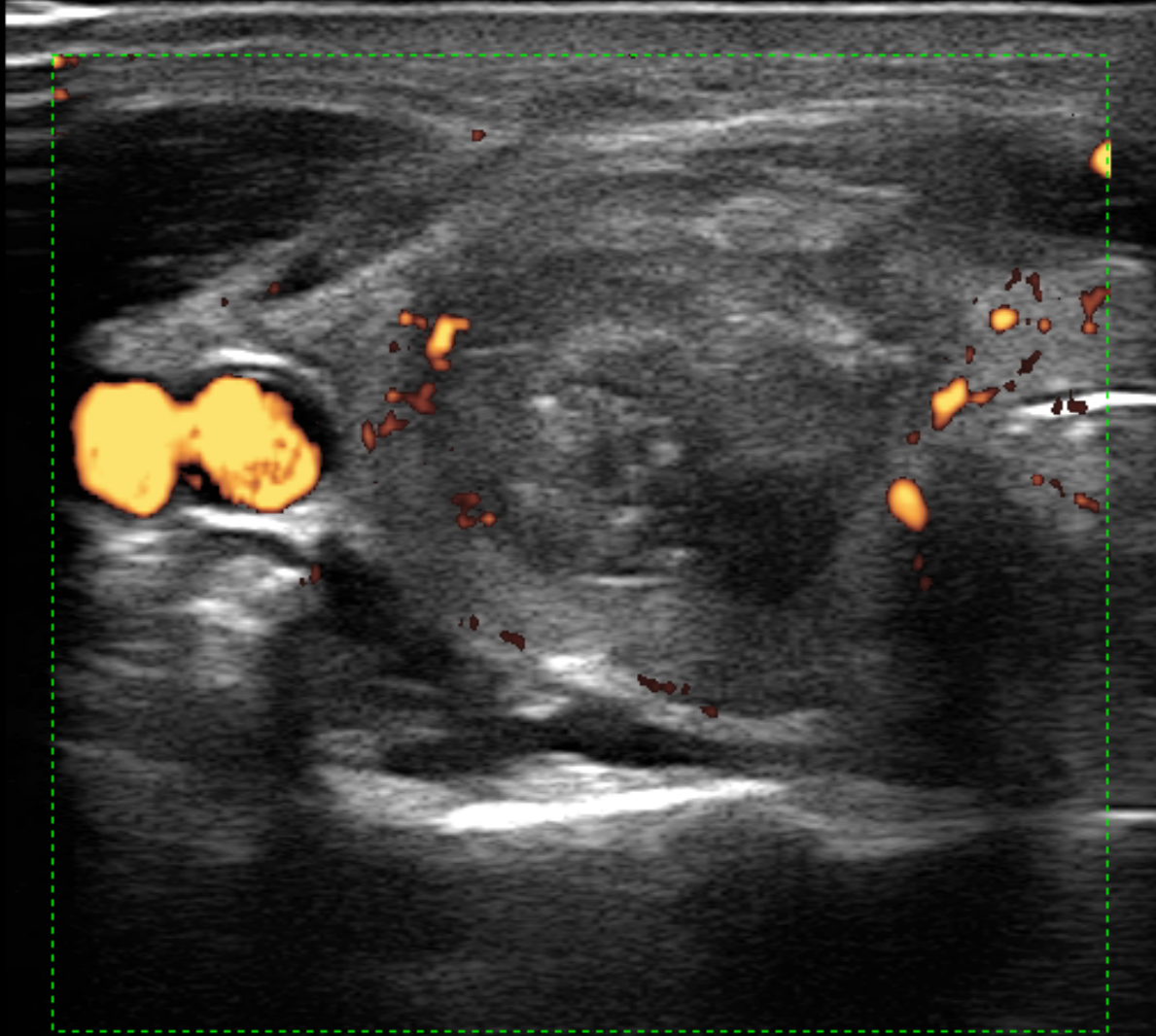
LUANA, ID: RFA DAY 1,

24 APR 2015 08:36

B GEN-M	G 45%	CFM F	5.6 MHz	G 40%
P 44mm	XV C3	PRF	1.3 KHZ	
PRC 8/1/2	PRS 5	PRC M/ 2	PRS 3	
PST 1	C 0	FP 4		

# 24 hours after RF

LA523



0  
1  
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4

14 days  
after RF





ECHOLASER

Tuana,

06 MAG 2015 08:17

B	PEN-B	G	---
P	52mm	XV	2
PRC	13/1/2	PRS	4
PST	0	C	2

6 18  
GENERALE LA435

D1	2.02	cm
D2	1.33	cm



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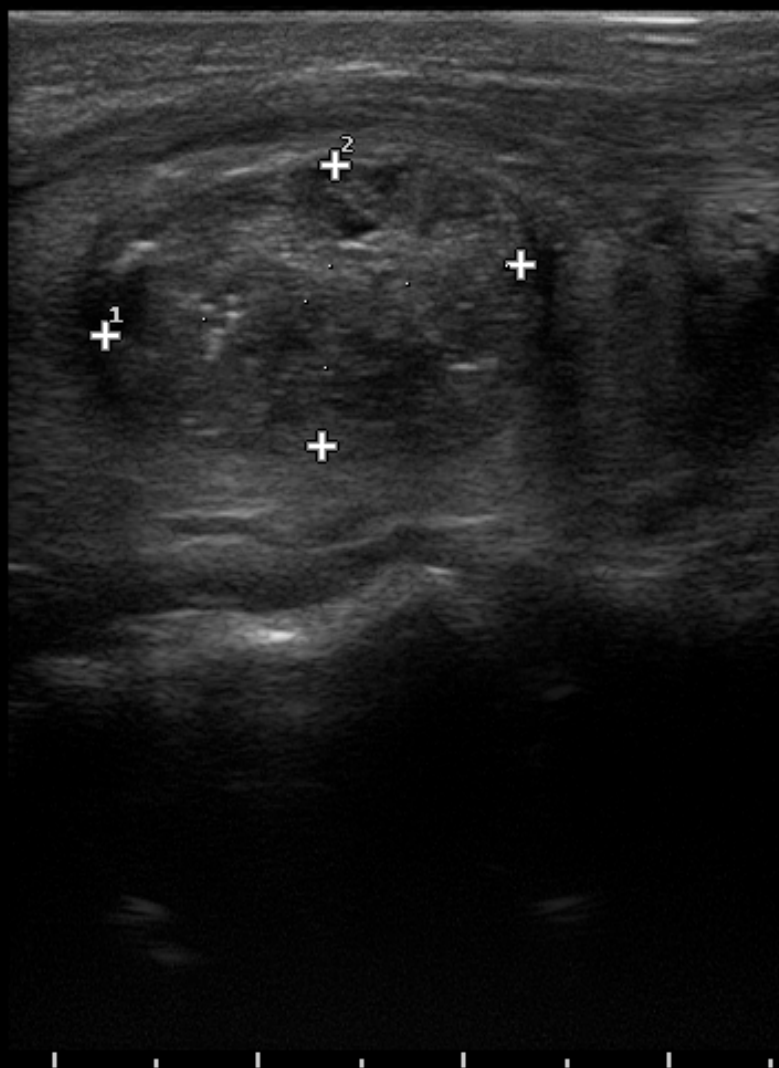


I, Luana,

B	PEN-B	G	53%
P	52mm	XV	2
PRC	13/1/2	PRS	4
PST	0	C	2

6 18  
GENERALE LA435

D1	2.06	cm
D2	1.37	cm



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ITALIAN CHAPTER

Tuana,

06 MAG 2015 08:18

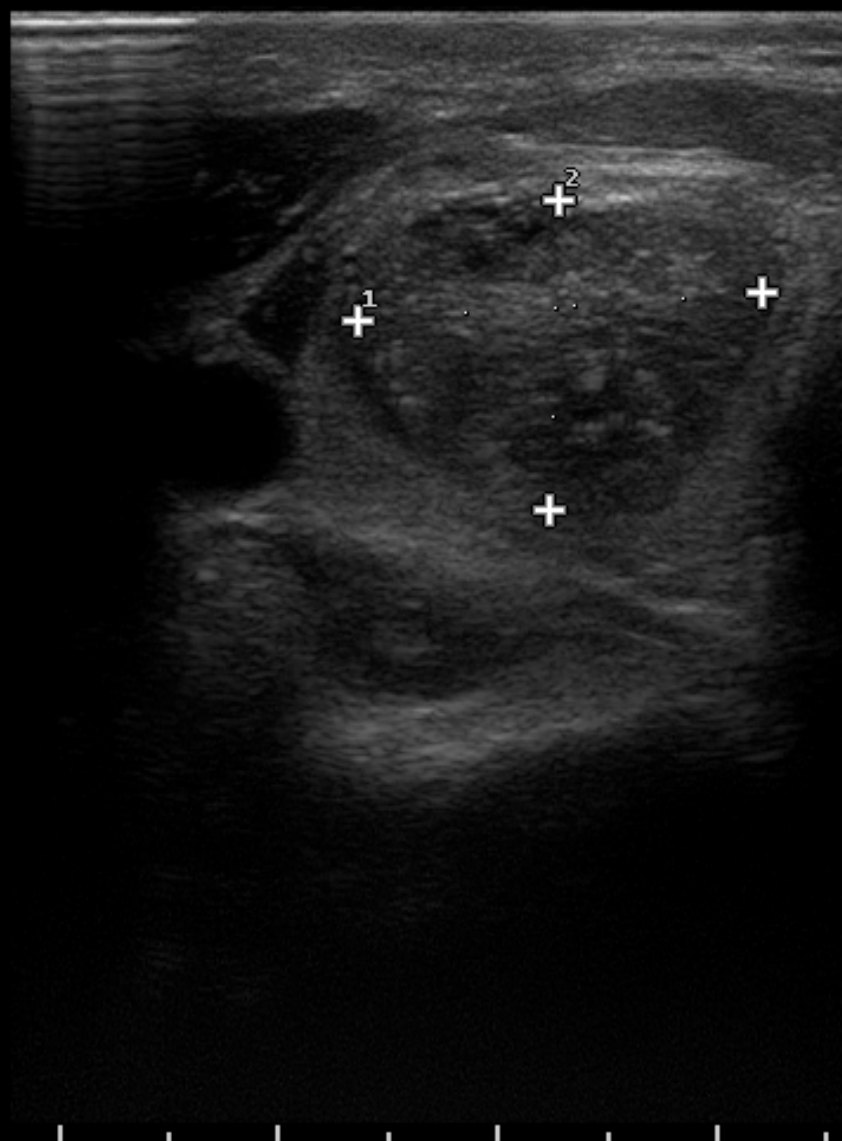
B	PEN-B	G	53%
P	52mm	XV	2
PRC	13/1/2	PRS	4
PST	0	C	2

6 18

GENERALE

LA435

D1	1.85	cm
D2	1.41	cm



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ECHOLASER

Tuana,

06 MAG 2015 08:20

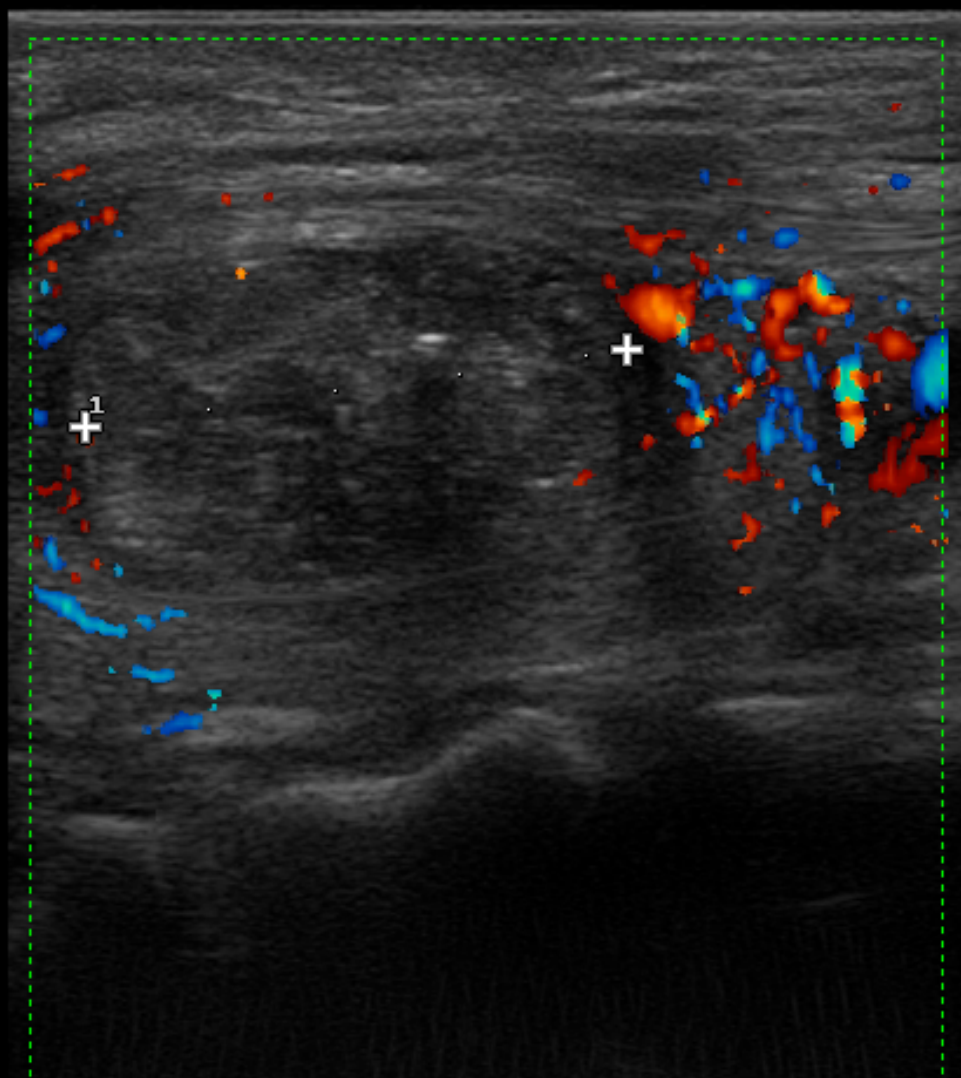
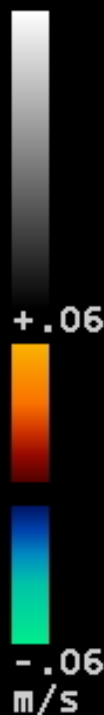
B	PEN-B	G	50%	CFM	F	6.3 MHz	G	40%
	P 44mm		XV 2		PRF	1.0 kHz		
	PRC 13/1/2		PRS 4		PRC	M/ 2		PRS 6
	PST 0		C 2		FP	3		



6 18  
GENERALE

LA435

D1 2.16 cm



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# 30 Days after RF

- US evidence of a 20 x 13 x 6 mm Ø fluid collection between pre-thyroidal muscles and anterior thyroid capsule
- No fever nor cutaneous redness or warmth
- Mild local symptoms: “pressure” and neck tenderness
- Antibiotic treatment was started (amoxicillin + clavulanic acid 1 gr bid)





ITALIAN CHAPTER



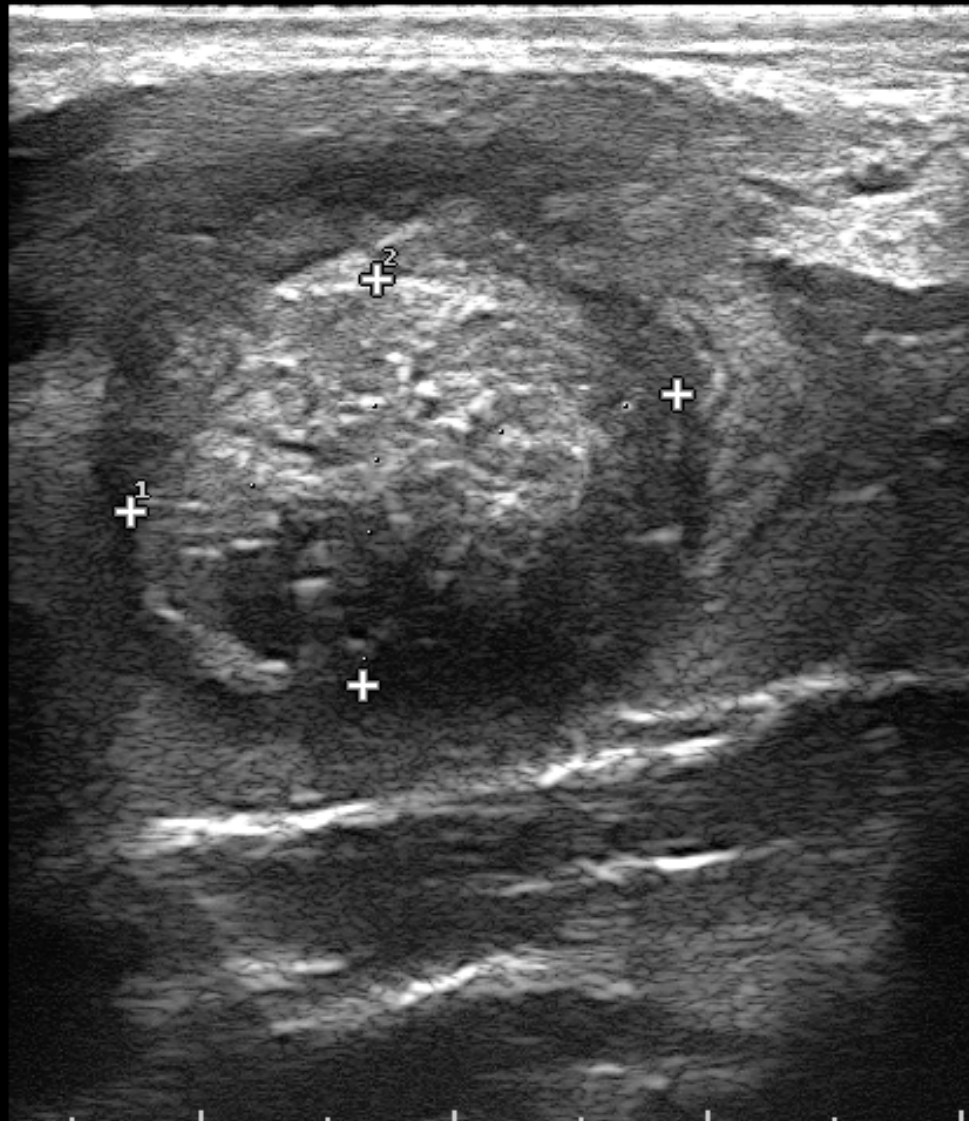
, luana,

22 MAG 2015 14:14

B	GEN-M	G	59%
P	44mm	XV	C3
PRC	8/4/2	PRS	3
PST	1	C	1

PIR 18 LA435

2.20 cm  
1.60 cm



0

1

2

3

4



ITALIAN CHAPTER



Tuana,

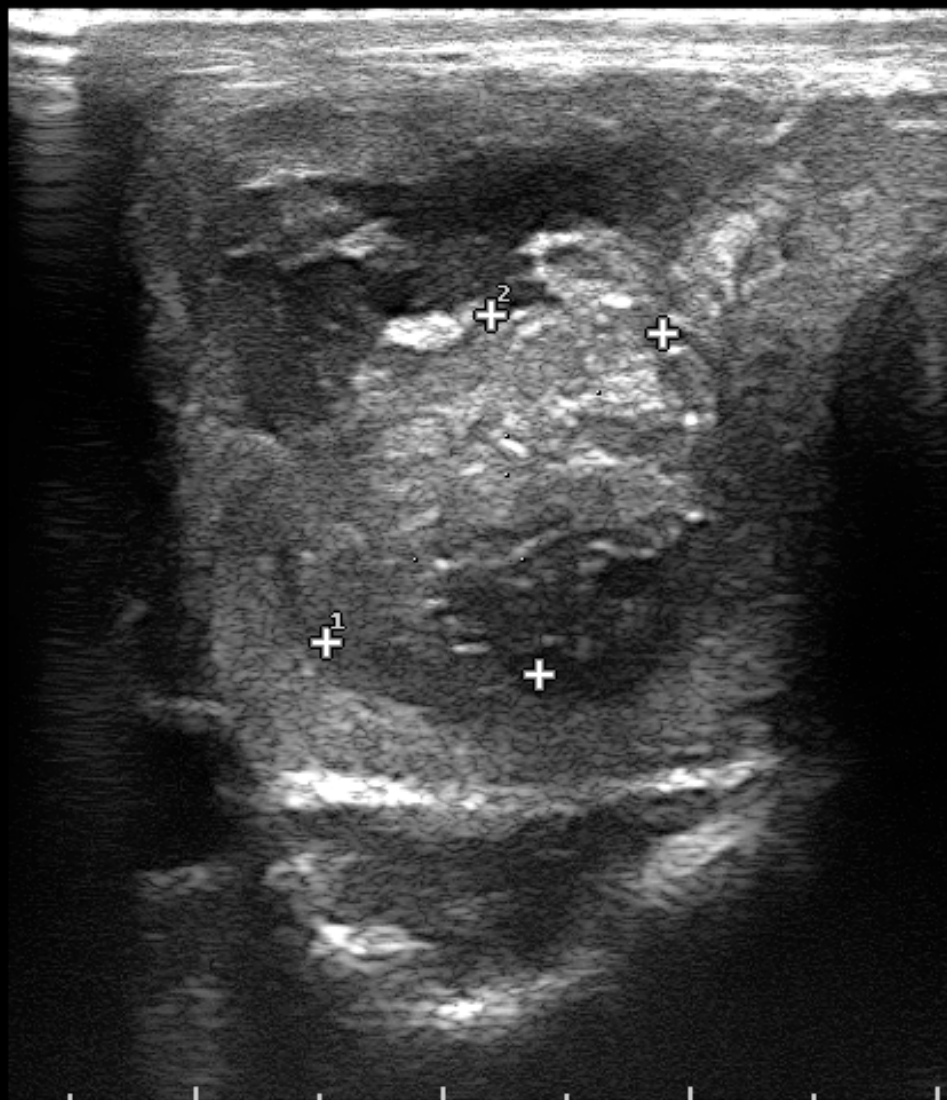
22 MAG 2015 14:14

B	GEN-M	G	59%
P	44mm	XV	C3
PRC	8/4/2	PRS	3
PST	1	C	1

18

PIR LA435

1.84 cm  
1.46 cm



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4



# 35 days after RF

- In spite of the antibiotic therapy, the fluid collection between pre-thyroidal muscles and anterior thyroid capsule increased (32 x 9 x 15 mm). The content was inhomogenously echoic.
- Luana was still apyretic but complained of more intense local symptoms. The skin was apparently unaffected.
- The exudate was drained by a 14 gauge teflon catheter which was kept in place and removed after 6 days.

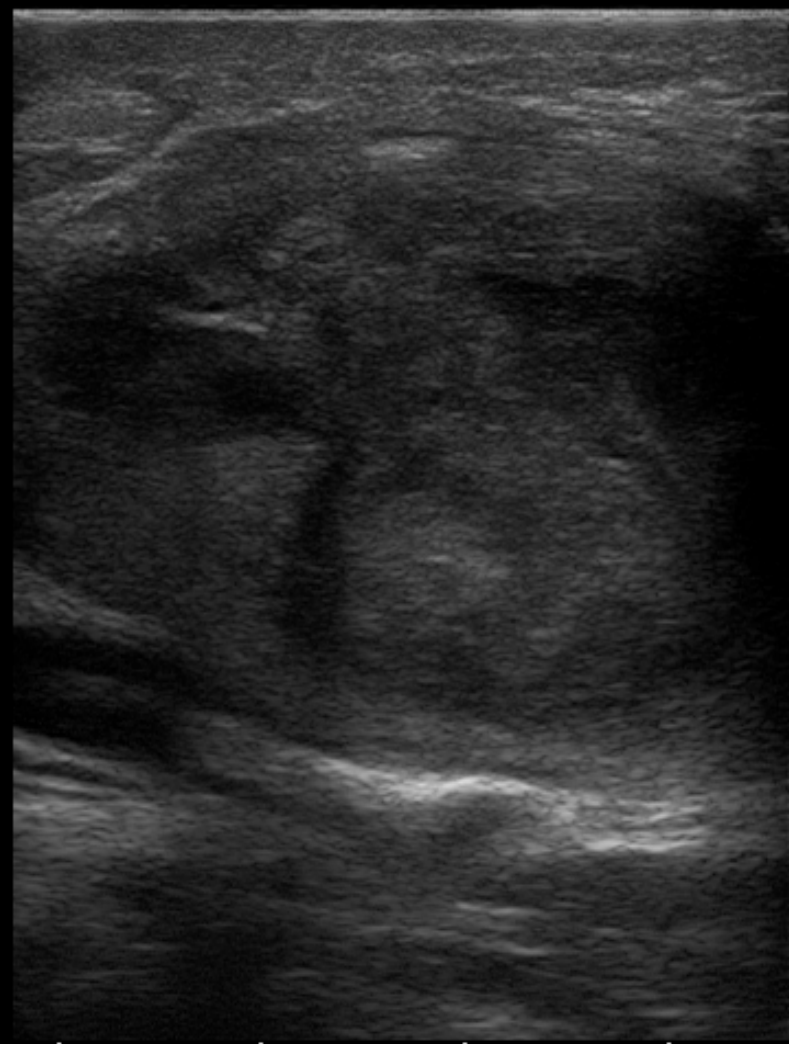


ITALIAN CHAPTER

B	PEN-B	G	53%
P	52mm	XV	2
PRC	13/1/2	PRS	4
PST	0	C	2

6 18  
GENERALE

LA435



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ITALIAN CHAPTER



26 MAG 2015 15:23

B	PEN-B	G	53%
P	52mm	XV	2
PRC	13/1/2	PRS	4
PST	0	C	2

18  
NERALE

LA435

0.69 cm  
3.23 cm



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# 45 days after RF

- Luana was totally asymptomatic
- The wound induced by the catheter was left open for secondary intention healing.
- The organized remnant of the exudate collection were visible as a small scar continuous to the nodule.
- The volume of the treated nodule was furtherly reduced (16 x 13 x 11 mm, 1.2 ml )



ECHOLASER

, Luana,

08 GIU 2015 07:35

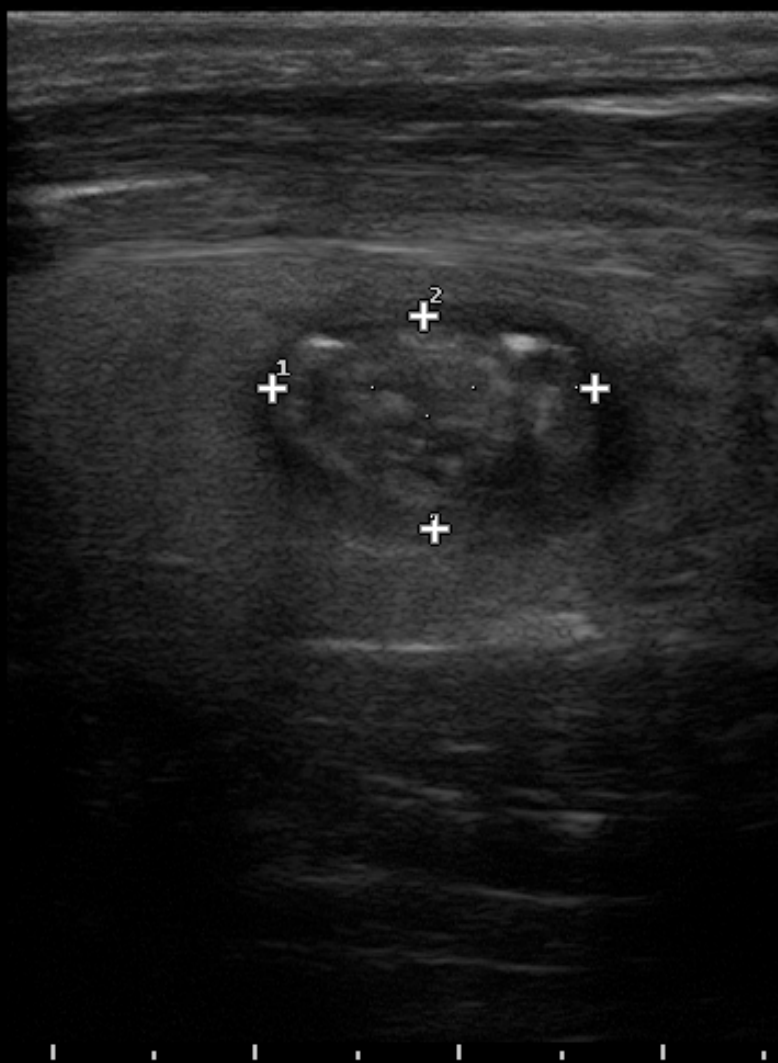
B	PEN-B	G	---
P	52mm	XV	2
PRC	13/1/2	PRS	4
PST	0	C	2



6 18  
GENERALE

LA435

D1	1.58	cm
D2	1.05	cm



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ECHOLASER

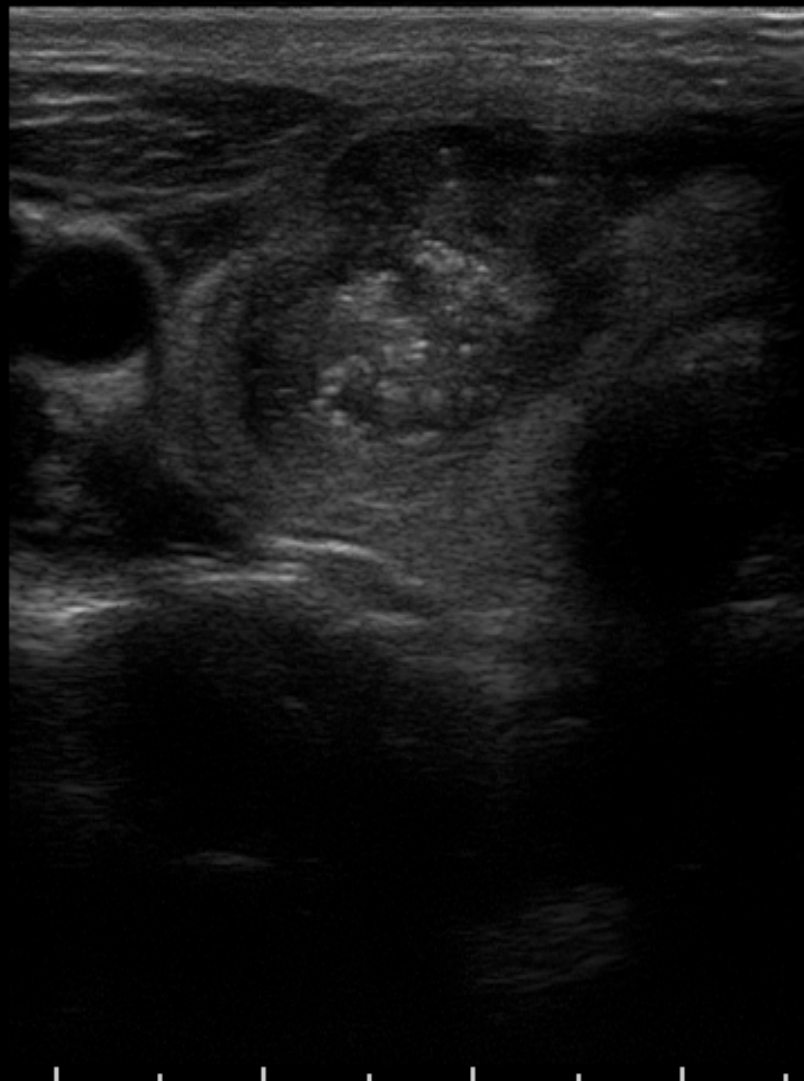
08 GIU 2015 07:40

luana,

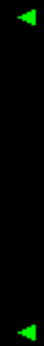
B	PEN-B	G	---
P	52mm	XV	2
PRC	13/1/2	PRS	4
PST	0	C	2

6 18  
GENERALE

LA435



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ITALIAN CHAPTER



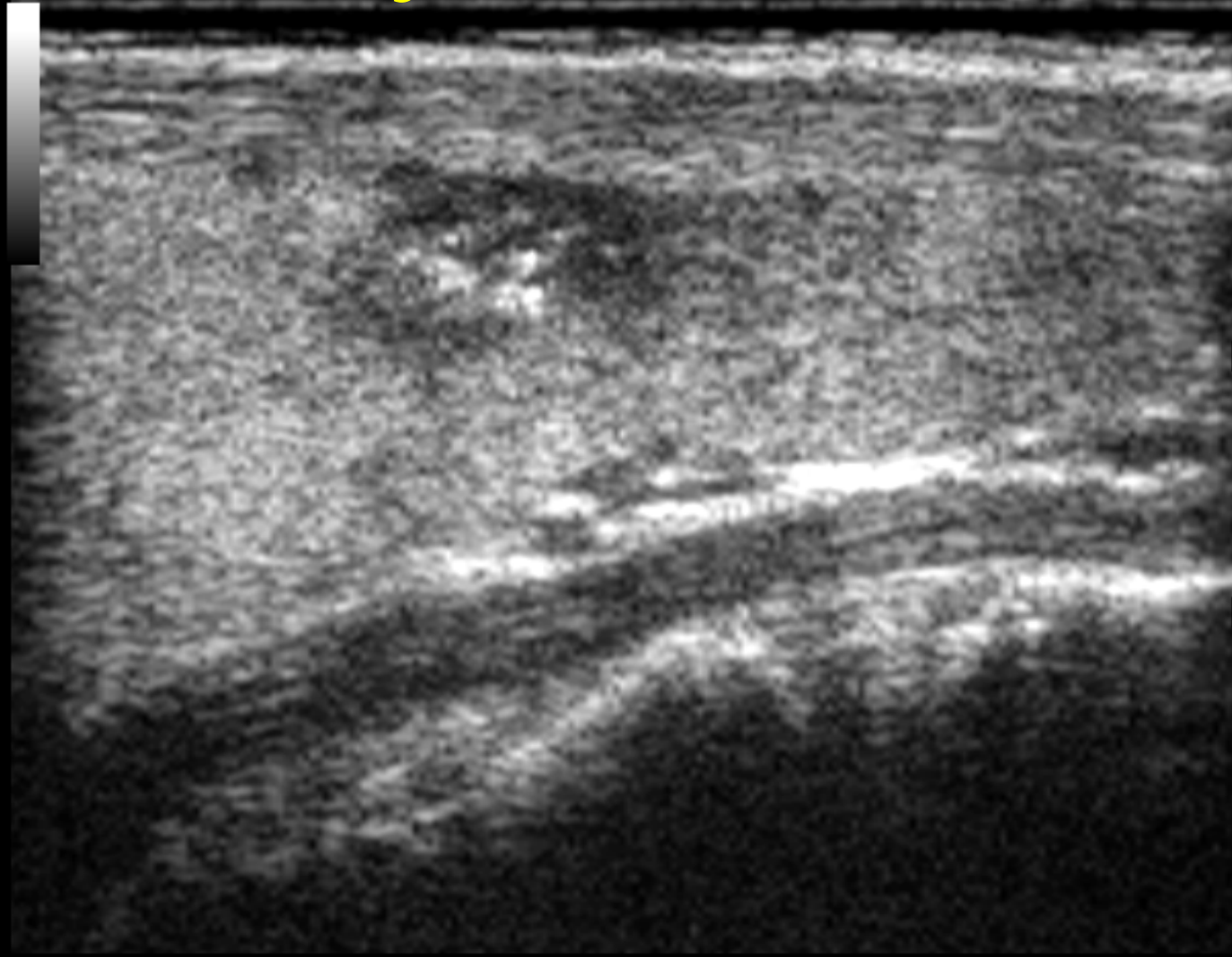
LUANA,

B F 15 MHz G 76%  
P 3 cm  
PRC 7-2-4 PRS 4  
PST 4

25 LUG 2015 08:14

# 90 days after RF

IDE1 LA424





ITALIAN CHAPTER



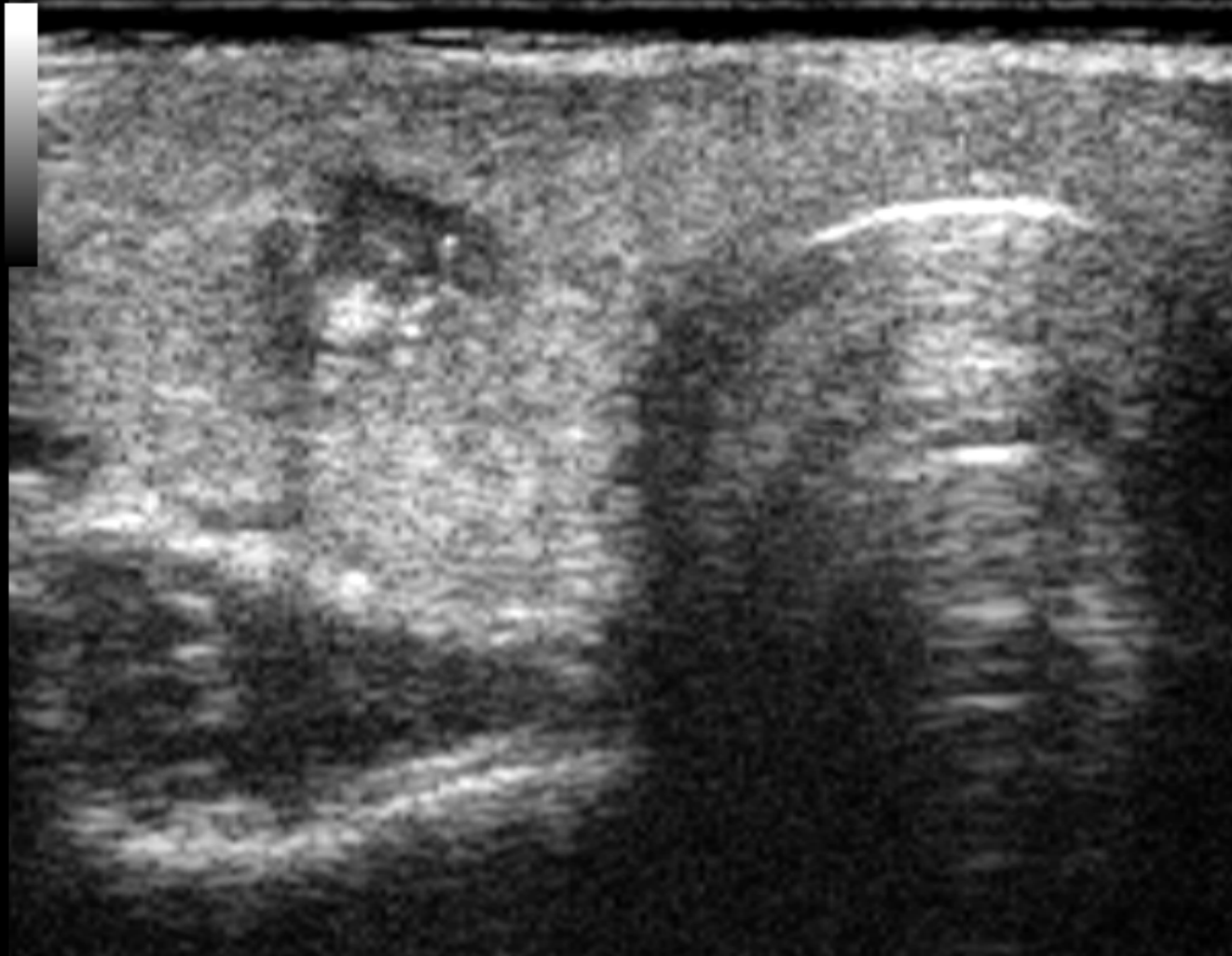
ILUANA,

25 LUG 2015 08:14

B F 15 MHz G 76%  
P 3 cm  
PRC 7-2-1 TRS 4  
PST 4

# 90 days after RF

TIROIDE1 LA424







ITALIAN CHAPTER



05 OTT 2015 08:00

B F 15 MHz G 58%  
P 3 CM  
PRC 15-A PPS 5  
PST 3

# 6 months after RF

LA424

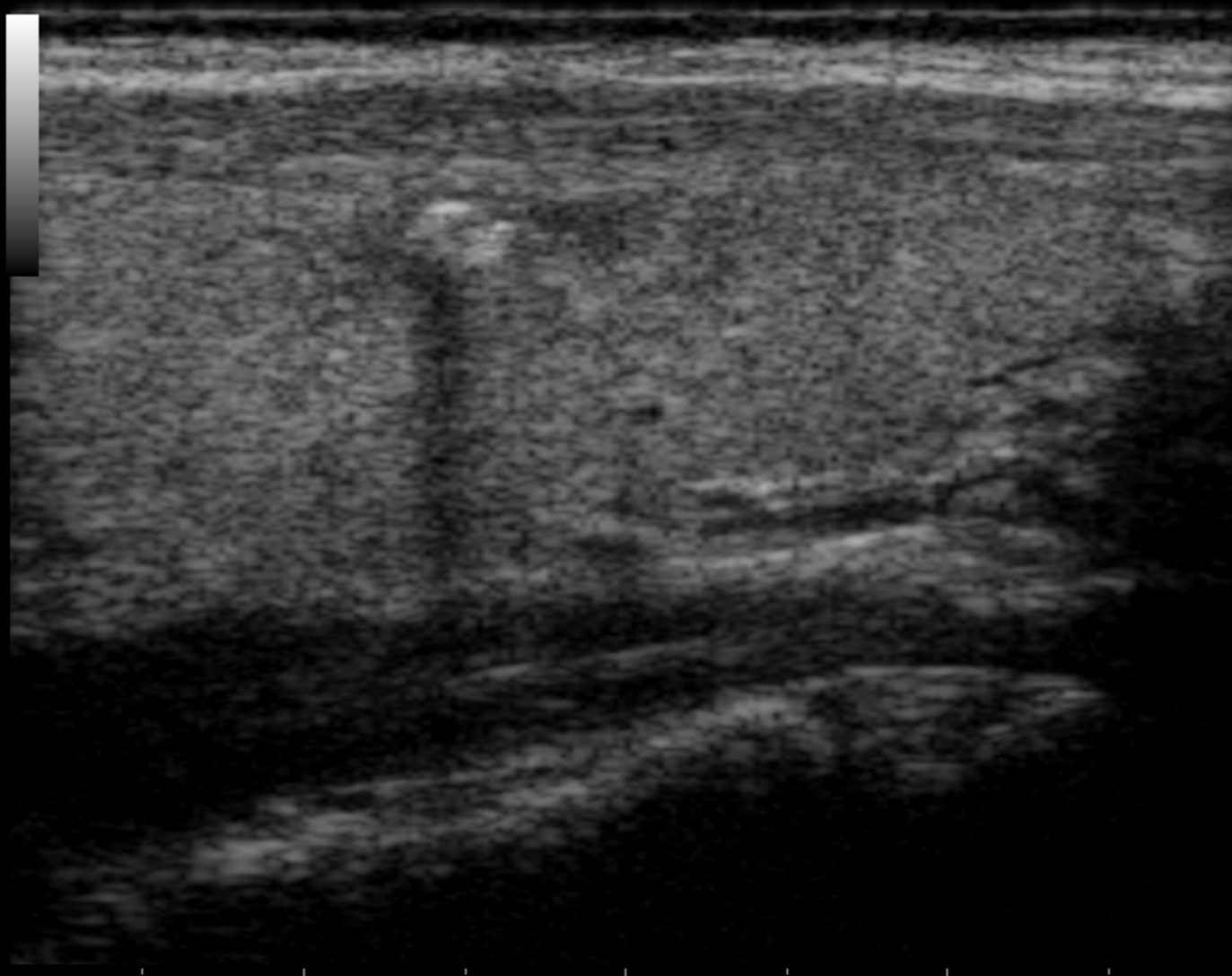




B F 15 MHz G 58%  
P 3 CM  
PRC 15-3-A PPS 5  
PST 3

# 6 months after RF

FACTORY LA424





ITALIAN CHAPTER



LI, Luana,

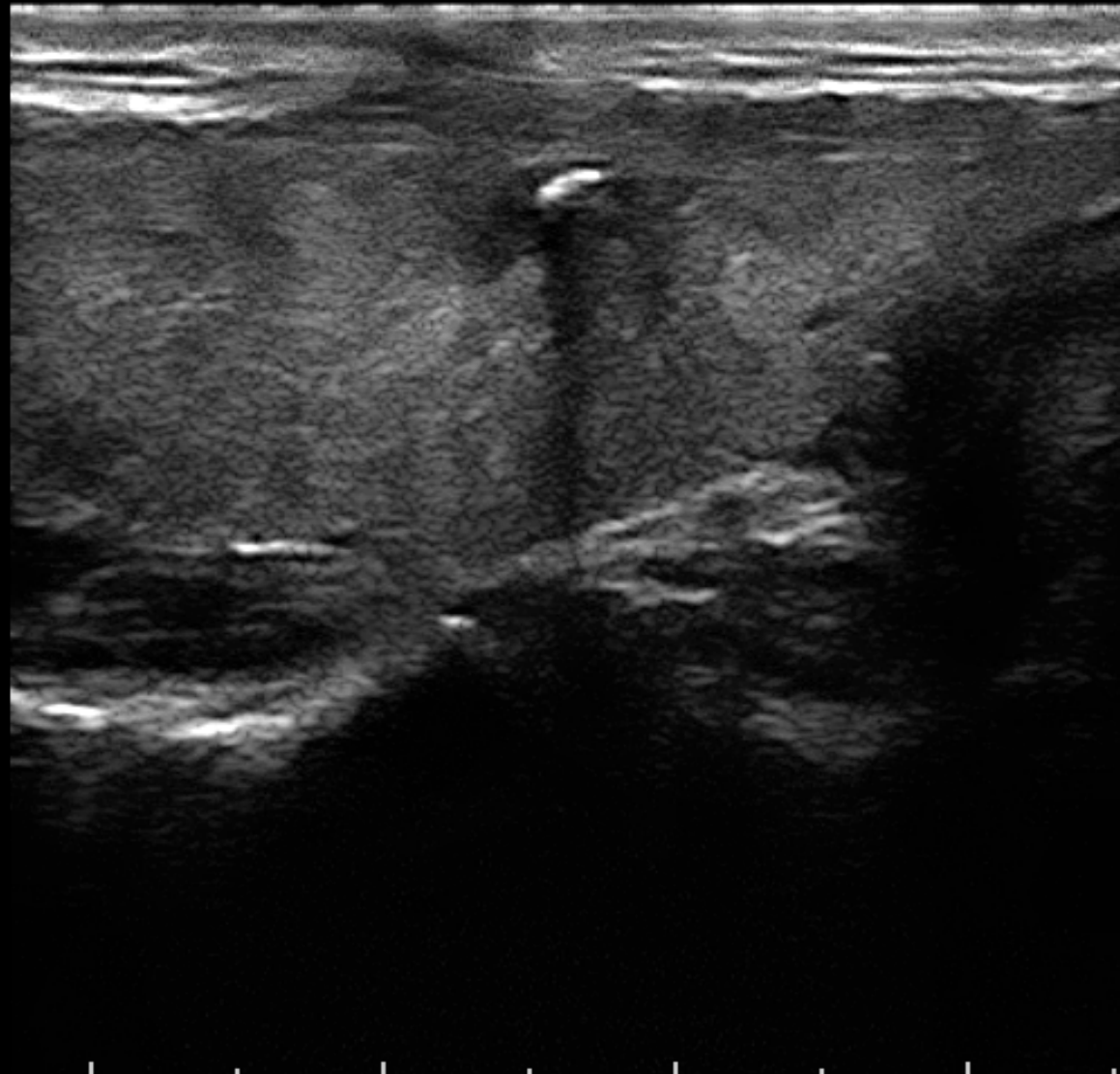
11 OTT 2016 08:11

B	RIS-B	G	---
P	37mm	V	03
PRC	9/2/2	PRS	7
PST	1	C	7

# 18 months after RF

6 18  
GENERALE

LA435



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ITALIAN CHAPTER



Tuana,

B RIS-B

P 37mm

PRC 9/2/2

PST 1

G 50%

X

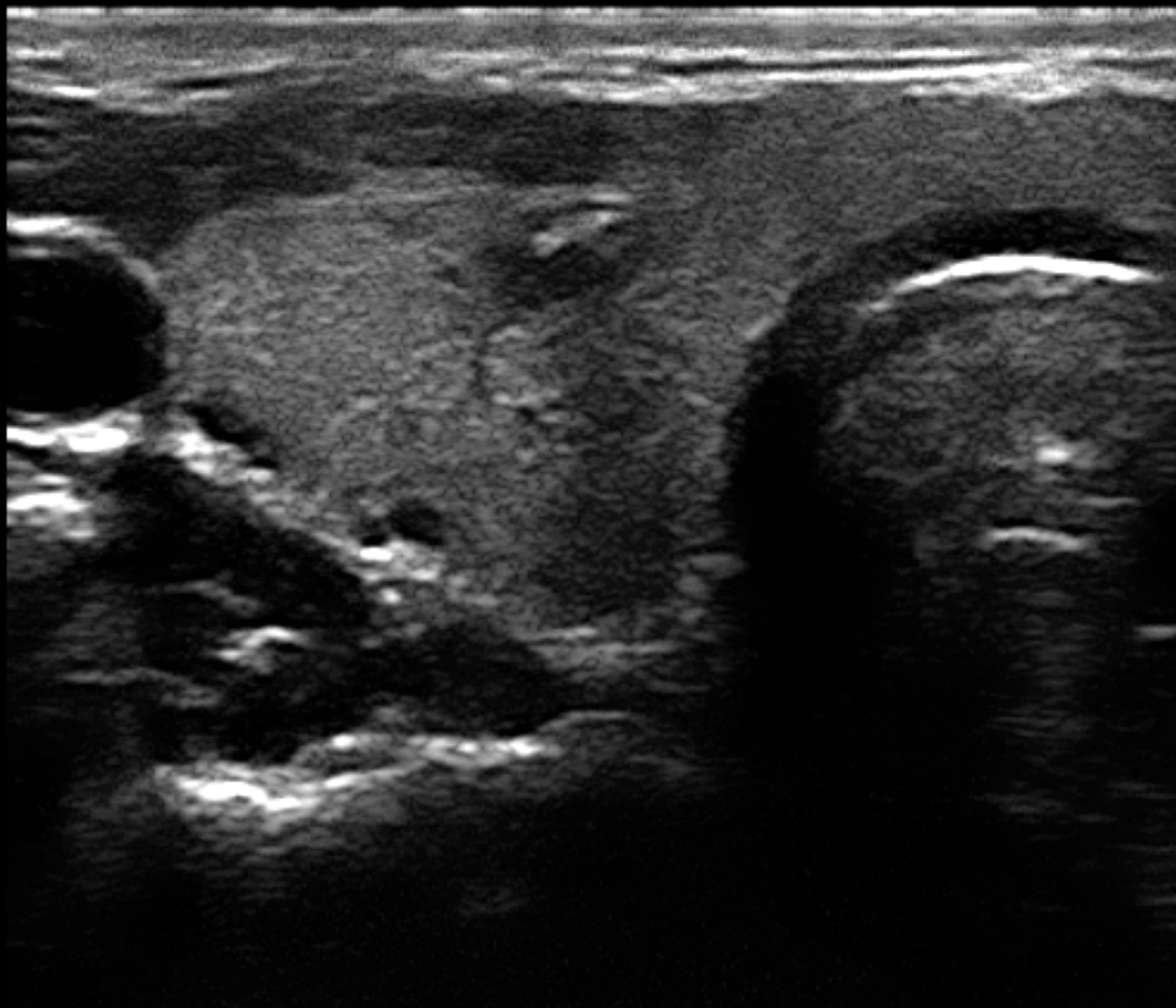
PRS

C

11 OTT 2016 08:12

# 18 months after RF

LA435



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ITALIAN CHAPTER



# Indications for RF ablation in thyroid pathology: Italian Opinion Statement

- Large (volume  $\geq 20$  ml), nonfunctioning, benign thyroid nodules in patients with local symptoms or cosmetic complaints when surgery is contraindicated or declined.
- Autonomously functioning thyroid nodules (AFTN), hot/warm at scintiscan, either toxic or pretoxic, when surgery and radioiodine are contraindicated or declined.
- Palliative therapy for recurrent thyroid cancers in the neck when surgery is contraindicated and radioiodine is ineffective





ITALIAN CHAPTER



# RF ablation of hyperfunctioning nodules: basic facts

- Antithyroid medication stopped in 23-89%
- Lower volume reduction (60% versus 76% at 12 month) and more number of sessions (2.2 versus 1.4) needed as compared to cold nodules
- Nodule regrowth (and hyperthyroid relapse) more common in ablated “hot “nodules.



**Nodule rupture  
Things we know  
(and do not  
know) about this  
complication...**



# Nodule rupture after RF: basic facts

- Rare complication (14 cases reported)
- Definition: *breakdown of the thyroid capsule and a leak of the fluid from intrathyroidal toward extrathyroidal space.*
- Time onset: 9 days to 5 months after RFA
- Diagnosis: Sonography and/or CT



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# Nodule Rupture: Clinical Evolution

- The lesions ultimately disappeared without medication or invasive procedures (7 patients)
- The lesion gradually regressed after treatment with antibiotics (2 patients)
- Incision and drainage due to worsening clinical signs (3 patients).
- Surgery (unilateral lobectomy) due to pain, neck skin redness due to cellulitis of the anterior neck and abscess formation (1 patient)



# Nodule rupture after RF: Possible Causes

- Delayed bleeding within the nodule, leading to delayed volume expansion and rupture.
- Tearing of the tumor wall and anterior thyroid capsule at a weak point, post-RFA massage, or strong movement of the neck.
- Loss of integrity of the thyroid capsule due to insertion of the needle and subsequent needle movement along different axes (direct mechanical injury to the thyroid capsule)
- Heat conduction (convection) backwards along the needle track (indirect thermal injury to the thyroid capsule)





# Nodule rupture after RF: Possible Risk factors

- Nodule located near the anterior thyroid capsule: the neck space on the anterior surface of the thyroid may not be as tight as on the other sides.
- Large and “mixed” nodules consisting of highly heterogenous tissue, which may require more RF power through the use of multiple ablations
- A higher maximum RFA power
- A longer ablation time



ITALIAN CHAPTER

# Measures for Best Outcomes

- The patient should be informed about the procedure and all of its potential complications
- Medical history related to hemorrhage risk should be thoroughly collected
- Nerve protection should always be carefully considered
- A venous line should be installed for drug delivery.
- Continuous US-guided tracing of the entire electrode is mandatory. When the electrode tip is in close proximity to critical structure (e.g. nerve or the trachea), switch off the power or withdraw the electrode tip



ITALIAN CHAPTER



Thank you for  
your attention!