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ITALIAN CHAPTER

# 17° Congresso Nazionale AME

Joint Meeting with AAACE Italian Chapter

## Update in Endocrinologia Clinica

8-11 novembre 2018

Roma



**RADIOFREQUENCY  
ABLATION**

**Maurilio Deandrea**

S.C. di Endocrinologia

AO Ordine Mauriziano di Torino

Presidio Ospedaliero "Umberto I", Torino, Italia





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# Conflitti di interesse



ITALIAN CHAPTER

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 ho avuto rapporti diretti di finanziamento con i seguenti soggetti portatori di interessi commerciali in campo sanitario:

**NOTHING TO DISCLOSE**

## Radiofrequency Ablation of Benign Cold Thyroid Nodules: Initial Clinical Experience

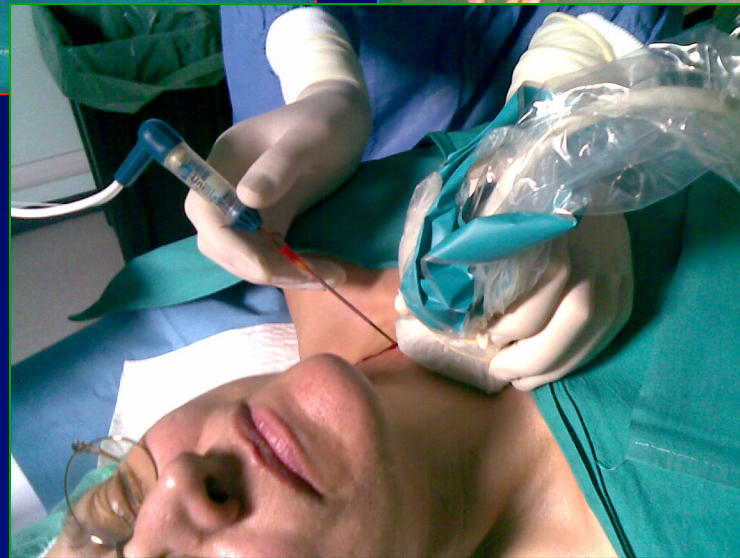
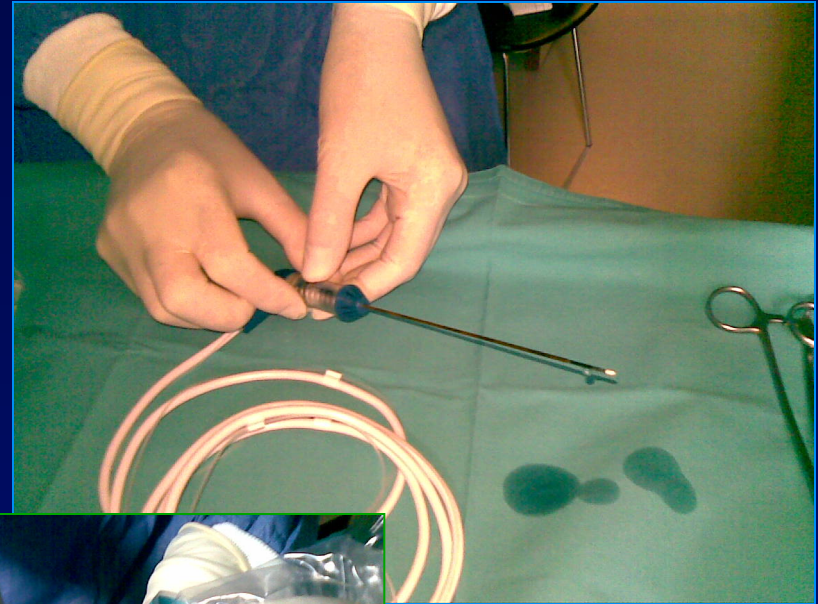
Young-Sun Kim, Hyunchul Rhim, Kyung Tae, Dong Woo Park, Sung Tae Kim

Thyroid. April 2006, Vol. 16, No. 4: 361-367

**A total of 35 benign cold thyroid nodules in 30 euthyroid patients (M:F = 2:28; mean age 39.1 years) underwent percutaneous RF ablation with a 1-cm-internally cooled electrode. Seventy-seven percent (23/30) of patients required conscious sedation for discomfort. We evaluated the tumor size, cystic component, vascularity (by color Doppler US), and the severity of mass-related symptoms before treatment. We assessed the therapeutic efficacy and safety of RF ablation by clinical and US follow-up (median 6.4 months). *Main outcome and results:* The volume of the tumors before ablation had a range of 0.6–28.2 mL (mean, 6.3 mL). **The residual volume was 53.5% ± 26.5% of original at 1.1–2.9 months (n = 32), 36.2% ± 27.4% at 3.0–5.9 months (n = 20), 30.7% ± 25.0% at 6.0–8.9 months (n = 15), and 11.8% ± 10.9% at 9.0–18.5 months (n = 13)****

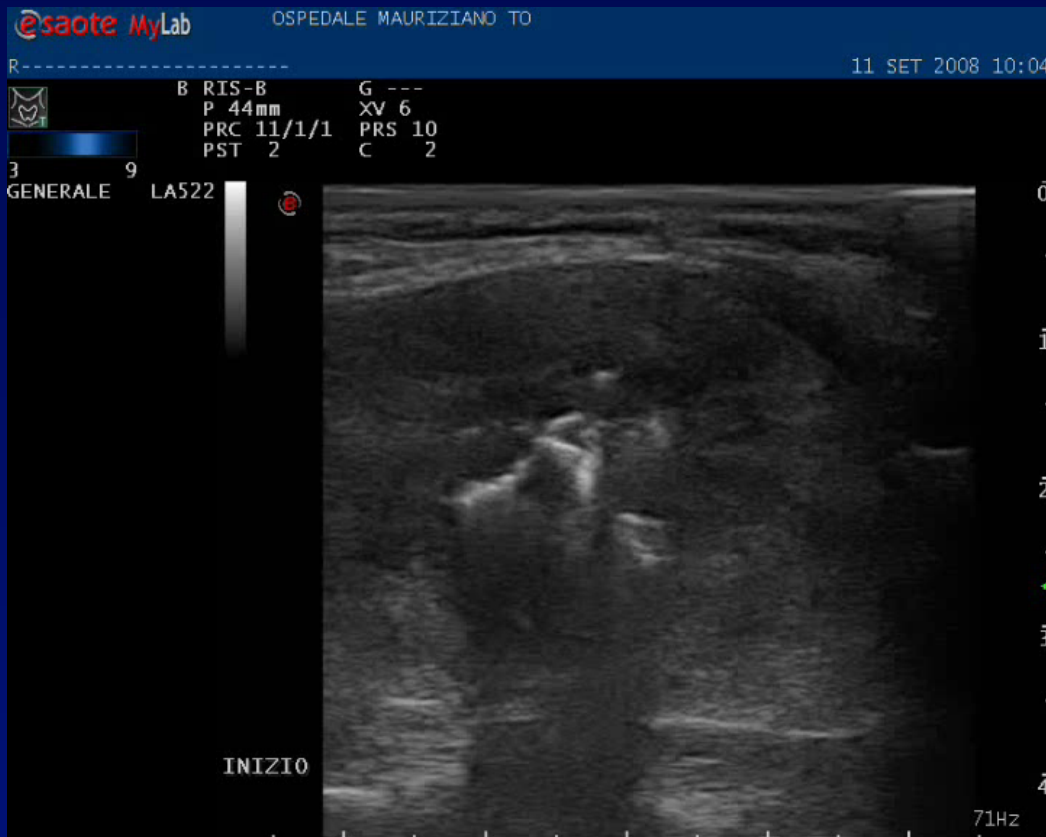
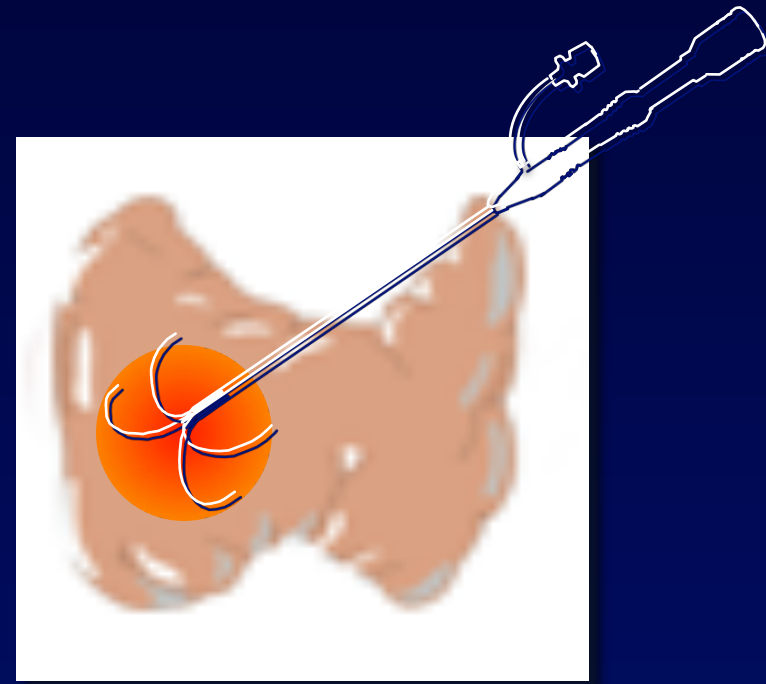


# RFA: 14Gauge fixed needle

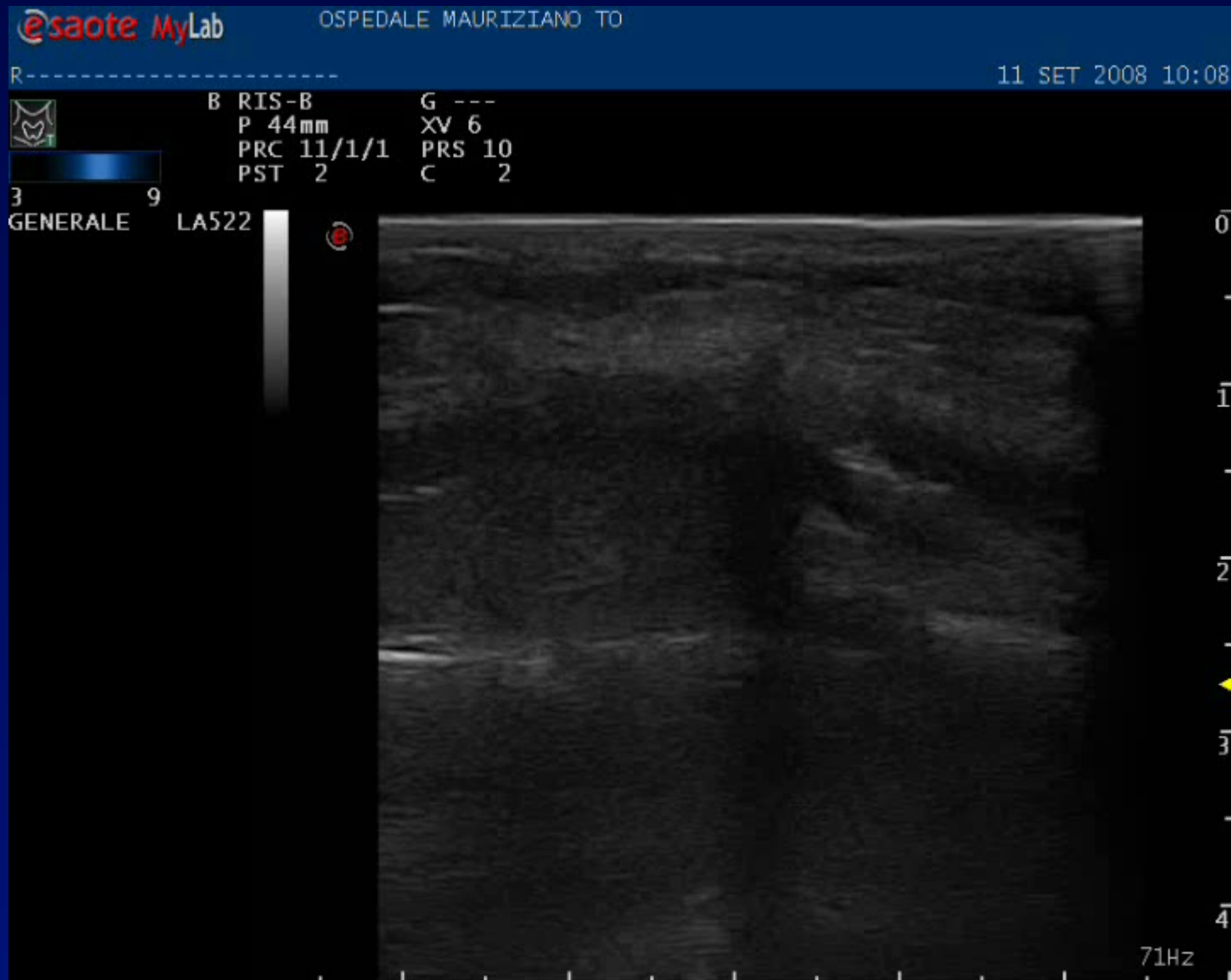


Curved needles release high frequency waves (460/500 kHz) and detect temperature and impedance at the top in real time.

The electric waves induce heating in the tissue around.



# *RFA complete heating*



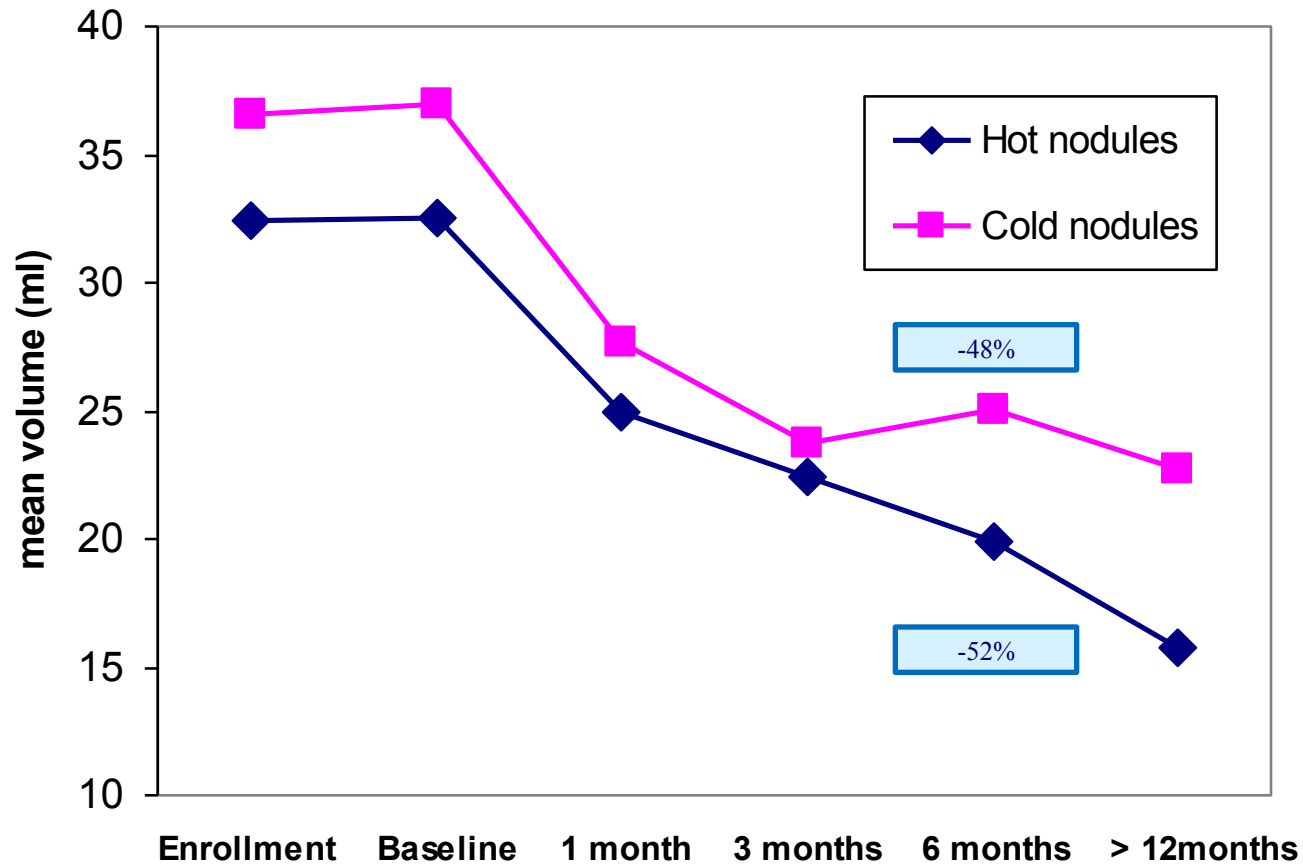
# US-GUIDED PERCUTANEOUS RADIOFREQUENCY THERMAL ABLATION FOR THE TREATMENT OF SOLID BENIGN HYPERFUNCTIONING OR COMPRESSIVE THYROID NODULES

MAURILIO DEANDREA,<sup>¶</sup> PAOLO LIMONE,<sup>¶</sup> EDOARDO BASSO,<sup>¶</sup> ALBERTO MORMILE,<sup>¶</sup>  
FEDERICO RAGAZZONI,<sup>¶</sup> ELENA GAMARRA,<sup>¶</sup> STEFANO SPIEZIA,<sup>†</sup> ANTONGIULIO FAGGIANO,<sup>‡</sup>  
ANNAMARIA COLAO,<sup>‡</sup> FILIPPO MOLINARI,<sup>§</sup> and ROBERTO GARBEROGLIO<sup>¶</sup>

Ultrasound in Med. & Biol., Vol. 34, No. 5, pp. 784–791, 2008

<b>Patients</b>		
	Number	57
	Sex	16♂ / 41♀
	Age range	28 - 88
	Median age	63.8
<b>Nodules</b>		
	Number	59
	Volume min-max (ml)	2,5 / 180,2
	Volume medium $\pm 2$ SD (ml)	34,5 $\pm$ 31
<b>Function</b>		
	Cold Nodules	26
	Hot nodules	33

# Volume Shrinkage





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

Stefano Spiezia,<sup>1</sup> Roberto Garberoglio,<sup>2</sup> Francesco Milone,<sup>3</sup> Valeria Ramundo,<sup>3</sup> Corrado Caiazzo,<sup>1</sup> Angelo Pio Assanti,<sup>1</sup> Maurilio Deandrea,<sup>2</sup> Paolo P. Limone,<sup>2</sup> Paolo E. Macchia,<sup>3</sup> Gaetano Lombardi,<sup>3</sup> Annamaria Colao,<sup>3</sup> and Antongiulio Faggiano<sup>3</sup>

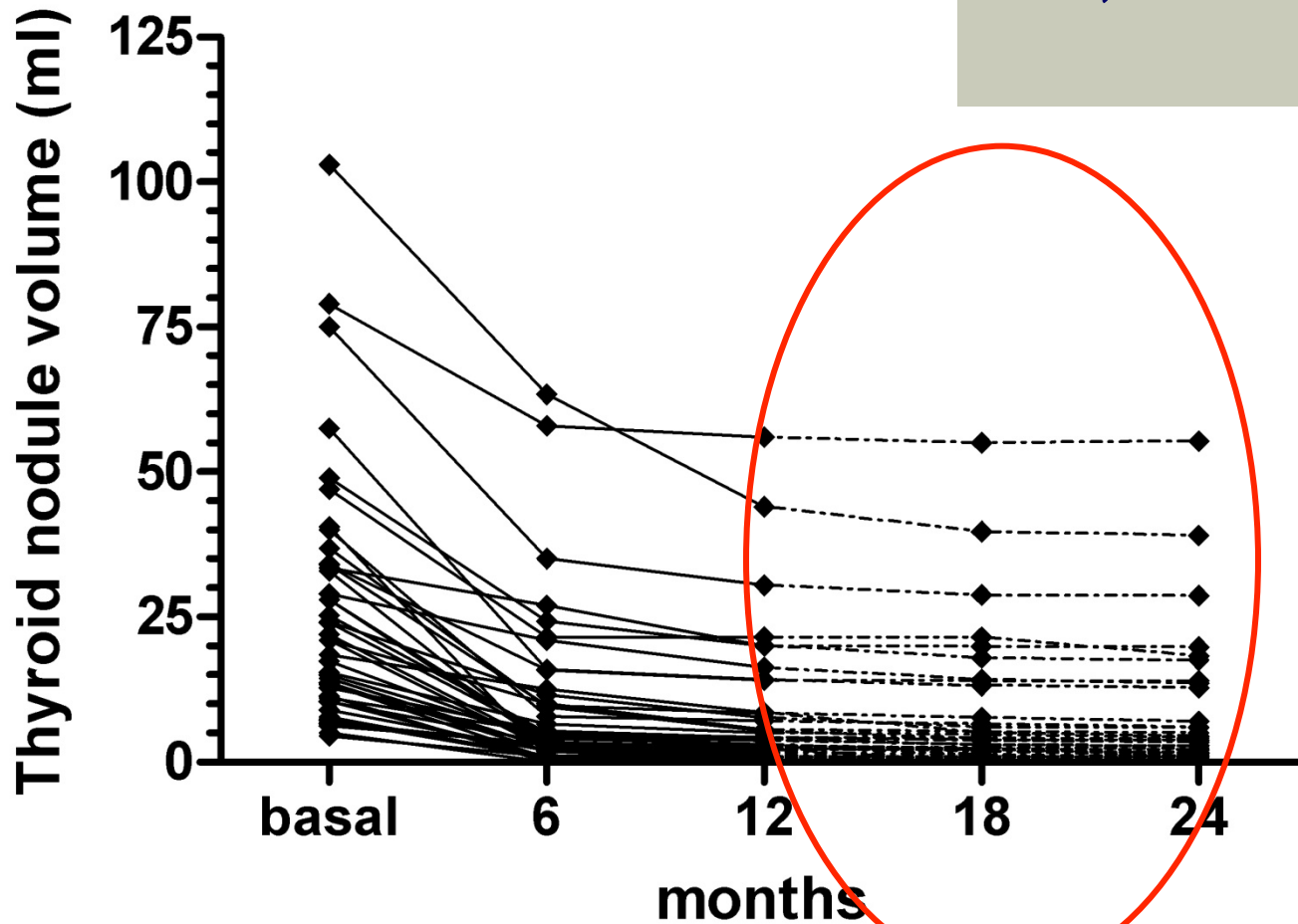
TABLE 1. CHARACTERISTICS OF PATIENT POPULATION AND THYROID NODULES

No. of patients	94
Age (range, mean $\pm$ SEM)	66–89, 72.5 $\pm$ 0.5 years
Sex M/F	39/55
Thyroid nodule volume (nontoxic + toxic/pretoxic nodules)	
Mean $\pm$ SEM	24.5 $\pm$ 2.1 mL
Range	4.5–103 mL
Nontoxic thyroid nodule volume	
Mean $\pm$ SEM	21.1 $\pm$ 1.7 mL
Range	4.5–73.2 mL
Toxic and pretoxic thyroid nodule volume	
Mean $\pm$ SEM	32.7 $\pm$ 5.4 mL
Range	5.3–103 mL

# Results

*US response:*

- 2 year follow-up
- 1 to 3 (1.4) sessions
- 70,9% volume reduction



***2008 RFA “moving – shot technique”***



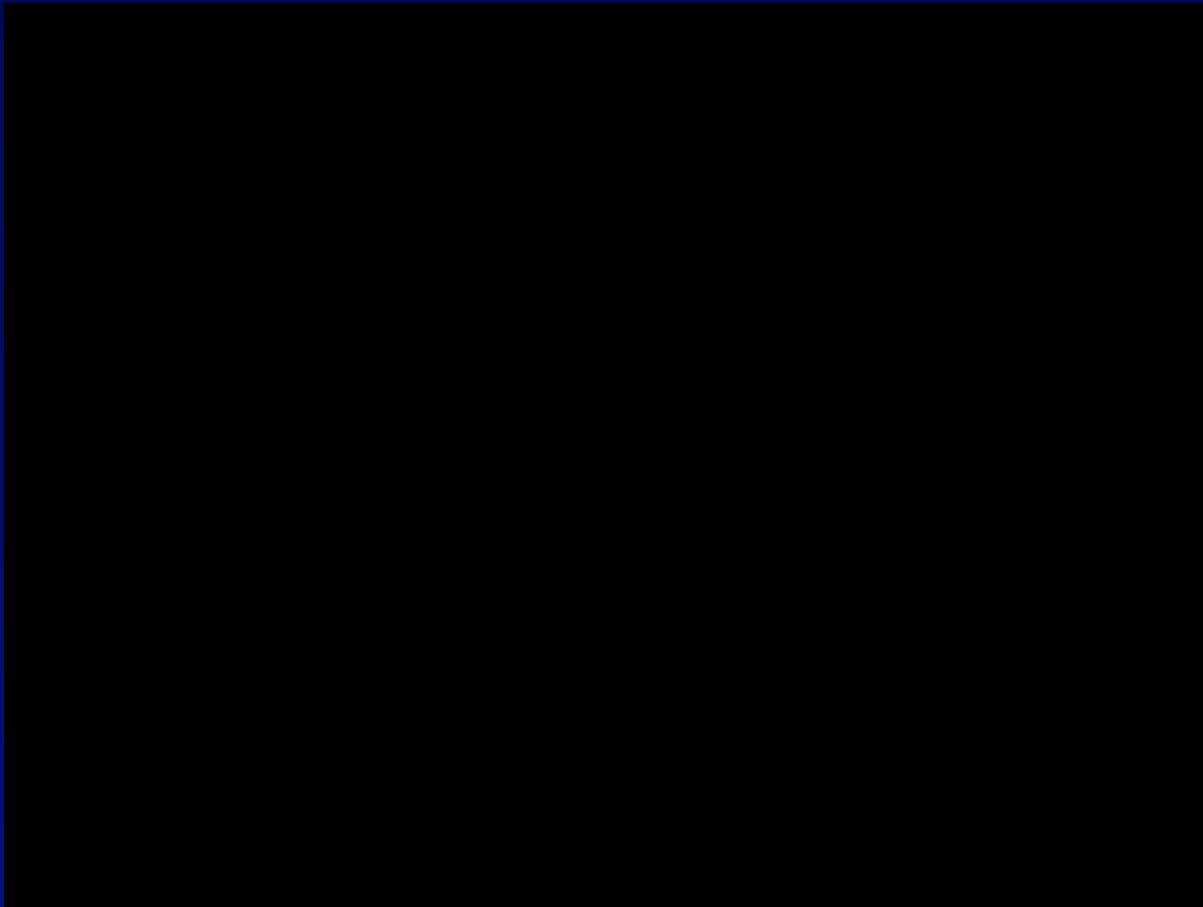
# Trans-isthmic approach method



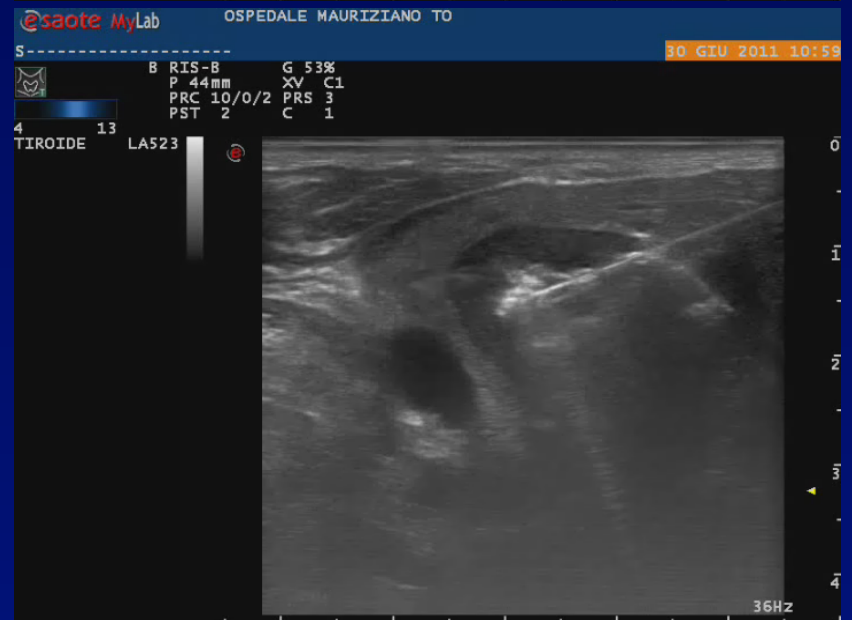
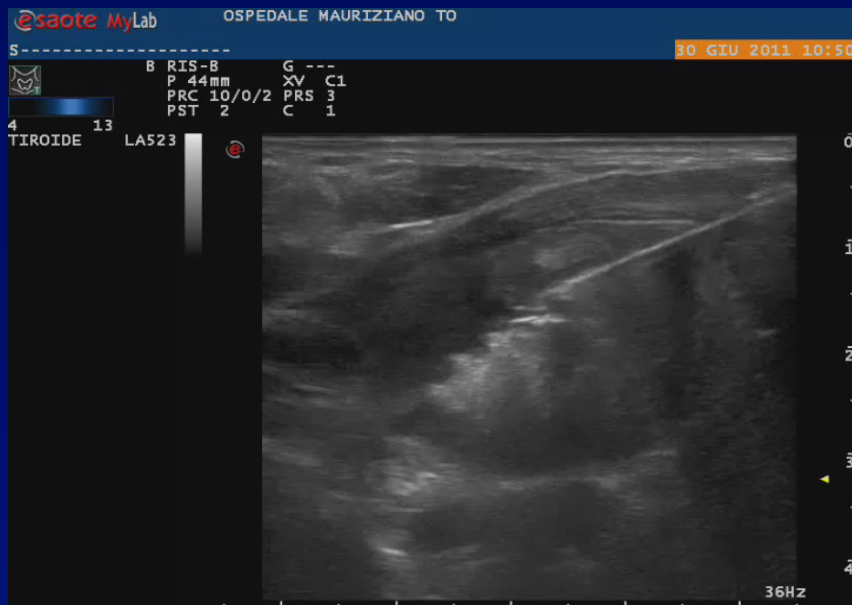
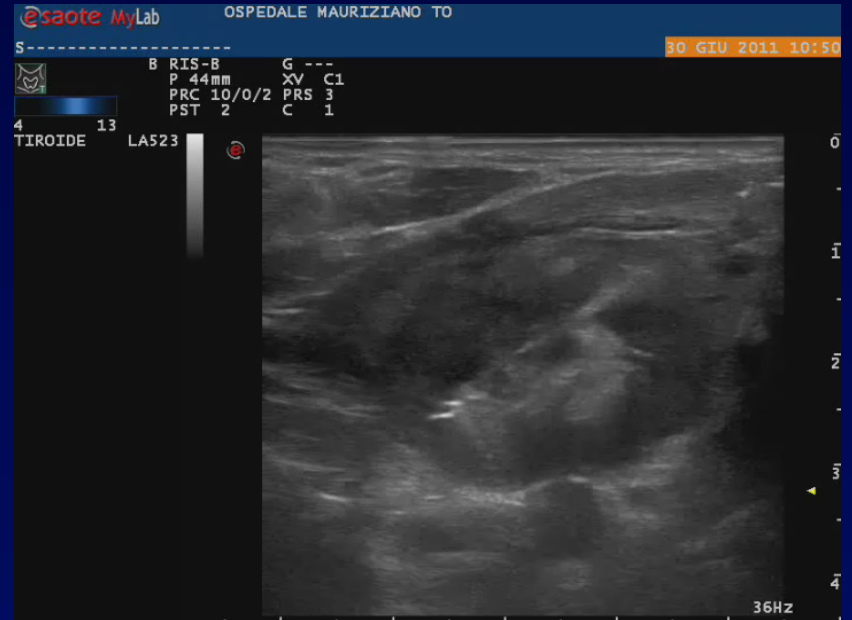
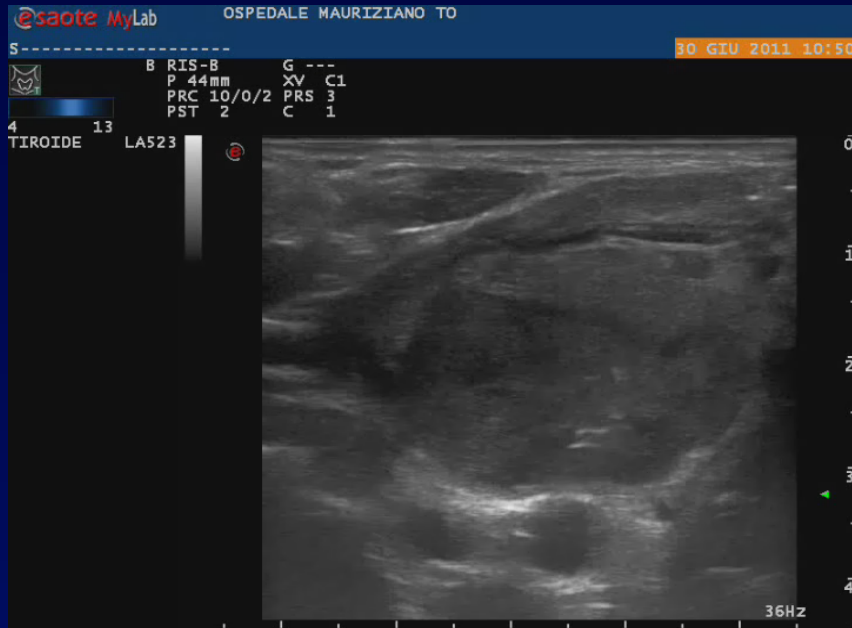
The electrode approach is made from the medial (isthmus) to the lateral (nodule) part of the neck along the transverse axis of the targeted nodule. The position in front or behind the patient's head, is depending on the position of the thyroid nodule to ablate.



Ablation is begun with 30 W of radiofrequency power. If a transient hyperechoic zone does not appear from at the electrode tip within 5–10 seconds, radiofrequency power is increased in 10-W increments up to 80 W. If the patient does not tolerate pain during ablation, the power is reduced or turned off. Ablation is terminated when all imaginary units have changed to transient hyperechoic zones.♪



# Treatment



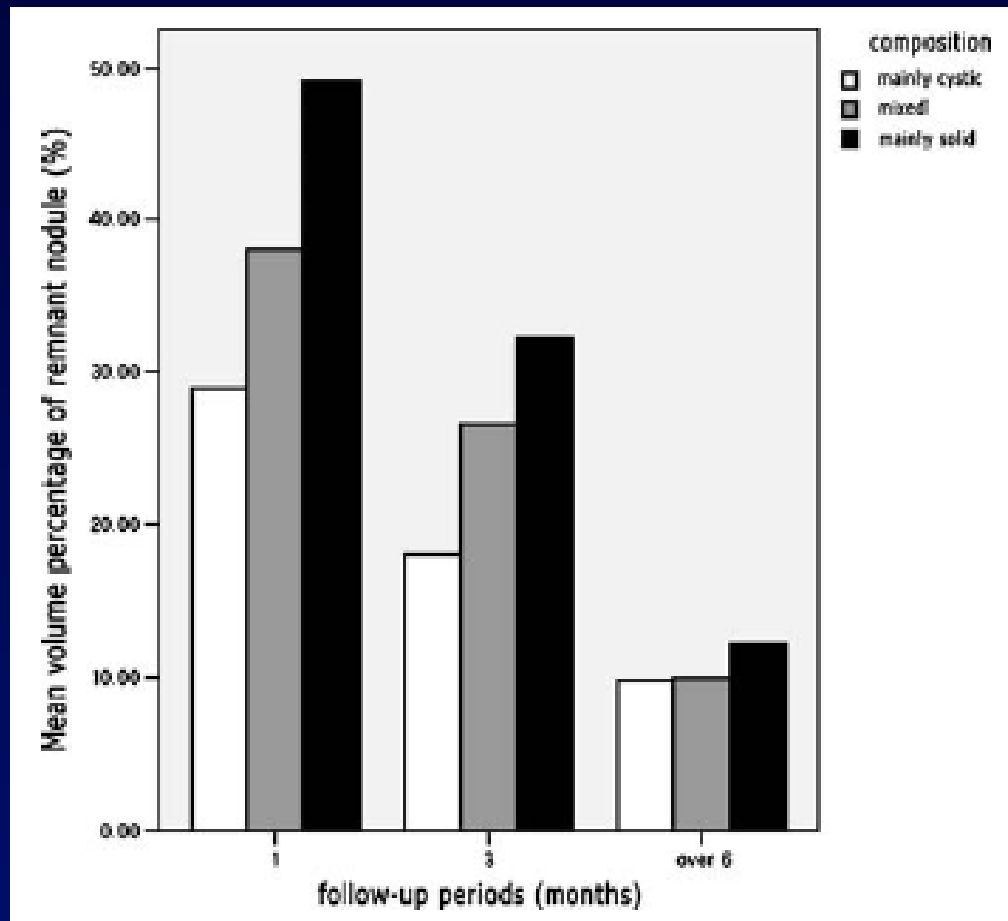
Woo Kyoung Jeong  
Jung Hwan Baek  
Hyunchul Rhim  
Yoon Suk Kim  
Min Sook Kwak  
Hyun Jo Jeong  
Ducky Lee

## Radiofrequency ablation of benign thyroid nodules: safety and imaging follow-up in 236 patients

**Table 1** The changes in volume before RFA and at each follow-up

	Initial	1 month later	3 months later	6 months later	Last follow-up
No. of nodules	302	247	155	140	302
Volume (ml) <sup>a</sup>	0.11–95.61 (6.13±9.59)	0.00–40.30 (2.53±4.40)	0.00–24.17 (2.00±3.24)	0.00–30.11 (1.54±4.38)	0.00–26.07 (1.12±2.92)
Largest diameter (cm) <sup>a</sup>	0.6–10.00 (2.44±1.36)	0.00–7.00 (1.73±1.03)	0.00–5.20 (1.60±0.97)	0.00–6.00 (1.26±1.07)	0.00–5.70 (1.01±1.00)
Volume reduction rate (%)		58.20	74.41	84.79	84.11

<sup>a</sup>Mean ±standard deviation *in parentheses*



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## Conclusion

Thyroid nodule RFA appears safe and imaging follow-up confirms volume reduction, however its efficacy and safety needs to be verified through long-term follow-up.



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

EJE 2014

Enrico Papini<sup>1,†</sup>, Claudio M Pacella<sup>2</sup> and Laszlo Hegedus<sup>3</sup>

**Table 3** Clinical outcomes of patients with symptomatic benign thyroid nodules treated with radiofrequency ablation.

Author	Pts/ nodule no	RCT	US pattern cystic-solid	Fluid com- ponent (%)	Baseline (vol. ml mean) hot/cold	Nodule function hot/cold no	Electrode type	Energy load (J/ml mean)	Number of session (mean)	FU mo	Volume reduction (% mean) hot/cold
Kim <i>et al.</i> (2006) (56) <sup>a</sup>	30/35		Cystic-solid	> 80	6.3	Cold	17G cooled electrode		1	6.4 (median)	88
Spiezia <i>et al.</i> (2007) (111)	39/39		Solid			Cold	14G multined electrodes		1.4	6	74
Jeong <i>et al.</i> (2008) (109) <sup>b</sup>	236/302		Cystic-solid	> 80	6.1	Cold	17G cooled electrode		1.4	6	85
Baek <i>et al.</i> (2008) (110)	1		Mixed		5.1	Hot	17G cooled electrode			19	97
Deandrea <i>et al.</i> (2008) (115) <sup>c</sup>	33/33		Cystic-solid	< 30	22.6/39.3	23/10	14G multined electrodes		1	6	52 vs 46
Spiezia <i>et al.</i> (2009) (116) <sup>c</sup>	94/94		Cystic-solid	< 30	32.7/21.1	28/66	14G multined electrodes		1 (median)	12	78
Baek <i>et al.</i> (2009) (112)	9/9		Cystic-solid	> 80	14.9	Hot	17–18G cooled electrode	10 818	2.2	6	71
Baek <i>et al.</i> (2010) (113)	15 vs 15		Cystic-solid	> 50	6.9/7.5	Cold	18G cooled electrode	4966	1	6	80
Sung <i>et al.</i> (2011) (120) <sup>d</sup>	21		Cystic	> 90	10.2	Cold	18G cooled electrode		1.7	6	> 50
Huh <i>et al.</i> (2012) (114) <sup>e</sup>	15 vs 15	Yes	Cystic-solid	> 50	13.3/13.0	Cold	18G cooled electrode	4377 vs 6157	1	6	70 vs 78
Faggiano <i>et al.</i> (2012) (117) <sup>c</sup>	20/20		Cystic-solid	< 30	11.2/13.3	10/10	14G multined electrodes		1	9	85
Lim <i>et al.</i> (2013) (118) <sup>f</sup>	111/126		Cystic-solid	65	9.8	Cold	17/18G cooled electrode	2936	2.2	49	93
Sung <i>et al.</i> (2013) (121) <sup>g</sup>	25 vs 25	Yes	Cystic	> 90	9.3	Cold	18G cooled electrode		1	6	93

Pts, patients.

<sup>a</sup>Sixteen of 35 (45.7%) nodules were mainly cystic with cystic portion > 80%.

<sup>b</sup>Fifty-four percent with solid portion > 80%, 16% with cystic component > 80%, and remaining 30% with mixed structure.

<sup>c</sup>Uniformly solid (100% solid) or predominantly solid with not more than 30% fluid component.

<sup>d</sup>Therapeutic success defined as volume reduction > 50 was achieved with RFA in 20/21 (95%) nodules.

<sup>e</sup>One RF session vs two RF sessions.

<sup>f</sup>Forty-five nodules with solid component ≤ 50% and 81 nodules with solid component > 50%.

<sup>g</sup>RCT: RFA vs PEIT.

# Efficacy and Safety of Radiofrequency Ablation Versus Observation for Nonfunctioning Benign Thyroid Nodules: A Randomized Controlled International Collaborative Trial

Maurilio Deandrea,<sup>1</sup> Jin Yong Sung,<sup>2</sup> Paolo Limone,<sup>1</sup> Alberto Mormile,<sup>1</sup> Francesca Garino,<sup>1</sup> Federico Ragazzoni,<sup>1</sup> Kyu Sun Kim,<sup>2</sup> Ducky Lee,<sup>3</sup> and Jung Hwan Baek<sup>4</sup>

**Prospective randomized trial** to assess RF ablation efficacy in the treatment of compressive benign thyroid nodules

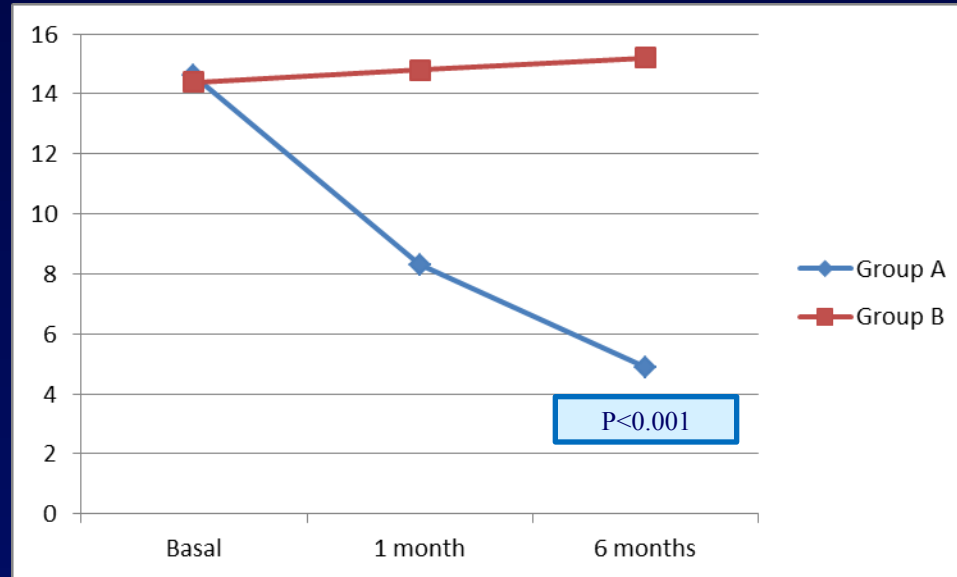
For this aim we selected a group of **benign nonfunctioning medium sized thyroid nodules** randomized to observation versus a single session of RFA

We applied the **moving-shot technique** in Italy and Korea centers to compare results in groups with large experience in radiofrequency thermal ablation.

# Results: patients and energy delivered

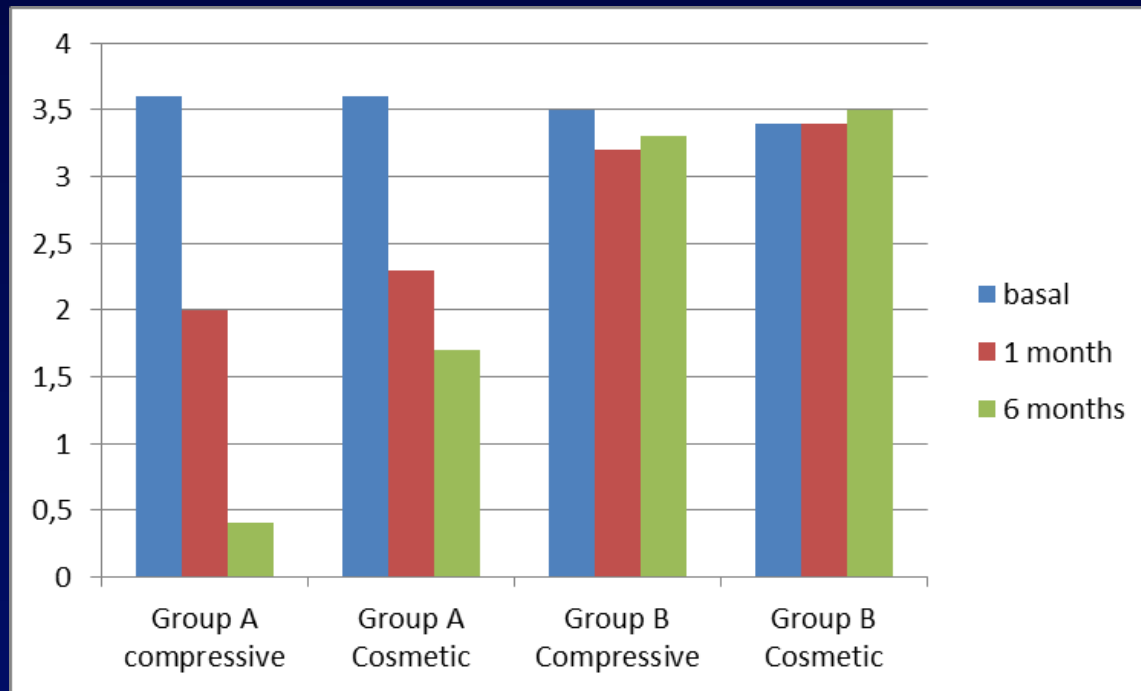
	Korea	Italy		P
<b>Females/Males</b>	36/4	34/6		NS
<b>Age</b>	39,5±9,5	56,5±14,2		0,06
<b>Ablation time</b>	7,2±2,3	14,2±3,5		0,03
<b>RF Power</b>	75,2±10,4	50,3±5,1		0,05
<b>Energy/ml</b>	40,6±15,2	43,6±12,7		NS
<b>Thyroid function</b>	normal	normal		
<b>Complications</b>	none	none		NS

# Results: volume reduction



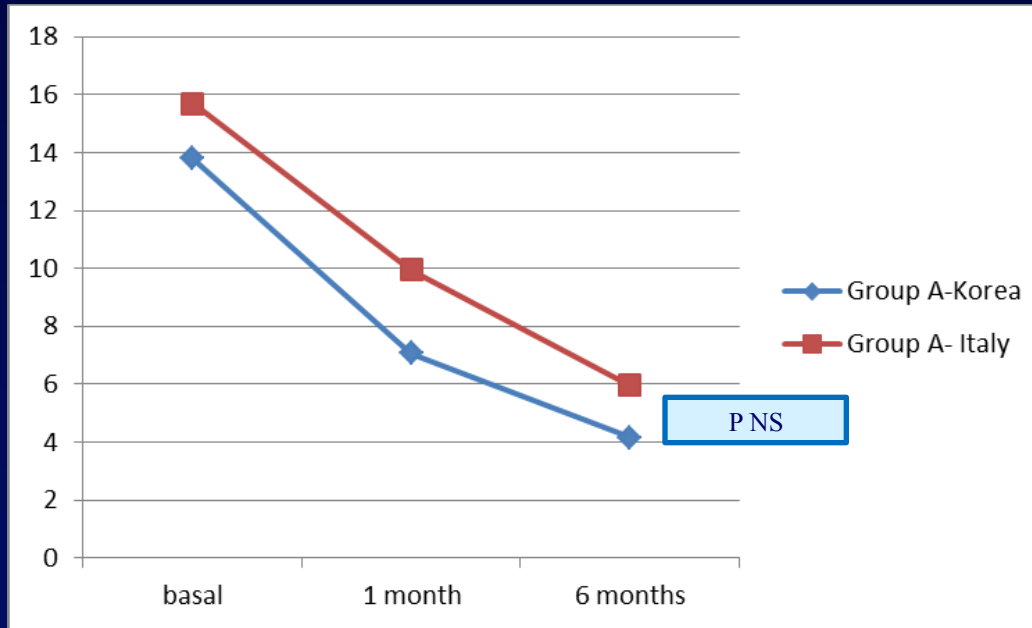
	Group A Volume (mean±SD)	% Volume	Group B Volume (mean±SD)	% Volume
<b>Basal</b>	14,6±3,1	-	14,4±3,3	-
<b>1 month</b>	8,3±2,9	- 43%	14,8±3,5	+2,7%
<b>6 months</b>	4,9±2,7	- 66,4%	15,2±3,5	+5,5%

# Results: aesthetic/compressive symptoms



	Group A Compressive	Group A Cosmetic	Group B Compressive	Group B Cosmetic
Basal	3,6±1,9	3,6±0,5	3,5±1,7	3,4±0,7
1 month	2,0±1,7	2,3±0,7	3,2±1,9	3,4±0,9
6 months	0,4±0,7	1,7±0,8	3,3±1,7	3,5±0,7

# Volume reduction: different countries



	Group A- Korea Vol (mean±SD)	Volume reduction	Group A – Italy Vol (mean±SD)	Volume reduction
<b>Basal</b>	13,8±3,3	-	15,9±2,5	-
<b>1 month</b>	7,0±2,6	47%	9,9±2,7	39%
<b>6 months</b>	4,1±2,9	69%	5,9±2,2	65%

# RESULTS ACCORDING TO DIFFERENT SIZE

## Prospective Study of Effectiveness of Ultrasound-Guided Radiofrequency Ablation Versus Control Group in Patients Affected by Benign Thyroid Nodules

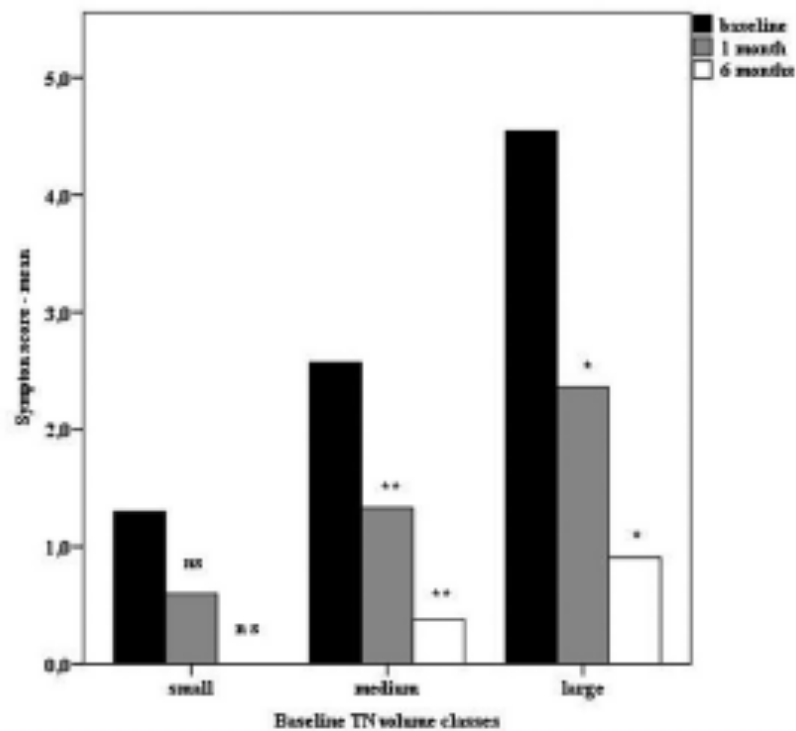
Roberto Cesareo, Valerio Pasqualini, Carla Simeoni, Marco Sacchi, Erminio Saralli, Giuseppe Campagna, and Roberto Cianni

J Clin Endocrinol Metab, February 2015, 100(2):460–466

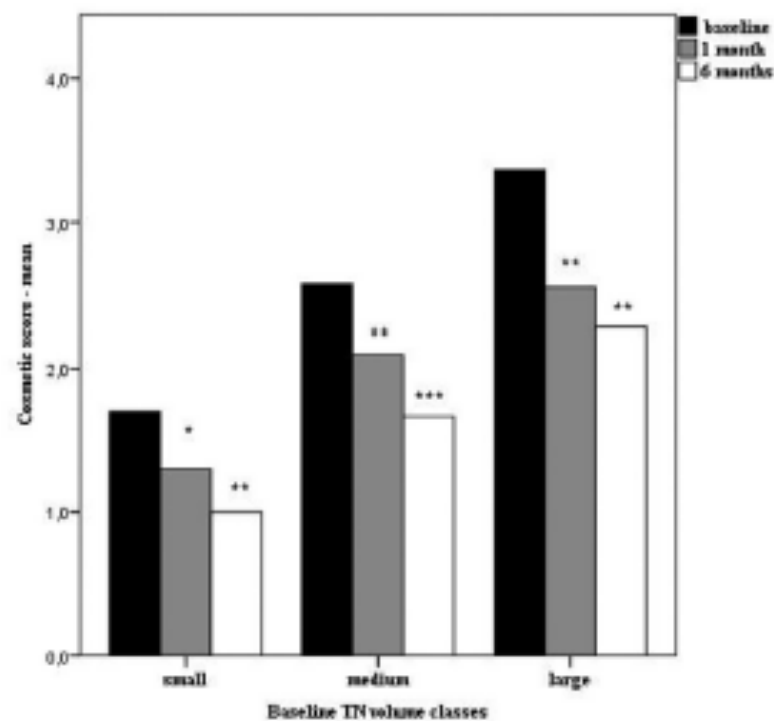
**Table 2.** TN Volume (Milliliters) in RFA Group

	Baseline	1 Month	6 Months
Whole group (n = 42)			
TN volume	24.5 ± 19.6	17.5 ± 34.7 <sup>a</sup>	8.6 ± 9.5 <sup>a</sup>
TN volume variation, %		-49.7 ± 14.5	-68.6 ± 13.5
Small (n = 10)			
TN volume	7.4 ± 2.7	3 ± 1.2 <sup>b</sup>	1.6 ± 1 <sup>b</sup>
TN volume variation, %		-57.5 ± 8.6	-78.2 ± 10.7
Medium (n = 21)			
TN volume	18.1 ± 4.4	9.3 ± 3 <sup>a</sup>	5.9 ± 2.5 <sup>a</sup>
TN volume variation, %		-47 ± 15	-67 ± 12.2
Large (n = 11)			
TN volume	52.3 ± 17.5	27.8 ± 13.7 <sup>c</sup>	20.1 ± 12.1 <sup>b</sup>
TN volume variation, %		-47.7 ± 16.3	-62.8 ± 14.8

Values are reported as mean ± SD. Differences in mean volumes are considered between value at 1 month and 6 month vs baseline.



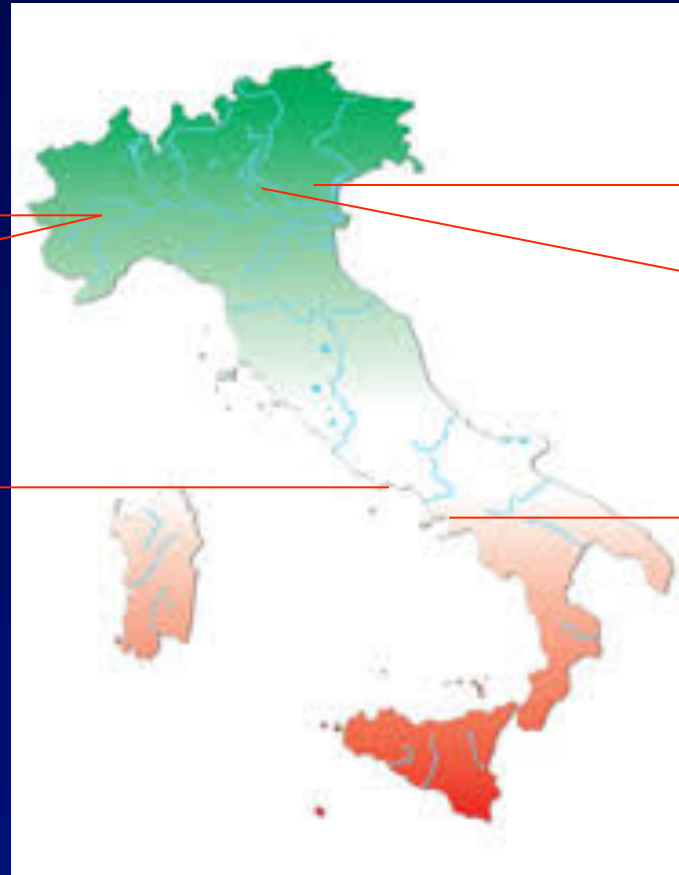
**Figure 1.** Pressure symptoms score in all subgroups at 1 month and at 6 months vs baseline. ns, not significant. \*,  $P \leq .05$ ; \*\*,  $P < .01$ .



**Figure 2.** Cosmetic score in all groups at 1 month and at 6 months vs baseline. \*,  $P \leq .05$ ; \*\*,  $P < .01$ ; \*\*\*,  $P < .001$ .



# RADIOFREQUENCY THERMAL ABLATION FOR BENIGN THYROID NODULES: RESULTS FROM AN ITALIAN MULTICENTER STUDY



Torino Mauriziano

Torino Molinette

Roma

Treviso - Venezia

Verona

Napoli

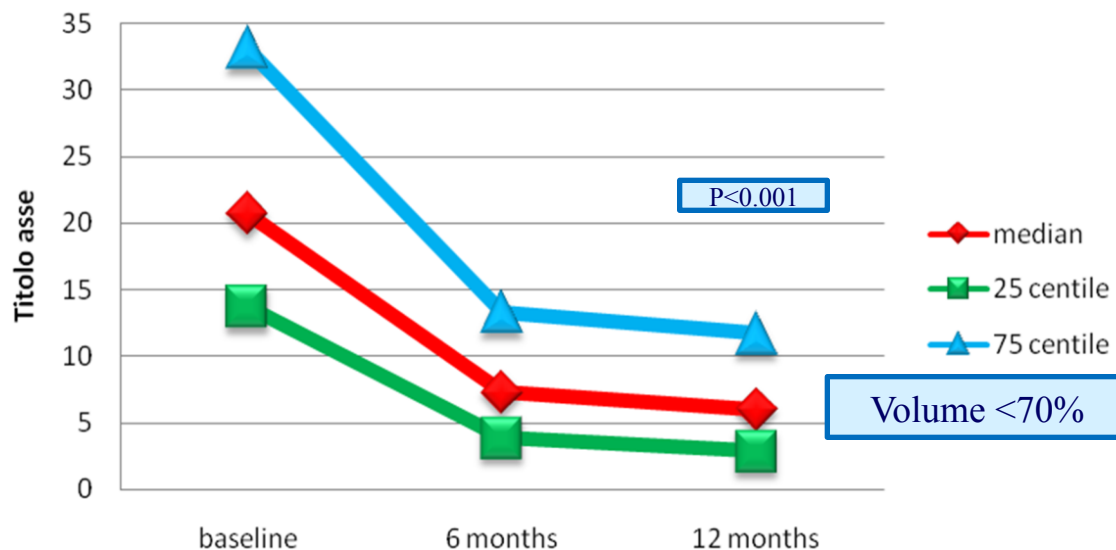
EJE 2018 in Press

## STUDY OBJECTIVES

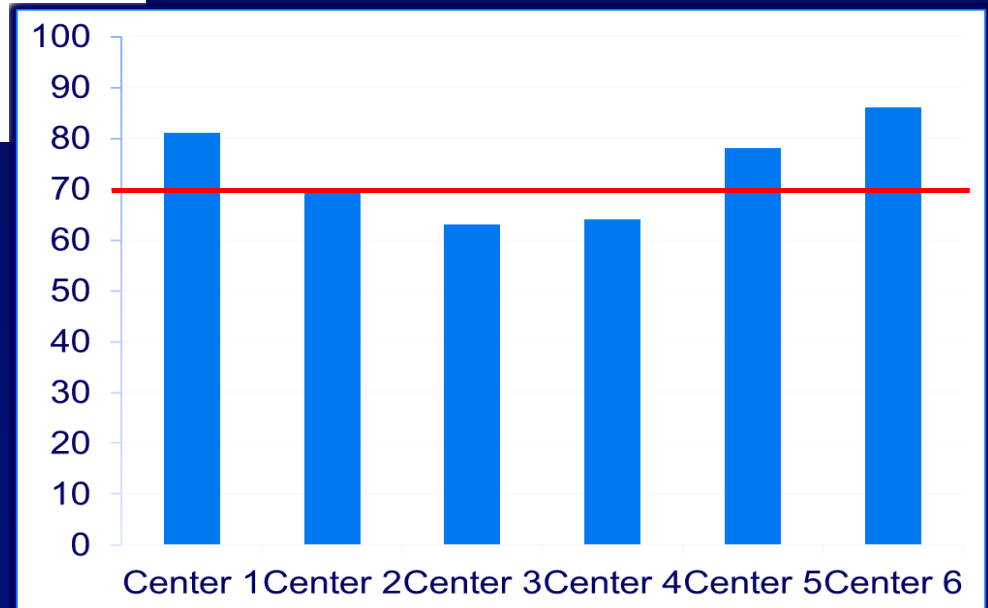
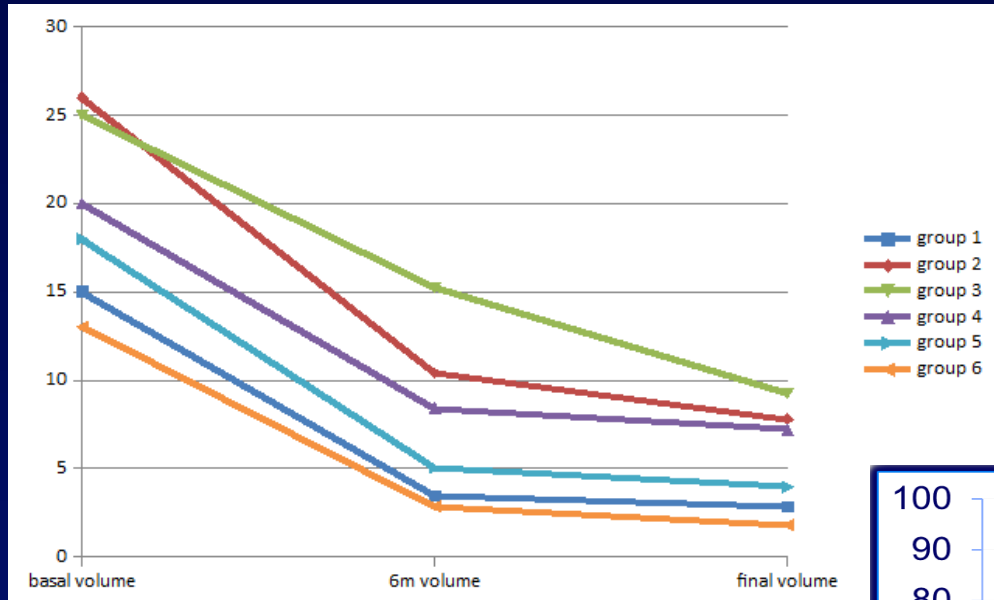
1. Assessment of nodules' reduction after one session of RF thermal ablation of benign solid thyroid nodule consecutively treated from 2014 to 2016 in different centers in Italy with different experience in moving-shot technique
2. Correlation between nodule shrinkage after RF and basal echostructure, nodule vascularity and presence of macrocalcification (escluded Egg-shell types)
3. Correlation between nodule shrinkage after RF and basal volume

Number of patients	337
Female (%)	76
Age (years) [IQR]	55 [40-73]
TSH (mIU/l) [IQR]	1,2 [0,5-2]
FT4 (pg/ml) [IQR]	1 [0,8-1,3]
AbTPO + (%)	24
Baseline volume [IQR]	20,7 [13,7-33,1]
Energy (Watt)	55 [50-62]
Time (min)	10 [7-15]

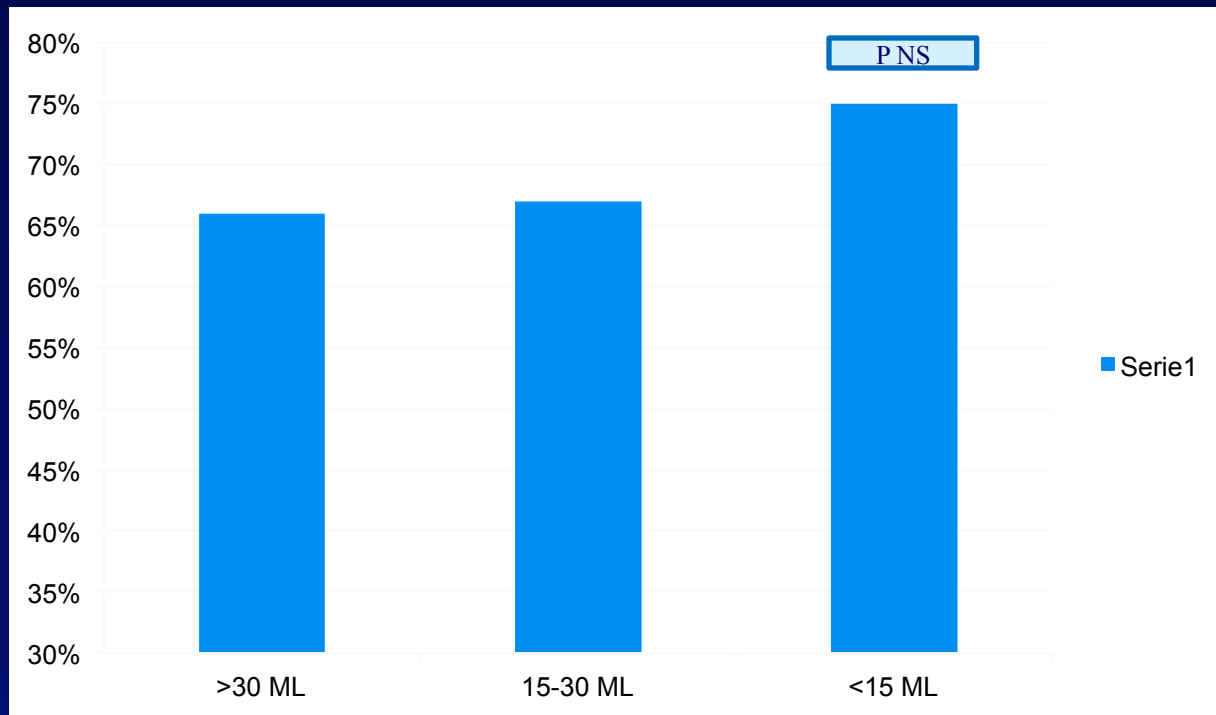
### Nodule volume by time



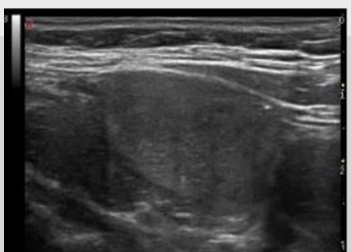
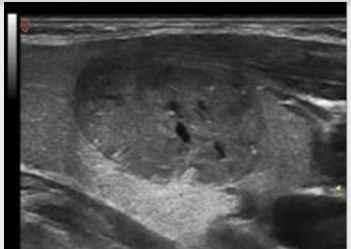
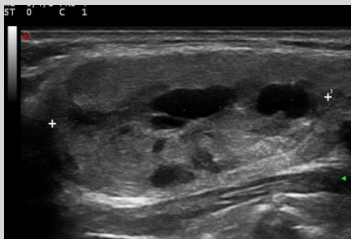
# RESULTS IN DIFFERENT CENTERS



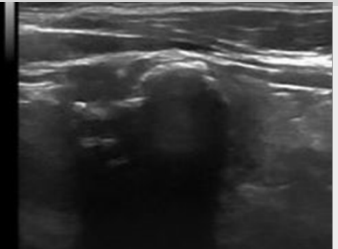
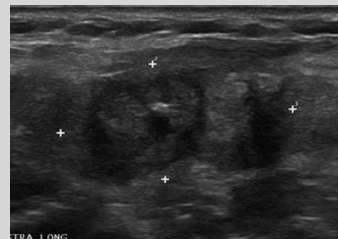
# NODULES' REDUCTION and BASAL VOLUME



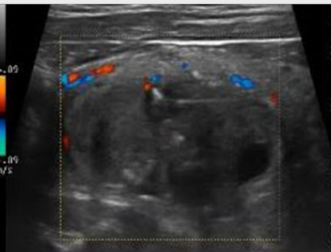
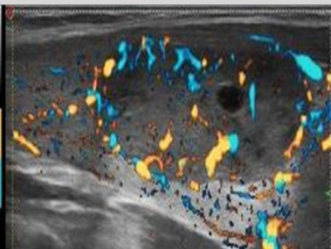
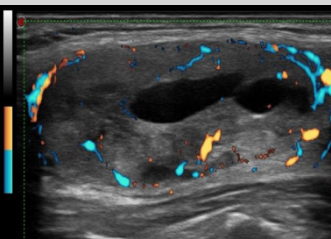
### US echostructure



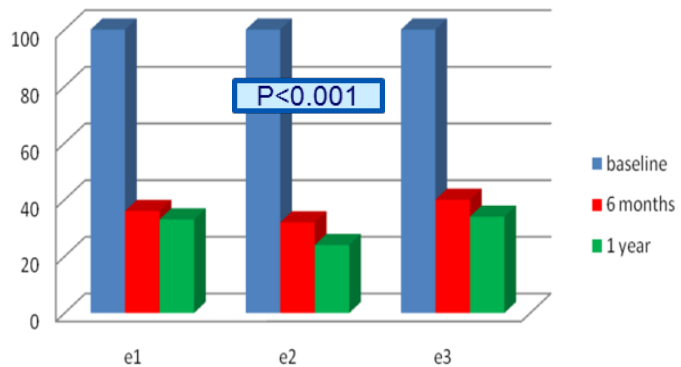
### Macrocalcifications



### US vascular pattern

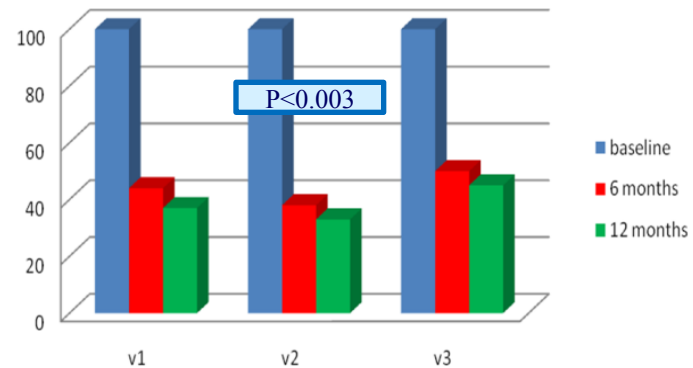


### Nodule shrinkage by US structure



PNS

### Nodule shrinkage by US vascular pattern



# COMPLICATIONS

DEGREE	TYPE	number	Recovery time (day)	%
Major	Voice change	1	3-7	0,4
	Nodule infection	1	30	
Minor	Edema	20	0,2	15
	Superficial ematoma	25	7	
	Muscle ematoma	7	14	
Side effects	Pain	42	Intraoperatively	13
	Cough	1	Intraoperatively	
	Fever	2	1 day	
<b>Permanent</b>	<b>complications</b>			0

## Summary of Published Data on Complications of RF Ablation in Patients with Benign Thyroid Nodules

Study	No. of Patients	Hematoma	Skin Burn	Pain	Transient Hyperthyroidism	Hypothyroidism	Edema	Fever	Voice Change
Kim et al (9), 2006	30	1	1	1	3	...	...	...	1
Jeong et al (8), 2008	236	5	...	13	3	...	...	...	3
Deandrea et al (20), 2008*	31	...	...	Few	...	...	3	...	...
Spiezia et al (19), 2009*	94	...	...	13	...	...	...	5	...
Baek et al (7), 2009*	9	...	...	...	...	1	...	...	...
Baek et al (10), 2010	15	...	...	...	...	...	...	...	...
Lee et al (11), 2010	27	1	...	...	...	...	...	...	...
<b>Total</b>	<b>442</b>	<b>7</b>	<b>1</b>	<b>27+Few</b>	<b>6</b>	<b>1</b>	<b>3</b>	<b>5</b>	<b>4</b>

\* Including autonomously functioning thyroid nodules.

**Table 2. Complications and Side Effects in 1531 Patients Who Underwent LA of Thyroid Nodules**

Type of complications (SIR class) <sup>1</sup>			Complications and Side effects no. (%) <sup>2</sup>				
			Time of Detection				Time to Recovery (days)
			Intra-operatively	Immediate post-operative (within 24 h)	Peri-procedural (within 30 days)	Delayed (after 30 days)	
<b>Major</b>	Voice change	(C)		8 (0.5)*		2-84	
<b>Minor</b>	Hematoma	(B)		8 (0.4)		2-10	
	Skin burn	(B)		1 (0.1)		10	
<b>Side Effects</b>							
	Pain	(A)					
	mild		194 (10.6)	61 (3.3)		1	
	moderate		30 (1.6)	34 (1.9)		1-2	
	severe			4 (0.2)		2-3	
	Vascular reaction	(A)	12 (0.7)				
	Cough	(A)	1 (0.1)				
	Fever (37.5 C-38.5 C)	(A)		141 (7.7)		1-4	

<sup>1</sup> Society of Interventional Radiology (SIR) guidelines criteria(24); <sup>2</sup> value calculated per LA sessions; \* detected in nodules with large volume >30 ml



# Efficacy and Safety of Radiofrequency Ablation for Benign Thyroid Nodules: A Prospective Multicenter Study

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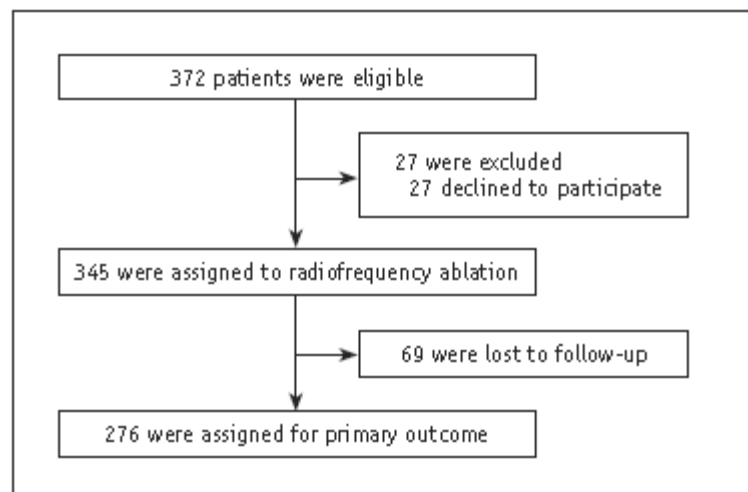


Fig. 1. Enrollment of study patients.

Table 1. Demographic Characteristics of Enrolled Patients

Characteristic	RFA (n = 345)
Gender (male:female)	43:302
Age (years)	46.0 ± 12.7 (15–79)
Nodule diameter (cm)	3.8 ± 1.1 (1.9–8.0)
Nodule volume (mL)	14.2 ± 13.2 (1.1–80.8)
Symptom score	2.5 ± 1.8 (0–8)
Cosmetic score	3.7 ± 0.6 (2–4)
Vascularity	2.0 ± 0.8 (0–3)

Values represent mean ± SD; numbers in parenthesis represent range. RFA = radiofrequency ablation

**Table 3. Outcomes for 276 Benign Thyroid Nodules after RFA**

Variables	Before	1 Month	12 Months	<i>P</i> *
Largest diameter	3.8 ± 1.1	3.0 ± 1.0	2.0 ± 1.0	< 0.001
Volume	14.2 ± 13.2	8.1 ± 8.8	3.2 ± 4.7	< 0.001
Volume reduction rate (%)		44.4 ± 17.0	80.3 ± 13.7	
Symptom score	2.5 ± 1.8	1.3 ± 1.2	0.4 ± 0.6	< 0.001
Cosmetic score	3.7 ± 0.6	2.9 ± 0.9	1.9 ± 0.9	< 0.001
Vascularity	2.0 ± 0.8	0.6 ± 0.8	0.6 ± 0.9	< 0.001
Therapeutic success (%) <sup>†</sup>	-	-	270/276 (97.8)	

Values represent means ± SD except for therapeutic success. \*Comparison of values before treatment and at 12 months, <sup>†</sup>Therapeutic success (volume reduction > 50%)

**Table 4. Multiple Linear Regression Analysis of Factors Independently Predictive of Volume Reduction**

Variable	Coefficient (β)	Standard Error*	<i>P</i>
Age	0.07	0.06	0.451
Gender	1.856	2.416	0.343
Number of treatment sessions	1.361	1.89	0.367
Initial solidity	6.903	1.193	< 0.001
Delivered energy <sup>†</sup>	0.001	< 0.001	0.01
Initial volume	-0.067	0.039	0.089
Initial vascularity	-0.398	1.021	0.597

\*Standard error of estimated coefficient, <sup>†</sup>Mean energy delivered per mL pretreatment nodule volume.

**Table 5. Complications and Side Effects**

Complications	Number of complications (%)	Time of detection (days)	Time to recovery (days)
Major complications (n = 3)			
Transient voice change	2 (0.7)	1	1
Hyperthyroidism*	1 (0.4)	30	-
Minor complications (n = 11)			
Hematoma	10 (3.6)	1	2
Skin burn (first degree)	1 (0.4)	1	7
Side effects (n = 13)			
Edema	10 (3.6)	1	2
Coughing	2 (0.7)	1	1
Nausea/vomiting	1 (0.4)	1	1
Total	27	1-30	1-7

**In conclusion,** RF ablation performed by trained radiologists from multiple institutions using a unified protocol and similar devices was effective and safe for treating benign thyroid nodules.

# LONG TERM RESULTS

Eur Radiol

DOI 10.1007/s00330-012-2671-3

HEAD AND NECK

## Radiofrequency ablation of benign non-functioning thyroid nodules: 4-year follow-up results for 111 patients

Hyun Kyung Lim · Jeong Hyun Lee · Eun Ju Ha ·  
Jin Young Sung · Jae Kyun Kim · Jung Hwan Baek

*Results* The mean follow-up duration was  $49.4 \pm 13.6$  months. Thyroid nodule volume decreased significantly, from  $9.8 \pm 8.5$  ml before ablation to  $0.9 \pm 3.3$  ml ( $P < 0.001$ ) at final evaluation: a mean volume reduction of  $93.4 \pm 11.7$  %. The mean cosmetic ( $P < 0.001$ ) and symptom scores ( $P < 0.001$ ) improved significantly. Factors related to efficacy were initial solidity and volume. The overall recurrence rate was 5.6 % (7/126). The overall complication rate was 3.6 % (4/111).

126 benign cold nodules

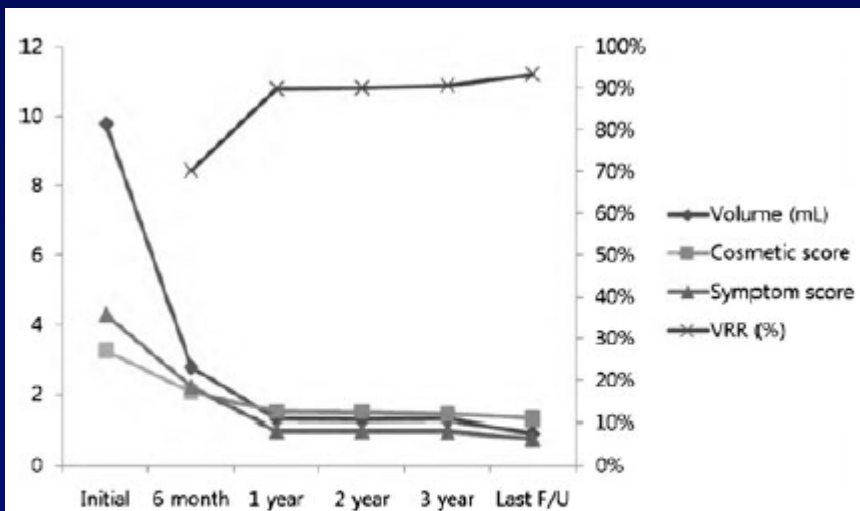
Volume <10ml (min diameter >20mm)

Recurrence 5.6%

Complications 3.6%

## Radiofrequency ablation of benign non-functioning thyroid nodules: 4-year follow-up results for 111 patients

Hyun Kyung Lim · Jeong Hyun Lee · Eun Ju Ha ·  
Jin Young Sung · Jae Kyun Kim · Jung Hwan Baek



**Fig. 1** Changes of thyroid nodule volume, cosmetic score, symptom score and volume reduction ratio (*VRR*) before RF ablation and at each follow-up

	1 year	2 years	3 years
Total	89.9±10.2	90.1±10.1	90.7±15.8
<i>P</i> value	> 0.999	< 0.001	< 0.001
Solidity ≤ 50 %	93.6±8.8	93.1±8.9	92.0±20.3
Solidity > 50 %	87.8±10.4	88.4±10.4	90.0±13.0
<i>P</i> value	0.003	0.021	0.002

**Table 1** Baseline characteristics of initial thyroid nodules, and patients' initial cosmetic and symptom scores

Characteristics	
Largest diameter (cm)	3.3±1.0 (2–6)
Volume (ml)	9.8±8.5 (2–43)
Volume ≤10 ml	81
Volume > 10 ml to ≤20 ml	28
Volume >20 ml	17
Proportion of solid component (%)	65.1±32.9 (5–100)
Solidity ≤50 %	45
Solidity > 50 %	81
Vascularity	1.7±0.7 (1–4)
Cosmetic score	3.2±0.8 (1–4)
Symptom score	4.3±1.6 (0–10)

Values are presented as mean ± SD (range) or number of nodules

**Table 4** Number of sessions and last VRR according to initial nodule volume

Initial nodule volume	0–10 ml (n=81)	10–20 ml (n=28)	> 20 ml (n=17)
Number of session	1.7±0.9	2.8±1.7	3.8±1.5
P value	0.001	0.023	
Last VRR (%)	94.5±9.6	93.6±9.7	88.2±20.4
P value	0.928	0.297	

Values are presented as mean ± SD (%)



# 41st Annual Meeting of the European Thyroid Association

**P2-04-112**

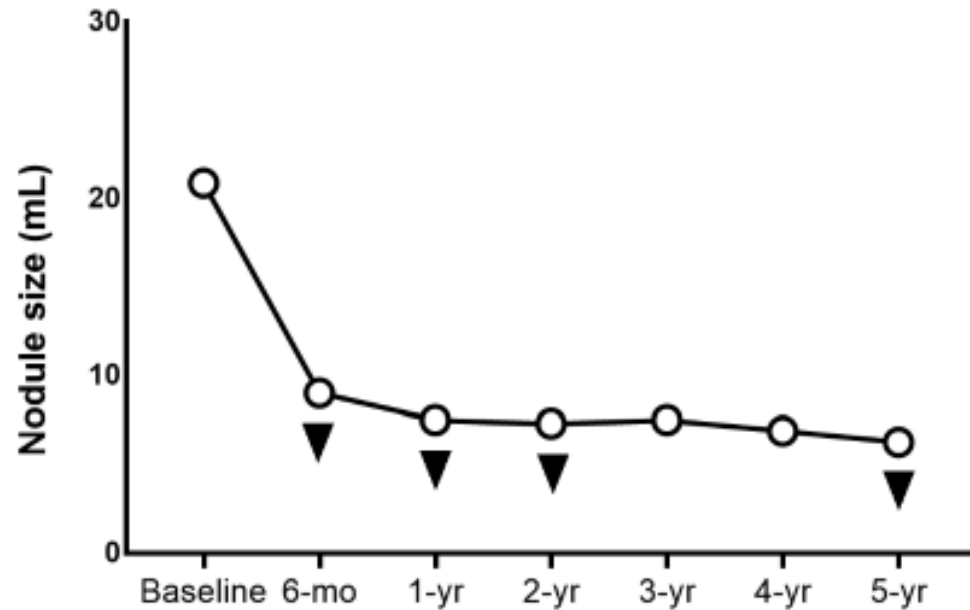
## **LONG-TERM EFFICACY OF RADIOFREQUENCY THERMAL ABLATION OF BENIGN THYROID NODULES: 5 YEAR RESULTS AFTER A SINGLE TREATMENT**

Table 1. Baseline features of thyroid nodules included in the study.

Nodules volume (mL), median (range)	20.9 (15-33)
Nodules with median volume < 10 mL, n	14
Nodules with median volume 10 - 20 mL, n	82
Nodules with median volume > 20mL, n	119
Compressive symptoms score (da 0 a 10), median	5
Cosmetic score (da 1 a 4), median	3
Time of follow-up after RFA (months), median	35

Legend – Compressive and cosmetic scoring evaluation is described in the text.

## Trend of nodules' size after RFA

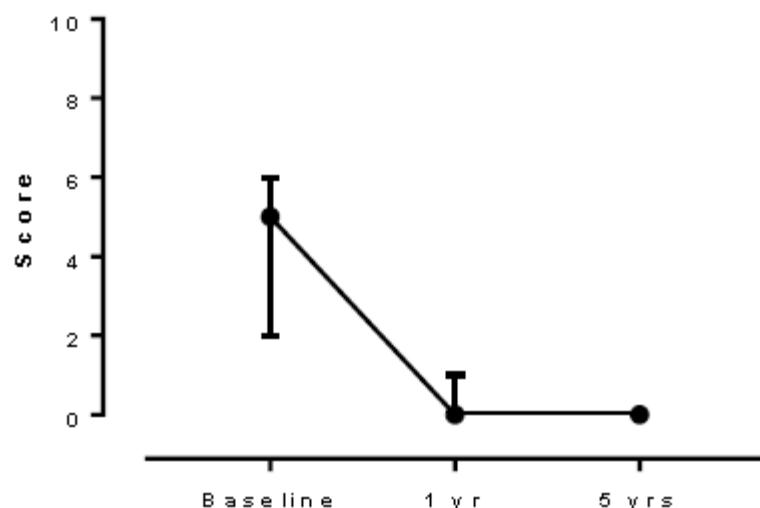


Number of values	215	206	197	154	117	84	71
Minimum	3.5	0.4	0.4	0.3	0	0	0.5
25% Percentile	15	5.5	4.5	3.9	3.25	3.1	4.1
Median	20.9	9	7.5	7.3	7.5	6.9	6.3
75% Percentile	33.2	15.55	13.9	13.63	13.35	12.78	11.8
Maximum	310	161	242	214	96	93.7	113

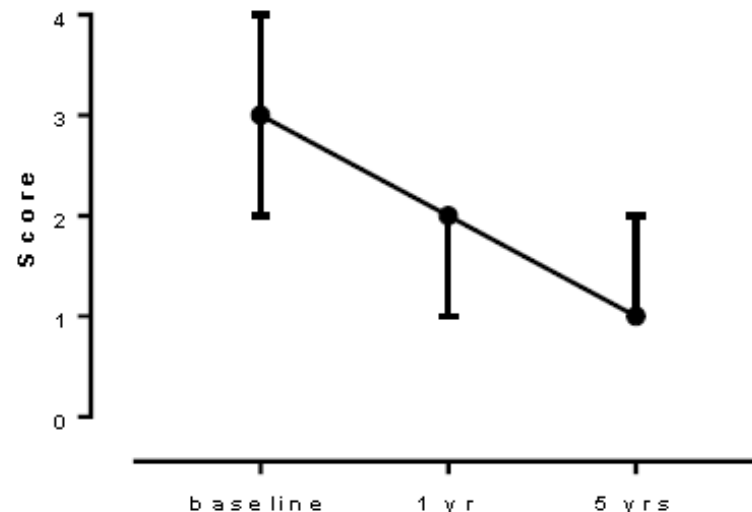
**Figure 1.** Volumetric trend of thyroid nodules after RFA.



### Compressive symptoms



### Cosmetic concerns

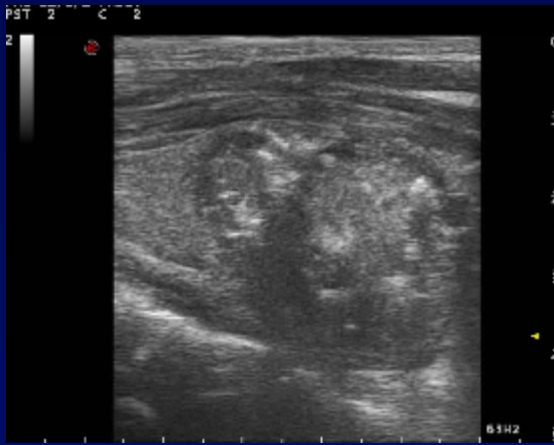


**Table 2. Percentage of volume reduction recorded in all nodules and according to their baseline size.**

	6 months	1 year	2 years	3 years	4 years	5 years
All nodules	56.2%	63%	67.4%	66.7%	66.9%	66.9%
< 10 mL	79%	78%	76.8%	76.8%	75%	81.8%
> 10 and <20 mL	59%	66.7%	74.2%	74.2%	70%	74.5%
> 20 mL	54.5%	60.9%	62.4%	62.4%	62%	65.3%

Legend – The rate of reduction was calculated with respect to the baseline volume. All percentages are expressed as median value.

# Results: volume reduction



Baseline 20,5 ml



After 1 year 8,7 ml



After 5 years 6,9 ml

# STATEMENT

## AACE/ACE/AME Guidelines

**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***

Percutaneous radiofrequency thermal ablation (RFA) is currently considered an effective tool for the management of benign thyroid nodules

### *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].

## CONCLUSIONS

Scientific data confirm the overall efficacy of RF ablation for treating compressive benign thyroid nodules

Therapeutic efficacy is maintained during follow-up

Some US-findings easily detectable before treatment can predict final shrinkage

RF ablation can be considered a safe and effective alternative to surgery for the treatment of compressive benign thyroid nodules

# Acknowledgements



**Thanks for your attention**

