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**Azienda Ospedaliera
Ordine Mauriziano
di Torino**



DOTTOR R.CESAREO UOS MALATTIE METABOLICHE LATINA

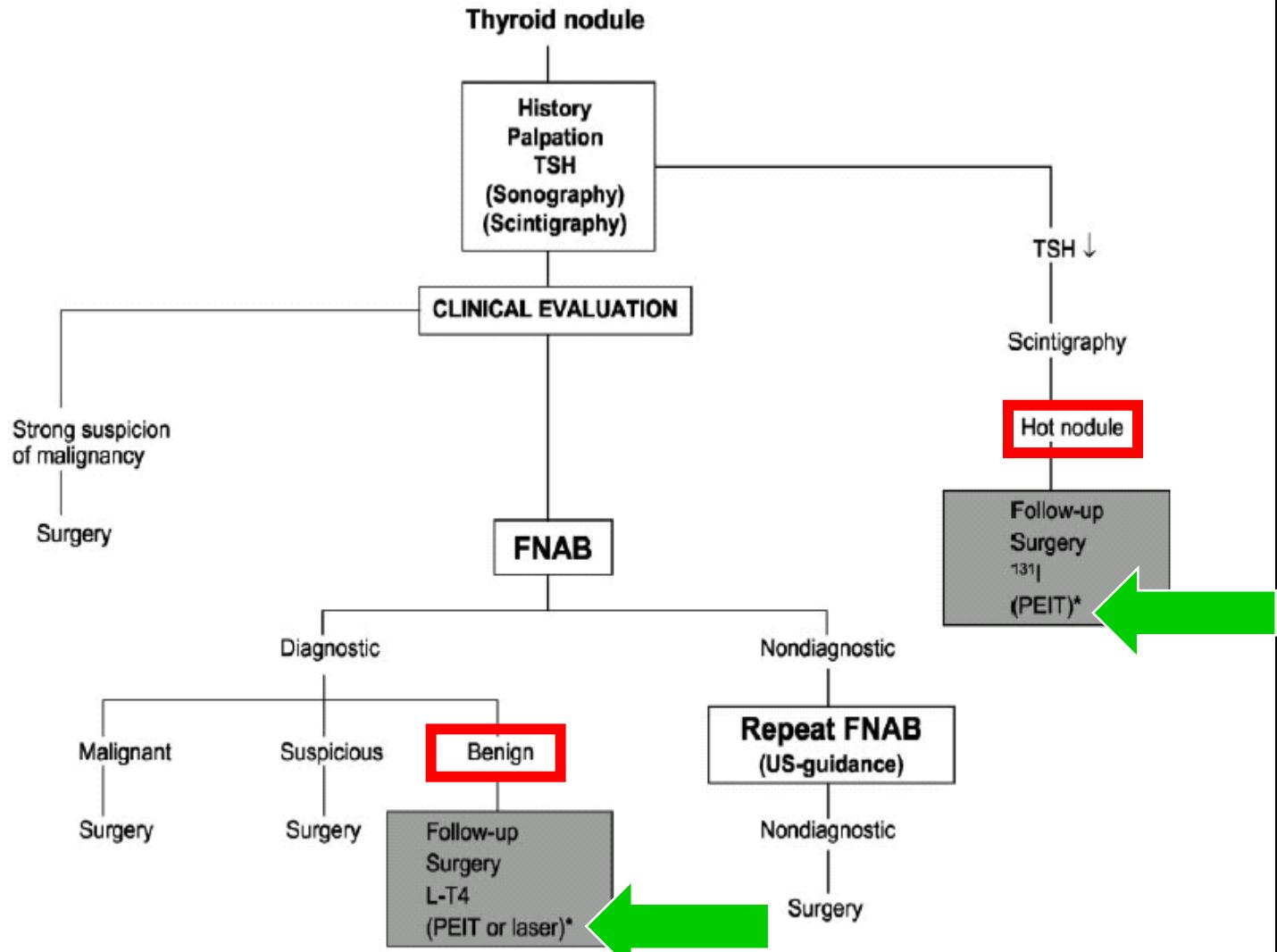
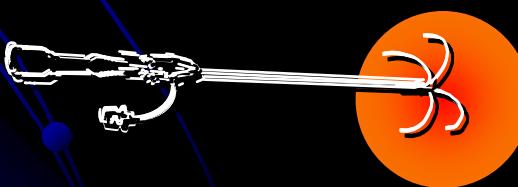


FIG. 2. Algorithm outlining a cost-effective evaluation and treatment of the solitary or dominant thyroid nodule. In case of strong suspicion of malignancy, surgery is advised irrespective of FNAB results. In case of a nondiagnostic result, repeat FNAB yields a satisfactory aspirate in 50%. FNAB guided by US (US-guidance) allows sampling from the periphery of a solid nodule or solid part of a mixed solid-cystic nodule, increasing the sufficiency rate. The options in case of a diagnostic FNAB cover both solid and cystic nodules. In case of recurrent cysts, the possibilities are reaspiration, surgery, or ethanol injection. The shaded boxes indicate treatment options. *, PEIT or ILP.

US-GUIDED PERCUTANEOUS RADIOFREQUENCY THERMAL ABLATION FOR THE TREATMENT OF SOLID BENIGN HYPERFUNCTIONING OR COMPRESSIVE THYROID NODULES

Table 1. Nodule volume and thyroid function before and after RF ablation

	Enrollment	Time of RTA	1 mo	3 mo	6 mo
Whole group					
Volume (mL)	27.4 ± 21.1	27.7 ± 21.5	$19.2 \pm 16.2\ddagger$	$15.9 \pm 14.1\ddagger$	$14.6 \pm 12.6\ddagger$
Volume variation (%)	-0.1 ± 5.8	—	-32.7 ± 20.0	-46.4 ± 18.8	-50.7 ± 16.5
Cold nodules					
Volume (mL)	38.7 ± 27.2	39.3 ± 27.8	$25.2 \pm 16.4^*$	$23.1 \pm 15.0\ddagger$	$21.4 \pm 14.3\ddagger$
Volume variation (%)	-0.5 ± 3.8	—	-31.7 ± 15.6	-39.8 ± 14.3	-46.3 ± 17.1
TSH (mIU/mL)	0.745 ± 0.490	0.910 ± 0.585	0.880 ± 0.531	0.834 ± 0.476	0.788 ± 0.505
FT4 (pg/mL)	10.7 ± 4.1	11.6 ± 4.5	10.3 ± 3.8	10.8 ± 4.0	11.1 ± 4.2
Hot nodules					
Volume (mL)	22.5 ± 16.1	22.6 ± 16.3	$16.6 \pm 15.8\ddagger$	$12.8 \pm 12.8\ddagger$	$11.6 \pm 10.7\ddagger$
Volume variation (%)	0.1 ± 6.6	—	-33.1 ± 21.9	-49.2 ± 20.1	-52.6 ± 16.3
TSH (mIU/mL)	$0.078 \pm 0.114\ddagger$	0.508 ± 0.339	0.638 ± 1.052	0.661 ± 1.233	0.993 ± 2.033
FT4 (pg/mL)	$22.1 \pm 4.7\ddagger$	10.3 ± 2.9	10.4 ± 3.1	11.7 ± 3.2	10.4 ± 2.4



Deandrea M et al 2008

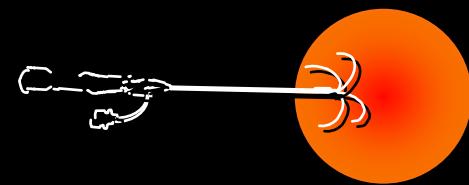
Thyroid Nodules and Related Symptoms Are Stably Controlled Two Years After Radiofrequency Thermal Ablation

OBIETTIVI

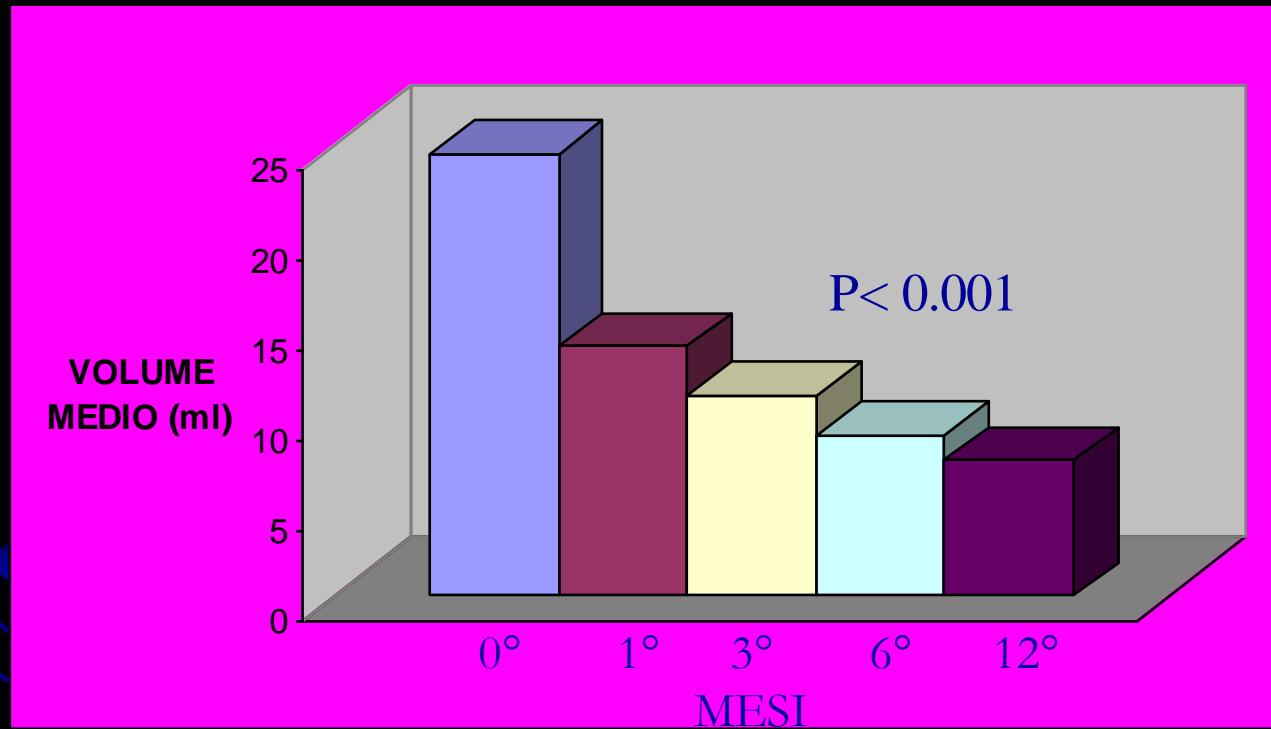
Valutare l'efficacia a lungo termine della RTA nel trattamento dei noduli benigni della tiroide ad ecostruttura solida in pazienti anziani con sintomi compressivi

POPOLAZIONE

- 94 pazienti (39 M e 55 F)
- Età media 72 ± 0.5 aa
- Nodulo solido (componente cistica < 30%)
- Volume **24.5 ml**
- 30% (pazienti con nodule pre-tossico o tossico)



Thyroid Nodules and Related Symptoms Are Stably Controlled Two Years After Radiofrequency Thermal Ablation



DOPO 1 ANNO RIDUZIONE DEL 78% RISPETTO AL BASALE
DOPO 2 ANNI RIDUZIONE DEL 79.4% RISPETTO AL BASALE

Radiofrequency Ablation for Autonomously
Functioning Thyroid Nodules:
A Multicenter Study

STUDIO RETROSPETTIVO

MULTICENTRICO

MORE TREATMENTS

LIMITI DEGLI STUDI

- Popolazione disomogenea
- Retrospettivi
- Ridotto follow-up
- Quasi sempre l'end-point principale era la riduzione volumetrica e non la normalizzazione degli ormoni tiroidei
- Usati differenti devices

12-month efficacy of a single radiofrequency ablation on autonomously functioning thyroid nodules

Stella Bernardi^{1,2} · Fulvio Stacul³ · Andrea Michelli¹ · Fabiola Giudici¹ ·
Giulia Zuolo¹ · Nicolò de Manzini^{1,4} · Chiara Dobrinja⁴ · Fabrizio Zanconati^{1,5} ·
Bruno Fabris^{1,2}

Table 1 Characteristics of the patients with AFTN, before and after RFA

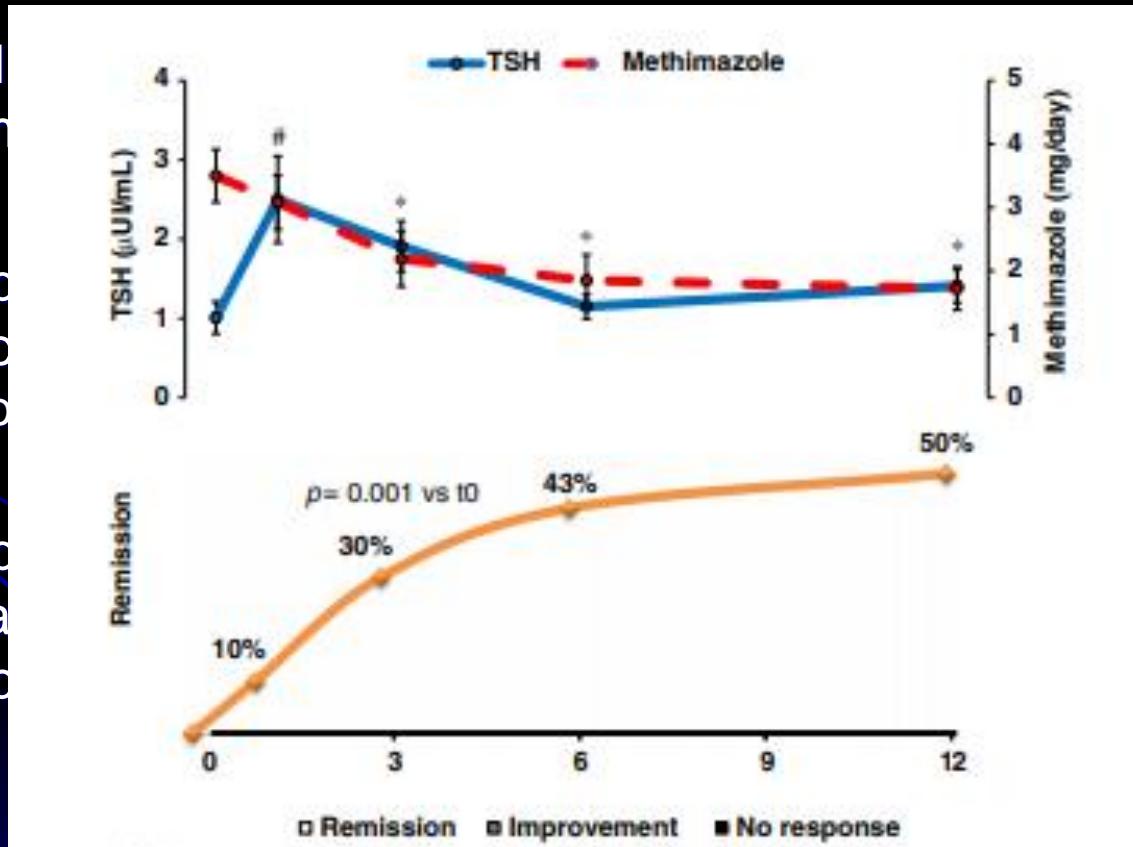
	Baseline	1 month	3 months	6 months	12 months	p vs. baseline
No of nodules	30	30	30	30	30	
US characteristics of the nodules						
Volume (mL)	17.12 ± 2.39	$7.92 \pm 1.09^*$	$7.41 \pm 1.38^*$	$4.65 \pm 0.63^*$	$4.29 \pm 0.61^*$	< 0.001
Largest diameter (mm)	39.20 ± 1.51	$30.70 \pm 1.26^*$	$28.21 \pm 1.37^*$	$25.67 \pm 1.29^*$	24.45 ± 1.28	< 0.001
Volume reduction (%)		51.06 ± 2.30	62.63 ± 2.13	69.35 ± 2.97	74.78 ± 3.01	< 0.001
Vascular grade (0–4)	2.50 ± 0.14	$1.30 \pm 0.08^*$	$1.30 \pm 0.08^*$	$1.37 \pm 0.09^*$	$1.33 \pm 0.08^*$	< 0.001
Symptom, cosmetic score, and thyroid function						
Symptom score (1–4)	2.03 ± 0.11	$1.20 \pm 0.09^*$	$1.20 \pm 0.09^*$	$1.07 \pm 0.05^*$	$1.07 \pm 0.05^*$	< 0.001
Cosmetic score (1–4)	3.08 ± 0.07	$2.35 \pm 0.10^*$	$2.35 \pm 0.10^*$	$2.00 \pm 0.12^*$	$1.74 \pm 0.12^*$	< 0.001
TSH (μ U/mL)	1.01 ± 0.20	$2.50 \pm 0.55^*$	1.91 ± 0.32	1.15 ± 0.15	1.41 ± 0.20	= 0.003
Methimazole (mg)	3.5 ± 0.41	3.08 ± 0.44	$2.19 \pm 0.44^*$	$1.85 \pm 0.40^*$	$1.72 \pm 0.37^*$	< 0.001

AFTN autonomously functioning thyroid nodules, RFA radiofrequency ablation, TSH thyroid-stimulating hormone

12-month efficacy of a single radiofrequency ablation on autonomously functioning thyroid nodules

Stella Bernardi^{1,2} · Fulvio Stacul³ · Andrea Michelli¹ · Fabiola Giudici¹ · Giulia Zuolo¹ · Nicolò de Manzini^{1,4} · Chiara Dobrinja⁴ · Fabrizio Zanconati^{1,5} · Bruno Fabris^{1,2}

- We demonstrated the efficacy of RFA in the treatment of AFTN.
- The patients had a significant response to RFA at 12 months.
- The patients had a significant reduction in TSH levels.



the response to RFA is similar to the regularity of AFTN.

AFTN reduction at 12 months is reduced on average by 50%.

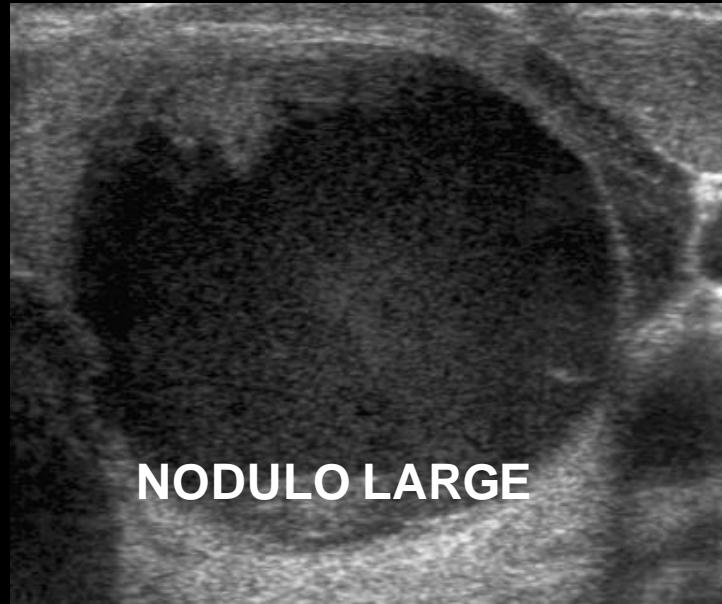
is reduced on average by 50%, which were performed before the procedure.

CALCOLO DEL VOLUME TIROIDEO



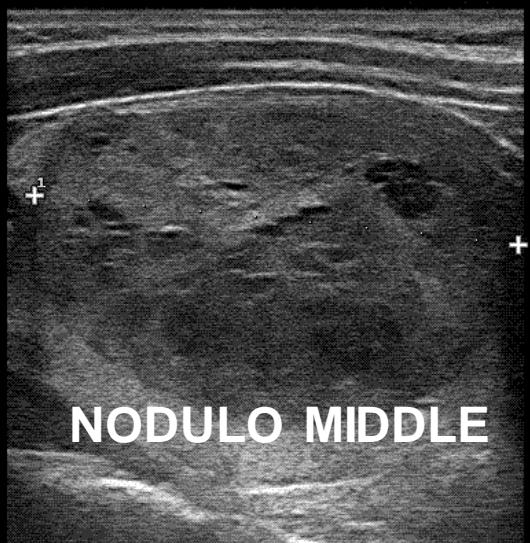
NODULO SMALL

VOLUME $26 \times 25 \times 24 = 8,1 \text{ ml}$



NODULO LARGE

VOLUME $46 \times 34 \times 46 = 37 \text{ ml}$



NODULO MIDDLE

VOLUME $42 \times 24 \times 36 = 19 \text{ ml}$

CLASSIFICAZIONE VOLUMETRICA

- Nodulo small
- Nodulo Middle
- Nodulo Large

<12 ml
12 e 30ml
>30 ml

Prospective study of effectiveness of ultrasound-guided radiofrequency ablation versus control group in patients affected by benign solid thyroid nodules

Roberto Cesareo, MD*- Valerio Pasqualini, MD**- Carla Simeoni*** M. Sacchi, MD[§] - E. Saralli, MD[§] - G. Campagna, MD^{§§} - Roberto Cianni, MD **

TABLE 2. Thyroid nodule volume (ml) in Radiofrequency ablation Group. Values are reported as mean ±SD

	Baseline	1 month	6 months
Whole group (n=42)			
TN vol.	24.5 ± 19.6	12.7 ± 11.8 ***	8.6 ± 9.5 ***
TN vol. variation (%)		-49.7±14.5	-68.6±13.5
Small (n=10)			
TN vol.	7.4 ± 2.7	3 ± 1.2**	1.6 ± 1**
TN vol. variation (%)		-57.5 ± 8.6	-78.2 ± 10.7
Medium (n=21)			
TN vol.	18.1 ± 4.4	9.3 ± 3***	5.9 ± 2.5***
TN vol. variation (%)		-47 ± 15	-67 ± 12.2
Large (n=11)			
TN vol.	52.3 ± 17.5	27.8 ± 13.7*	20.1 ± 12.1**
TN vol. variation (%)		-47.7 ± 16.3	-62.8 ± 14.8

Differences in mean volumes are considered between value at 1 month and 6 month vs baseline.

*p≤0.05, **p<0.01, ***p<0.001.

Nodule size as predictive factor of efficacy of radiofrequency ablation in treating autonomously functioning thyroid nodules

R. Cesareo, A. M. Naciu, M. Iozzino, V. Pasqualini, C. Simeoni, A. Casini, G. Campagna, S. Manfrini, G. Tabacco & A. Palermo

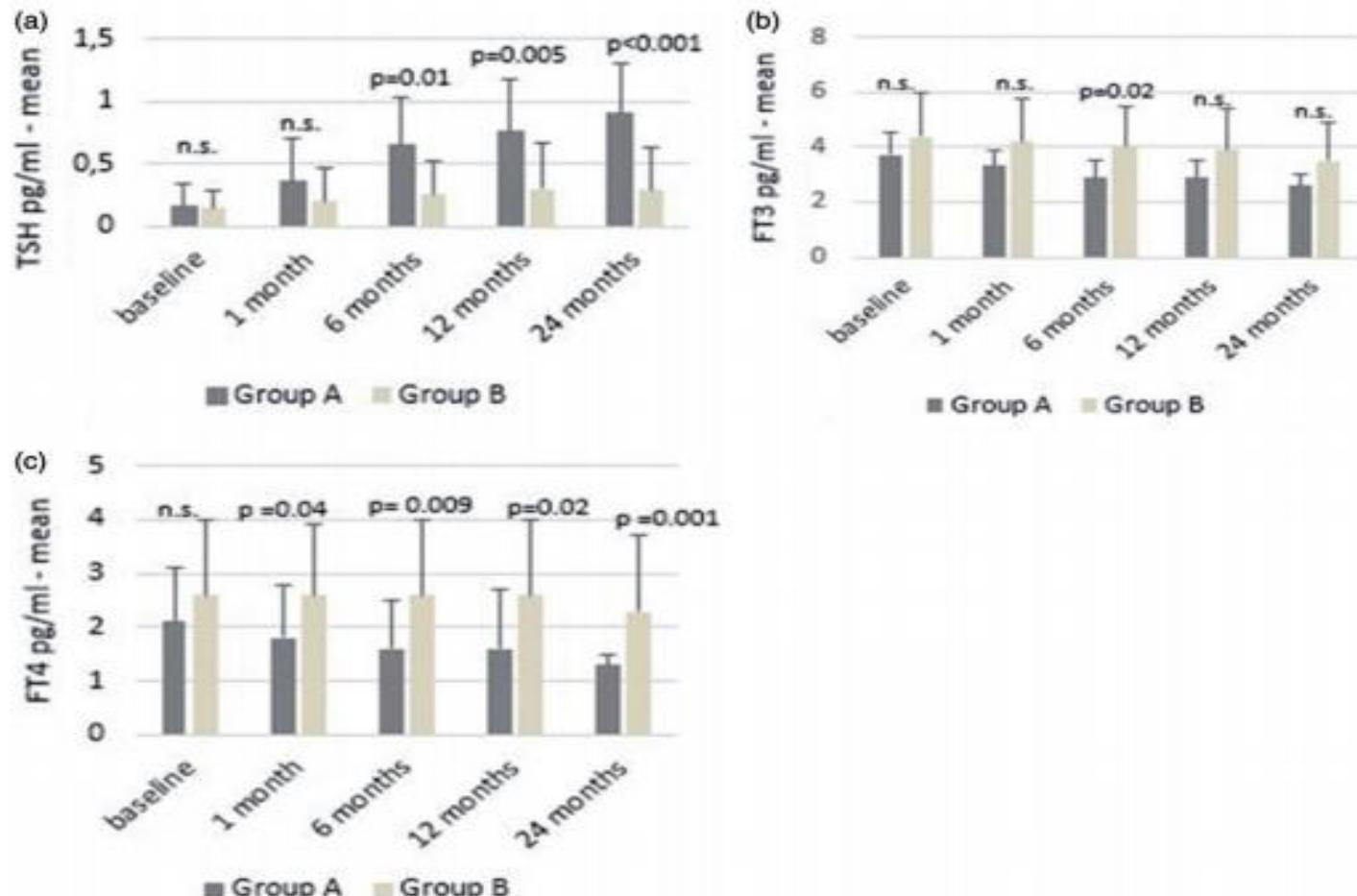
Table 1. Main baseline characteristics of the study population.

Parameter	Group A	Group B	p
N	15	14	
Sex (males/females)	6/9	5/9	ns
Age in years	53 ± 15 (34–75)	50 ± 17 (28–80)	ns
Thyroid nodule volume (mL)	5.2 ± 1.8 (2.8–8.4)	18.3 ± 4.7 (12–29.3)	<0.001
TSH(mIU/mL)	0.2 ± 0.2 (0.01–0.6)	0.1 ± 0.2 (0.01–0.5)	ns
FT3 (pg/mL)	3.71 ± 0.9 (2.2–5.2)	4.4 ± 1.6 (2.2–7.2)	ns
FT4 (pg/mL)	2.1 ± 1.0 (1.4–4.9)	2.6 ± 1.4 (1.4–5.2)	ns
Cosmetic score	0.6 ± 1 (0–3)	1.9 ± 0.7 (1–3)	<0.001
Symptom score	0.07 ± 0.3 (0–1)	2.6 ± 1.7 (0–5)	0.001

p values is related to the difference between group A and group B. Values are reported as mean ± SD (range).

Nodule size as predictive factor of efficacy of radiofrequency ablation in treating autonomously functioning thyroid nodules

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NODULE SIZE AS PREDICTIVE FACTOR OF EFFICACY FOR RADIOFREQUENCY ABLATION ON AUTONOMOUSLY FUNCTIONING THYROID NODULES

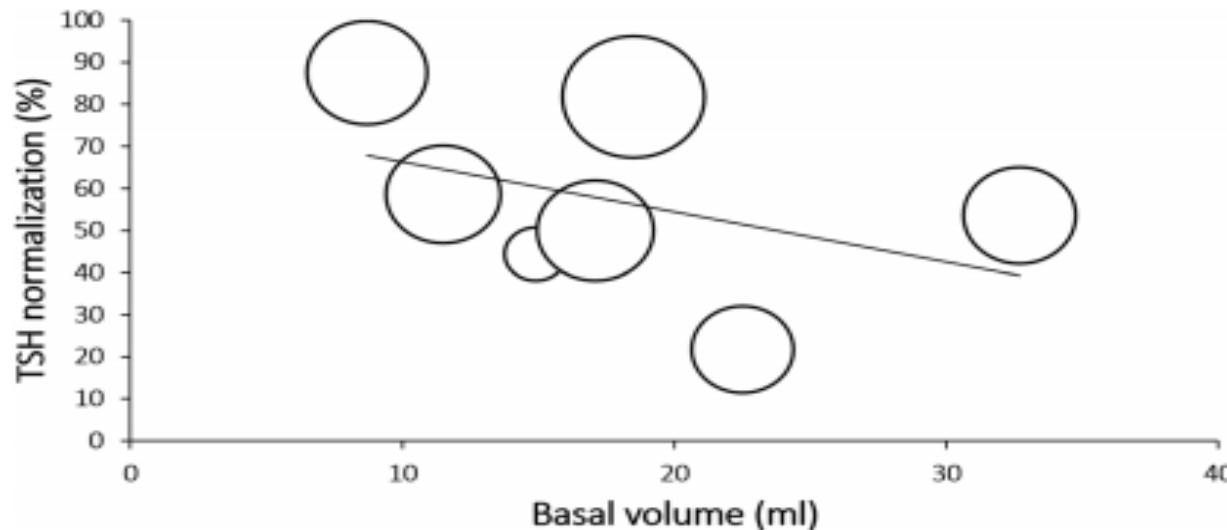
		Scintigrafia_t0			scintigrafia_t24		
		hot	cold	Drop-out	hot	cold	
VOLUME NODULO	<12	15	0	1	2	12	
	>12	14	0	3	9	2	

STRENGTH OF THE STUDY

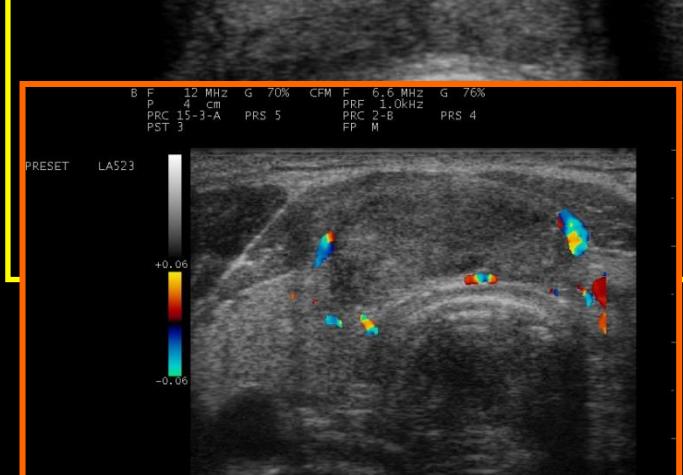
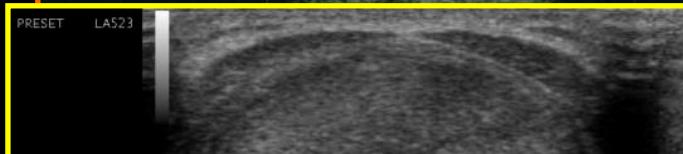
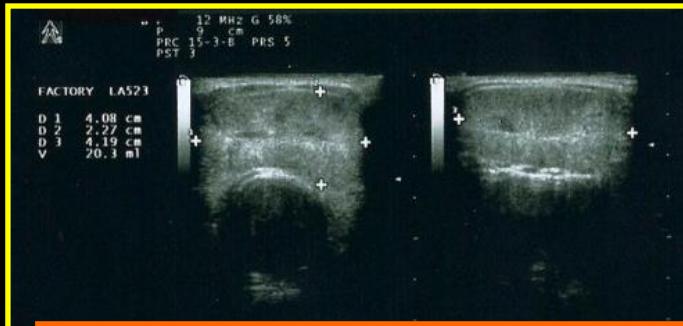
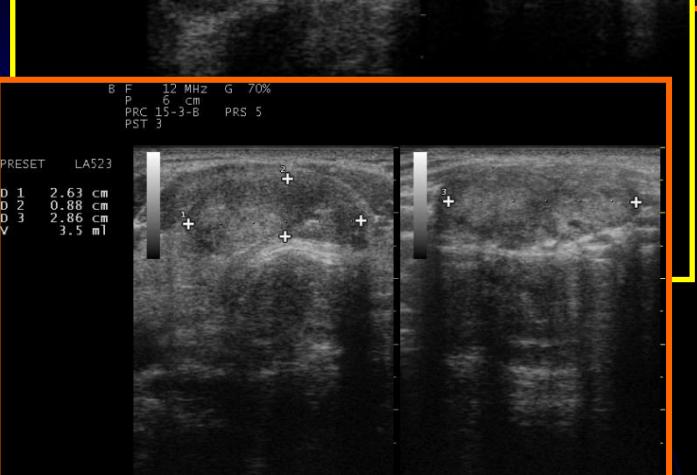
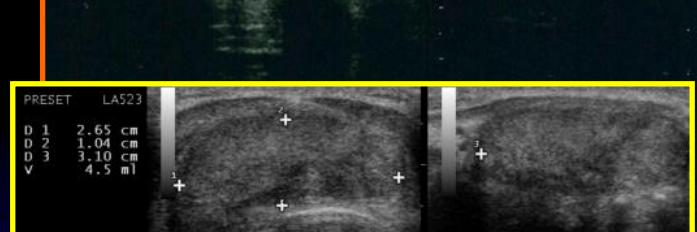
- Studio prospettico (24 months)
- One single treatment
- Monocentric study

Efficacy of radiofrequency ablation in autonomous functioning thyroid nodules. A systematic review and meta-analysis

R. Cesareo¹ • A. Palermo² • D. Benevenuto³ • E. Cella³ • V. Pasqualini⁴ • S. Bernardi⁵ • F. Stacul⁶
G. Mauri⁸ • M. Ciccozzi³ • Pierpaolo Trimboli⁹ 



CASISTICA “SANTA MARIA GORETTI” LATINA



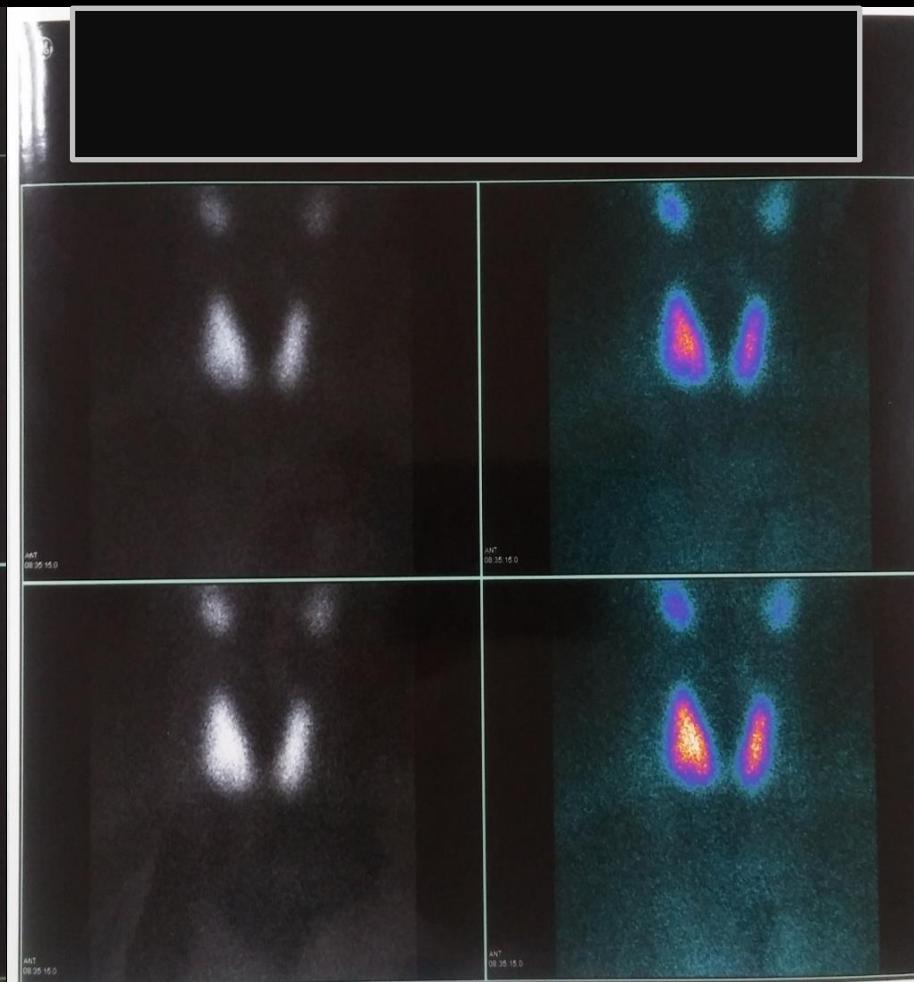
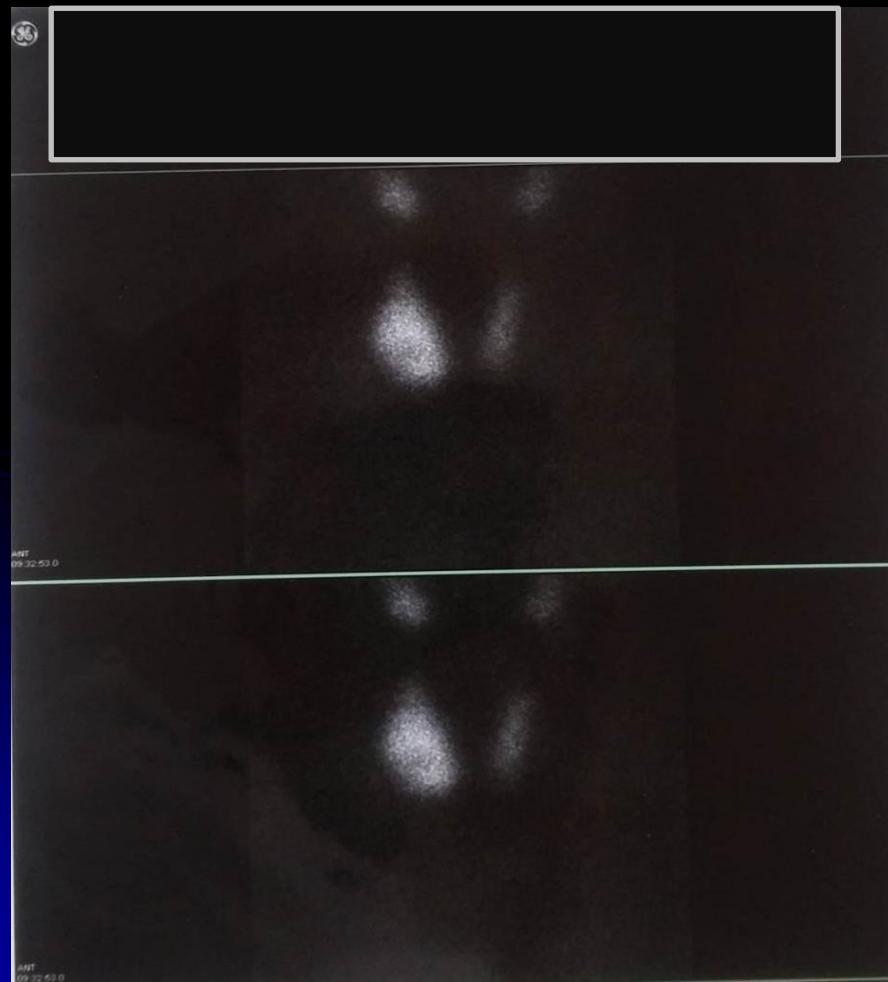
PRE RF

1 MESE
RIDUZIONE DEL
57%

6 MESI
RIDUZIONE DEL
78%

12 MESI
RIDUZIONE DEL
83%

5 ML NODULE SCINTI-SCAN BEFORE AND AFTER RFA



FlexScan S19

Tc Thyroid Scan
10/21/2020

Ospedale S.M.Goretti I



Load to New Mammogram Tc Thyroid Scan

00000194

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Efficacy and safety of thermal ablation for autonomously functioning thyroid nodules: a systematic review and meta-analysis

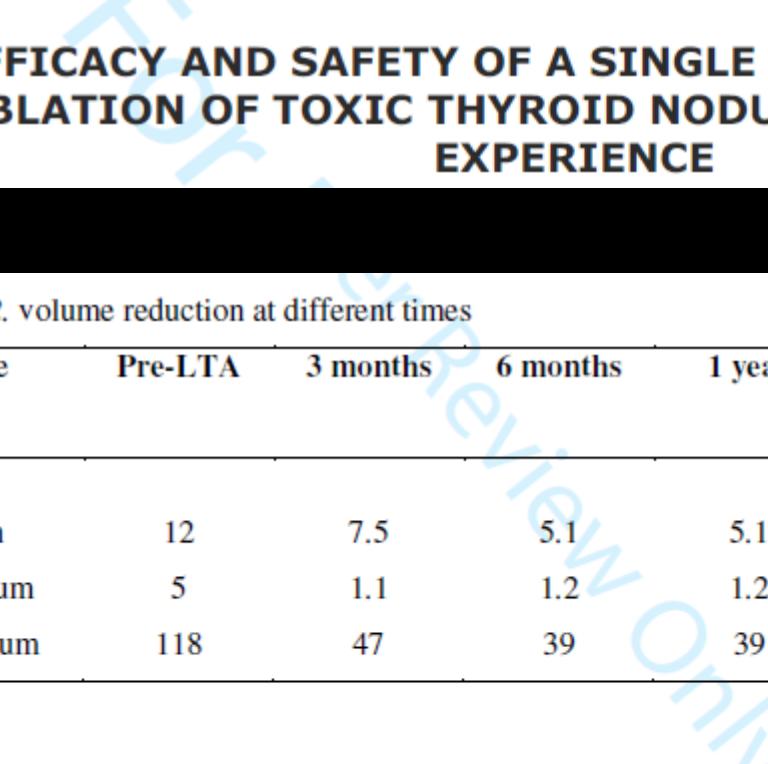
Hyun Jin Kim¹ · Se Jin Cho² · Jung Hwan Baek³ · Chong Hyun Suh³

Subgroup	TSH normalization		<i>p</i> value
	Pooled proportions [95% CI]	<i>I</i> ² * (%)	
Volume			
≤ 18 mL	73.6% [60.5–83.6]	68.7	0.53
> 18 mL	67.0% [43.6–84.2]	82.1	
Treatment sessions			
Single	66.7% [49.3–80.4]	81.1	0.23
Multiple	79.3% [71.1–85.6]	0.0	
Ablation method			
LA	74.8% [59.1–85.9]	59.1	0.67
RFA	69.9% [54.1–82.1]	78.0	

Efficacy and safety of thermal ablation for autonomously functioning thyroid nodules: a systematic review and meta-analysis

Hyun Jin Kim¹ • Se Jin Cho² • Jung Hwan Baek³ • Chong Hyun Suh³

- The smaller nodules (<18 ml) showed a higher proportion of TSH normalization than larger ones, but the difference was not statistically significant ($p = 0.53$).
- Patients who underwent multiple treatment sessions showed higher rates of TSH normalization than those who underwent single session, but the difference was not significant ($p = 0.23$).
- In terms of the method of thermal ablation, LA showed more frequent TSH normalization than RFA, but again the difference was not significant ($p = 0.67$)



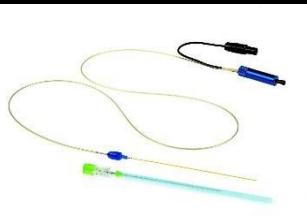
EFFICACY AND SAFETY OF A SINGLE SESSION OF LASER ABLATION OF TOXIC THYROID NODULES: THE PERUGIA EXPERIENCE

Table 2. volume reduction at different times

Volume (ml)	Pre-LTA	3 months	6 months	1 year	3 years
Median	12	7.5	5.1	5.1	5
Minimum	5	1.1	1.2	1.2	1.2
Maximum	118	47	39	39	40

Table 3. Correlation between initial volume of toxic nodule and therapeutic response (suspension of methimazole)

0-5 ml (n= 6)	5-15 ml (n= 51)	15-25 ml (n= 18)	> 25 ml (n= 7)
6/6 (100%)	46/51 (90.2%)	11/18 (61.1%)	2/7 (28.5%)



Laser Ablation and 131-Iodine: A 24-Month Pilot Study of Combined Treatment for Large Toxic Nodular Goiter

In group (LAT131I), however, **normalization of TSH** occurred in nine of 15 patients (**60%**) already 1 month after LAT; in particular, in three of these patients radioiodine was not necessary

Combined treatment determined **faster volume reduction and relief of symptoms, and faster control of hyperthyroidism.**

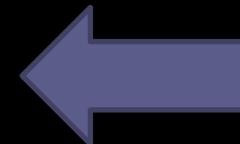
Minimally-invasive treatments for benign thyroid nodules: a Delphi-based consensus statement from the Italian minimally-invasive treatments of the thyroid (MITT) group

Enrico Papini, Claudio Maurizio Pacella, Luigi Alessandro Solbiati, Gaetano Achille, Daniele Barbaro, Stella Bernardi, Vito Cantisani, Roberto Cesareo, Arturo Chiti, Luca Cozzaglio, Anna Crescenzi, Francesco De Cobelli, Maurilio Deandrea, Laura Fugazzola, Giovanni Gambelunghe, Roberto Garberoglio, Gioacchino Giugliano, Livio Luzi, Roberto Negro, Luca Persani, Bruno Raggiunti, Francesco Sardanelli, Ettore Seregni, Martina Sollini, Stefano Spiezia, Fulvio Stacul, Dominique Van Doorn, Luca Maria Sconfienza & Giovanni Mauri

Statement # 4. A single cytological sample can be considered adequate to confirm nodule benignity if the US appearance is at low risk of malignancy (EU-TIRADS ≤ 3) and in AFTN.

Statement #10. Thermal ablation may be proposed as a treatment option for AFTN in patients who refuse or cannot undergo traditional treatments with radioiodine or surgery.

Statement #11. Small size AFTN can be treated with thermal ablation when the preservation of normal thyroid tissue function is a priority and it is reasonable to expect at least 80% nodule volume ablation.



2020 European Thyroid Association Clinical Practice Guideline for the Use of Image-Guided Ablation in Benign Thyroid Nodules

Enrico Papini^a Hervé Monpeyssen^b Andrea Frasoldati^c Laszlo Hegedüs^d



Recommendation 2 We recommend against the use of TA for asymptomatic lesions (1, 0000)

Recommendation 15 We recommend against TA as first-line treatment for large AFTN; due to the low rate of restoration of normal thyroid function, TA should be considered only for patients who decline or are not candidates for RAI therapy or surgery (1, 0000)

Recommendation 16 TA should be considered in young patients with small AFTN and incomplete suppression of perinodular thyroid tissue due to the higher probability of normalization of thyroid function and the advantage of avoiding irradiation and restricting risk of late hypothyroidism (1, 0000)

Recommendation 17 Treatment with a combination of LTA or RFA and RAI may be considered in selected patients with large AFTN that cause local pressure symptoms in order to achieve a more rapid volume reduction and use of a lower RAI activity (2, 0000)

DIAGNOSIS OF ENDOCRINE DISEASE

Thyroid ultrasound (US) and US-assisted procedures: from the shadows into an array of applications

Enrico Papini^{1,*†}, Claudio M Pacella² and Laszlo Hegedus³

1 Progressively growing benign thyroid lesions that reach to a volume over 12 ml seem to be especially suited for minimally invasive procedures. Less appropriate indications are large nodular goitres, multinodular thyroid disease or deeply positioned lesions.

**AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS,
AMERICAN COLLEGE OF ENDOCRINOLOGY, AND
ASSOCIAZIONE MEDICI ENDOCRINOLOGI MEDICAL GUIDELINES FOR
CLINICAL PRACTICE FOR THE DIAGNOSIS AND MANAGEMENT OF
THYROID NODULES – 2016 UPDATE
*EXECUTIVE SUMMARY OF RECOMMENDATIONS***

7.2.5. Image-guided thermal ablation for benign nodules

- Consider laser or radiofrequency ablation for the treatment of solid or complex thyroid nodules that progressively enlarge or are symptomatic or cause cosmetic concern [BEL 2, GRADE C].

TAKE HOME MESSAGES

- Il trattamento dei noduli tiroidei caldi al momento deve essere considerato una seconda opzione a quella chirurgica e/o radiometabolica
- I dati di più robusta evidence sembrerebbero rilevare che la maggiore efficacia terapeutica si riscontra in noduli dove si segnala una significativa necrosi cellulare (almeno 80%)
- L'efficacia terapeutica sembra pertanto maggiore sui noduli small
- Saranno necessari maggiori studi finalizzati a confermare tali evidenze e a valutare l'eventuale effetto additivo e combinato con il trattamento radiometabolico su noduli larger

GRAZIE!!!

