



Roma, 8-11 novembre 2018

Noduli tiroidei



ITALIAN CHAPTER



Le terapie mini-invasive: *limiti e complicanze*

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

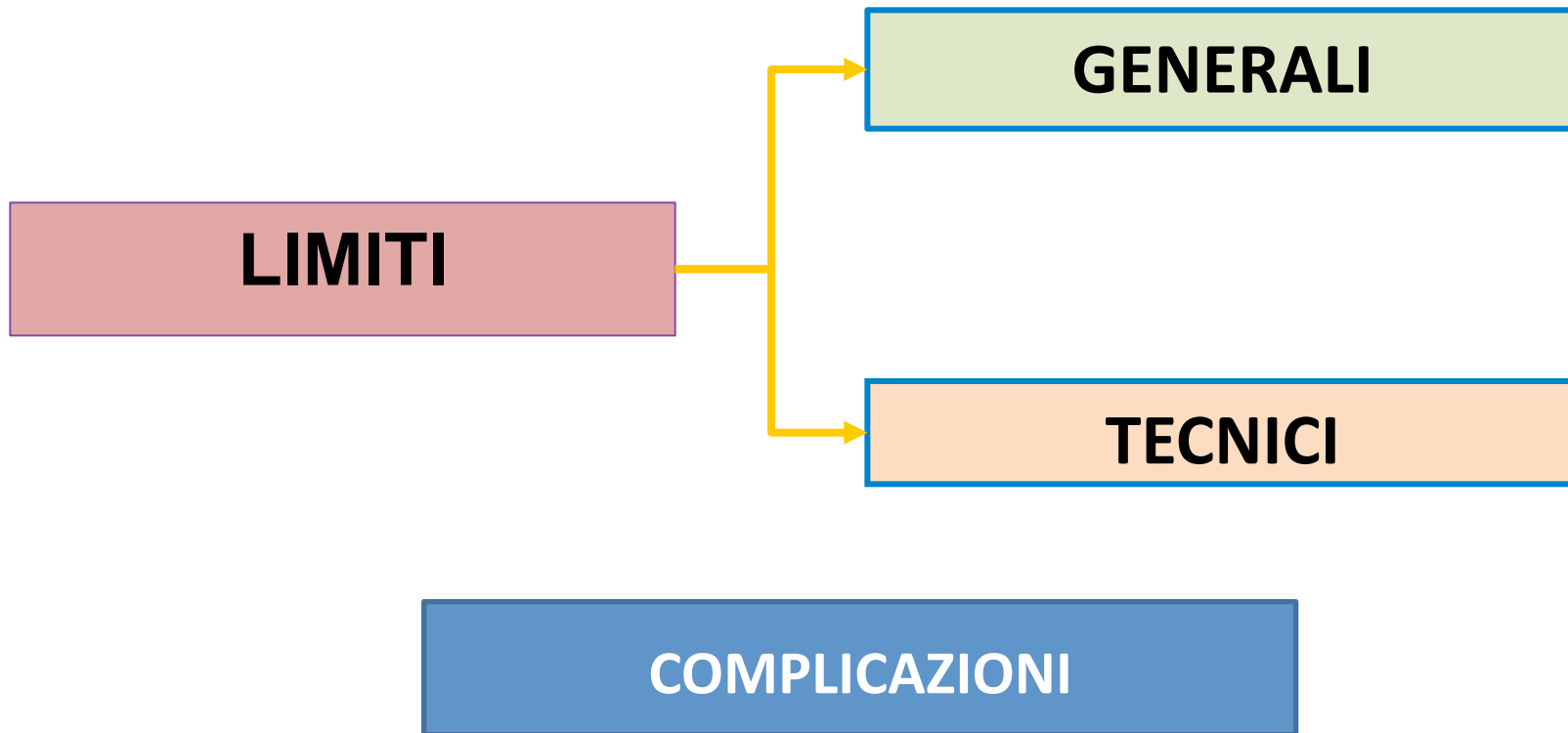


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Noduli tiroidei: trattamenti mininvasivi



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Noduli tiroidei: trattamenti mininvasivi



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Limiti (generali)

Necessità di accurata valutazione citologica (trattamento limitato ai nodi citologicamente benigni – TIR2)

Persistenza della lesione nodulare

Necessità di follow-up ecografico

Possibilità di ricrescita (*ma anche di ri-trattamento*)

Necessità di operatori esperti

Risoluzione dell'iperfunzione in < 50% dei nodi tossici

Difficoltà interpretative di successivi campioni citologici

Complicanze rare ma talora anche severe



Limiti (tecnici)

Possibilità di trattare solo nodi ben visibili con US (no retrosternali)

Plurimi trattamenti per nodi molto voluminosi (aumento dei costi, e del disagio per il paziente)

Volume del nodo (shrinkage inversamente proporzionale)

Macrocalcificazioni?

Vascularizzazione?

Struttura del nodo



Limiti

Necessità di accurata valutazione citologica (trattamento limitato ai nodi citologicamente benigni – TIR2)

215 nodi citologicamente TIR2 sottoposti a FU fino a 5 anni
A causa di una ricrescita dopo singolo trattamento, sei sono stati sottoposti ad exeresi chirurgica

Esame istologico ha confermato benignità in tutti i casi



Limiti

Necessità di accurata valutazione citologica (trattamento limitato ai nodi citologicamente benigni – TIR2)

6 nodi TIR3

A causa di ricrescita 6 sono stati sottoposti a rivalutazione citologica e ad intervento >>> 2 carcinomi follicolari



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Noduli tiroidei: trattamenti mininvasivi



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Limiti

Persistenza della lesione nodulare

Necessità di follow-up ecografico

Possibilità di ricrescita (ma anche di ri-trattamento)

Ricrescita nel 3-10% dei casi



Noduli tiroidei: trattamenti mininvasivi



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TABLE 2. CHARACTERISTICS OF 11/122 PATIENTS TREATED WITH PERCUTANEOUS LASER ABLATION WHO HAD AN INCREASE IN NODULE VOLUME ABOVE INITIAL VALUES DURING A 3-YEAR FOLLOW-UP

<i>Patient no.</i>	<i>Structure solid/spongiform</i>	<i>Time 0 volume (mL)</i>	<i>1 year, mL (% change)</i>	<i>2 years, mL (% change)</i>	<i>3 years, mL (% change)</i>
1	Solid	2.8	3.0 (+7.1)	3.0 (+7.1)	3.6 (+28.6)
2	Solid	5.2	4.0 (-23.1)	3.9 (-25.0)	7.5 (+44.2)
3	Solid	7.8	3.0 (-61.5)	4.8 (-38.5)	8.3 (+6.4)
4	Solid	8.1	4.8 (-40.7)	—	8.8 (+8.6)
5	Spongiform	9.1	8.2 (-9.9)	8.0 (-12.1)	11.8 (+29.7)
6	Solid	9.9	9.1 (-8.1)	8.9 (-10.1)	12.2 (+23.2)
7	Solid	15.3	11.0 (-28.1)	15.6 (+2.0)	28.2 (+84.3)
8	Solid	21.0	19.8 (-5.7)	20.0 (-4.8)	33.2 (+58.1)
9	Solid	24.0	14.7 (-38.8)	18.2 (-24.2)	36.6 (+52.5)
10	Spongiform	27.9	26.4 (-5.4)	26.0 (-6.8)	34.6 (+24.0)
11	Spongiform	44.0	40.0 (-9.1)	39.0 (-11.4)	45.6 (+3.6)



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Noduli tiroidei: trattamenti mininvasivi



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Limiti

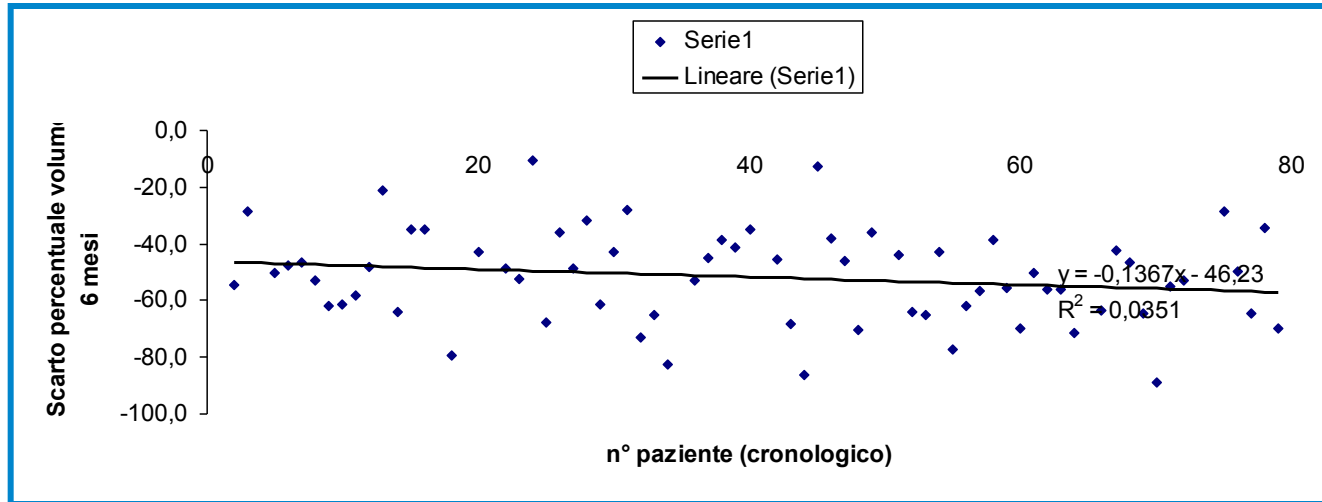
Necessità di operatori esperti



Noduli tiroidei: trattamenti mininvasivi



Personal series of RFA using “Moving-shot” technique (first 73 treated nodules)





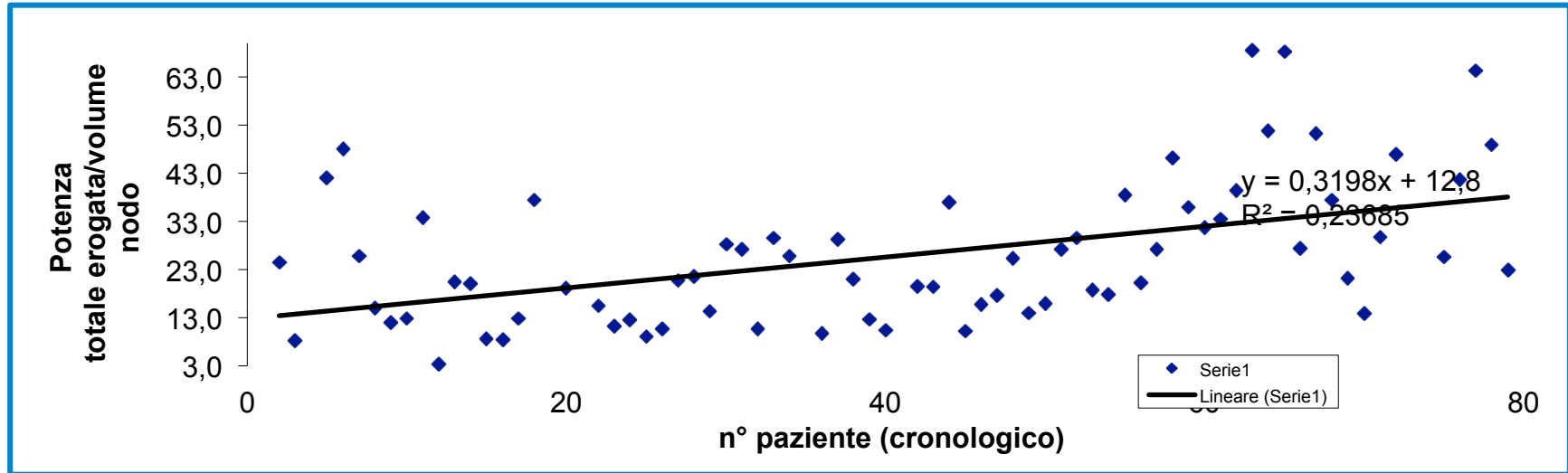
Noduli tiroidei: trattamenti mininvasivi



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Power delivered (watts/ml) and experience





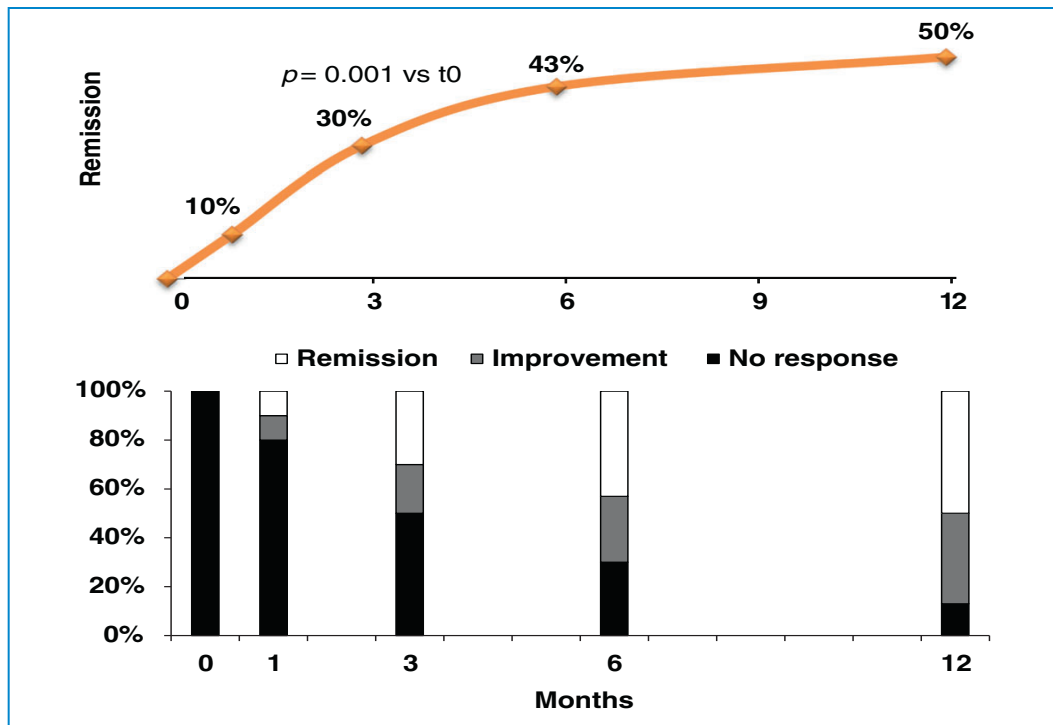
Noduli tiroidei: trattamenti mininvasivi



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Risoluzione dell'iperfunzione nel 50% dei nodi tossici



RFA

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

Stella Bernardi^{1,2}, Fulvio Stacul¹, Andrea Michelli¹, Fabiola Giudici¹, Giulia Zuolo³, Nicolò de Manzini^{1,4}, Chiara Dobrinja⁴, Fabrizio Zanconati^{1,5}, Bruno Fabris^{1,2}



Noduli tiroidei: trattamenti mininvasivi

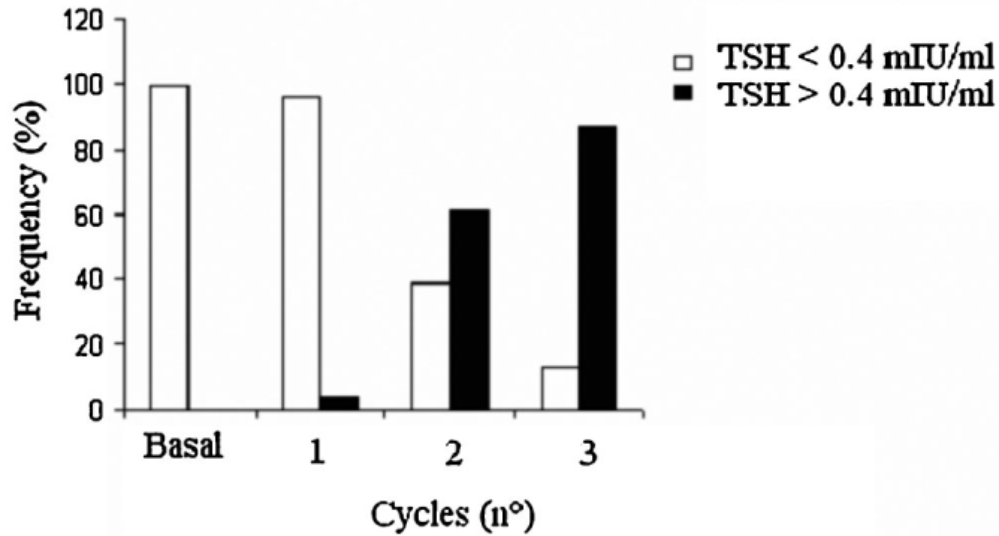


Fig. 2. Frequencies of patients with hyper-functioning nodules showing suppressed serum levels of TSH before and after 1, 2, and 3 cycles of ILP.

LTA



Noduli tiroidei: trattamenti mininvasivi



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[151] Chung SR, Suh CH, Baek JH, Park HS, Choi YJ, Lee JH. Safety of radiofrequency ablation of benign thyroid nodules and recurrent thyroid cancers: a systematic review and meta-analysis. *Int J Hyperthermia*. 2017;33(8):920-930.

Difficoltà interpretative di successivi esami citologici?



Noduli tiroidei: trattamenti mininvasivi



ITALIAN CHAPTER

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[151] Chung SR, Suh CH, Baek JH, Park HS, Choi YJ, Lee JH. Safety of radiofrequency ablation of benign thyroid nodules and recurrent thyroid cancers: a systematic review and meta-analysis. *Int J Hyperthermia*. 2017;33(8):920-930.

CLINICAL REVIEW

WILEY

**Image-guided chemical and thermal ablations for thyroid disease:
Review of efficacy and complications**

The impact of image-guided ablation of thyroid nodules on subsequent cytological and histological analysis is unclear. In 2000, Monzani et al¹⁷² reported on 13 patients who underwent surgery after percutaneous ethanol. They found that histological analysis was not impeded by previous treatment. Song et al¹⁷³ reported the cytological findings after percutaneous ethanol and found that a necrotic background to the samples was seen with multinucleated giant cells. Schrut et al¹⁷⁴ studied 39 patients who had undergone percutaneous ethanol for toxic nodules. They demonstrated an increase in nondiagnostic cytology specimens from 3% pretreatment to 19% posttreatment. They, therefore, recommend caution in interpreting cytology results after percutaneous ethanol.¹⁷⁴ A number of groups have shown that laser ablation results in hemorrhage and fibrosis on histological analysis of excised specimens but the collateral damage is minimal.^{11,12,175}



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Noduli tiroidei: trattamenti mininvasivi



ITALIAN CHAPTER



Limiti (*tecnici*)

Possibilità di trattare solo nodi ben visibili ad US (no retrosternali)

Plurimi trattamenti per nodi molto voluminosi (aumento dei costi e dei disagi per il paziente)

Volume del nodo (shrinkage inversamente proporzionale)

Macrocalcificazioni?

Vascularizzazione?

Struttura del nodo?



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

1 to 6 (1.4) sessions

Table 1 The changes in volume b...

	Initial	1 month later	3 months later	6 months later	Last follow-up
No. of nodules	302	247	155	140	302
Volume (ml) ^a	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) ^a	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

^aMean ±standard deviation in parentheses



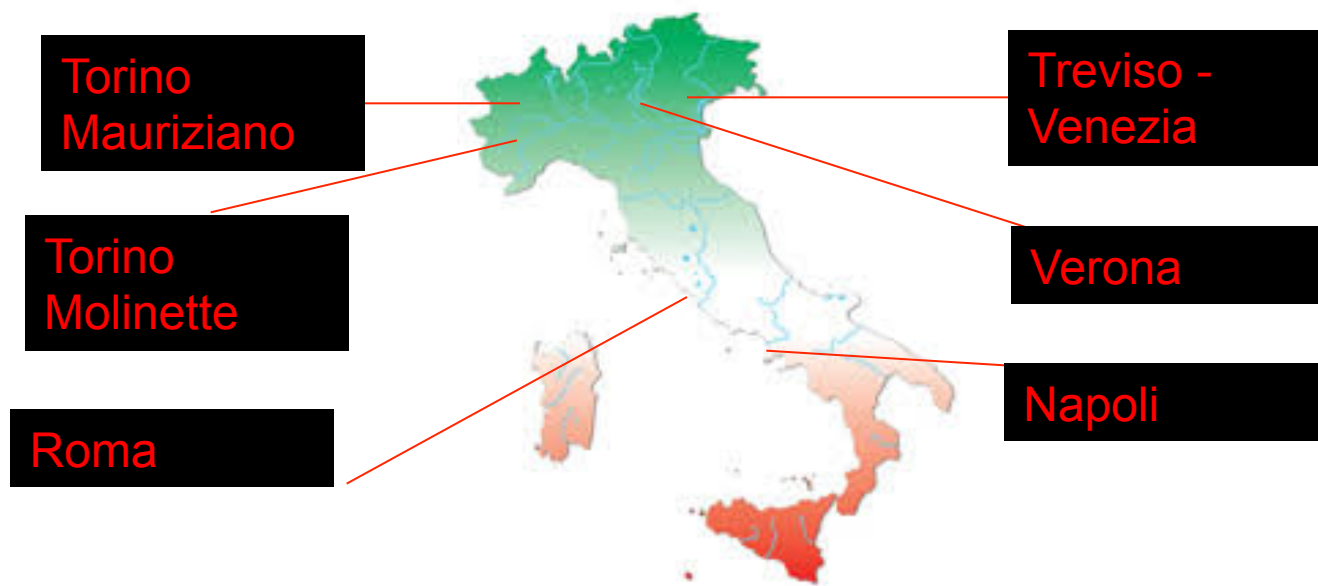
Noduli tiroidei: trattamenti mininvasivi



ITALIAN CHAPTER

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RADIOFREQUENCY THERMAL ABLATION FOR BENIGN THYROID NODULES: RESULTS FROM AN ITALIAN MULTICENTER STUDY (*EJE, in press*)





Noduli tiroidei: trattamenti mininvasivi



ITALIAN CHAPTER

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Risposta in base a pattern US

	Volume prima (mediana)	Volume 6 mesi (mediana)	Volume 12 mesi (mediana)	p
E1 (poche aree cistiche di medie dimensioni)	21 ml	7,5 ml	6,6 ml (-69%)	
E2 (multiple aree microcistiche < 2 mm)	19,9 ml	6,2 ml	4,9 ml (-76%)**	**0.01
E3 (solido, non aree cistiche)	22,1 ml	8 ml	6,9 ml (-68%)	





Noduli tiroidei: trattamenti mininvasivi



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Risposta in base pattern vascolare

	Volume prima (mediana)	Volume 6 mesi (mediana)	Volume 12 mesi (mediana)	p
V1 (perinodulare intensa)	21,9 ml	7,9 ml	7,2 ml (-68,8%)	
V2 (peri- ed intranodulare)	18,9 ml	6,2 ml	5,5 ml (-71%)**	**<0.03
V3 (perinodulare debole)	20,1 ml	8,7 ml	6,5 ml (-67,9%)	





Noduli tiroidei: trattamenti mininvasivi



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Risposta in base a presenza di macrocalcificazioni

	Volume prima (mediana)	Volume 6 mesi (mediana)	Volume 12 mesi (mediana)	p
M1 (intranodulari)	23 ml	8,5 ml	6,5 ml (-71,5%)	**NS
M2 (perinodulari/ egg shell)	20 ml	6,9 ml	6 ml (-70%)	
M3 (intra- e perinodulari)	24,8 ml	9,5 ml	8,2 ml (-69,8%)	





Noduli tiroidei: trattamenti mininvasivi



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	Delivered energy (Joule/vol)	Volume before (median)	Volume 6 months (median)	Volume 12 months (median)	p
Whole group (337 nodules)	2180 J/ml	20,7 ml	7,3 ml (-63.5%)	6 ml (-70%)	<0.001
Volume < 15 ml (103 nodules)	2940 J/ml	11,2 ml	3,2 ml	2,5 ml (-76.7%)**	** <0.001
Volume 15-30 ml (129 nodules)	2200 J/ml	20,7 ml	7,5 ml	6,5 ml (-67.3%)	
Volume > 30 ml (105 nodules)	1200 J/ml	41 ml	16,6 ml	15 ml (-66.7%)	



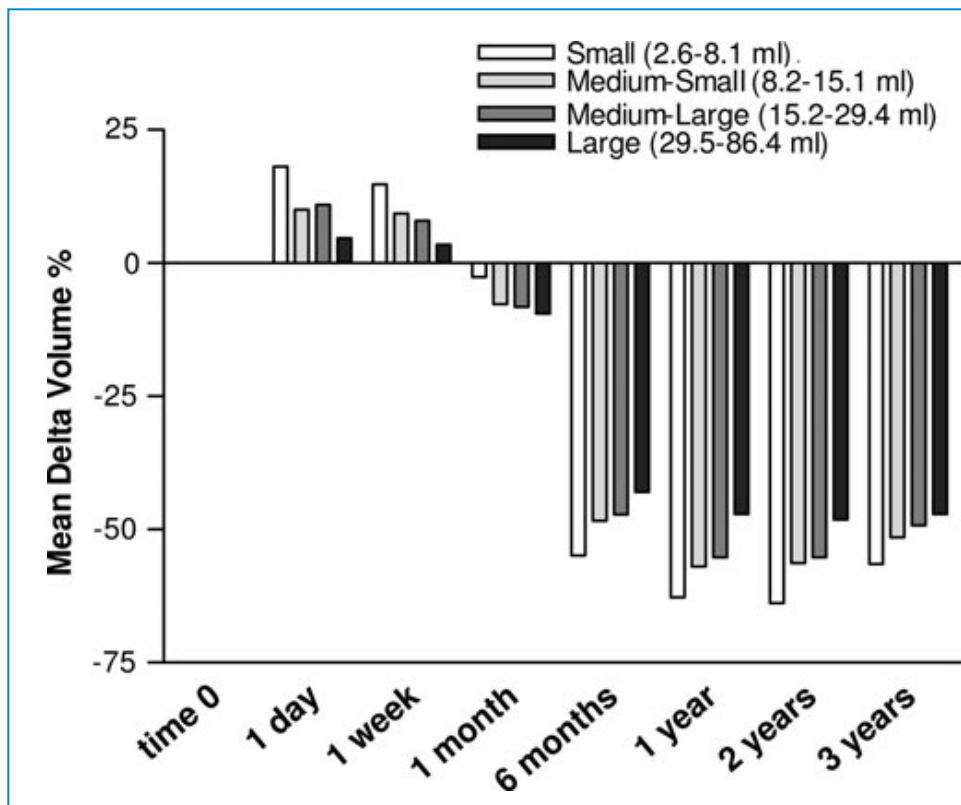


Noduli tiroidei: trattamenti mininvasivi



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Percutaneous Laser Ablation of Cold Benign Thyroid Nodules: A 3-Year Follow-Up Study in 122 Patients
Roberto Valcavi¹, Fabrizio Riganti¹, Angelo Bertani¹, Debora Formisano² and Claudio M. Pacella³



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Noduli tiroidei: trattamenti mininvasivi



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COMPLICAZIONI



Noduli tiroidei: trattamenti mininvasivi



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List of complications	SIR class	Total (n = 875)		Benign thyroid nodules (n = 746)		Recurrent thyroid cancers (n = 129)		P-value
		n	%	n	%	n	%	
		Major complications ^a		14	1.6	7	0.9	
Voice change >1 month	C	6	0.7	5	0.7	1	0.8	>0.999
Permanent voice change	E	3	0.3	0	0	3	2.3	0.003
Nodule rupture requiring drainage	C	1	0.1	1	0.1	0	0	>0.999
Horner syndrome	E	1	0.1	1	0.1	0	0	>0.999
Spinal accessory nerve injury	C	3	0.3	0	0	3	2.3	0.003

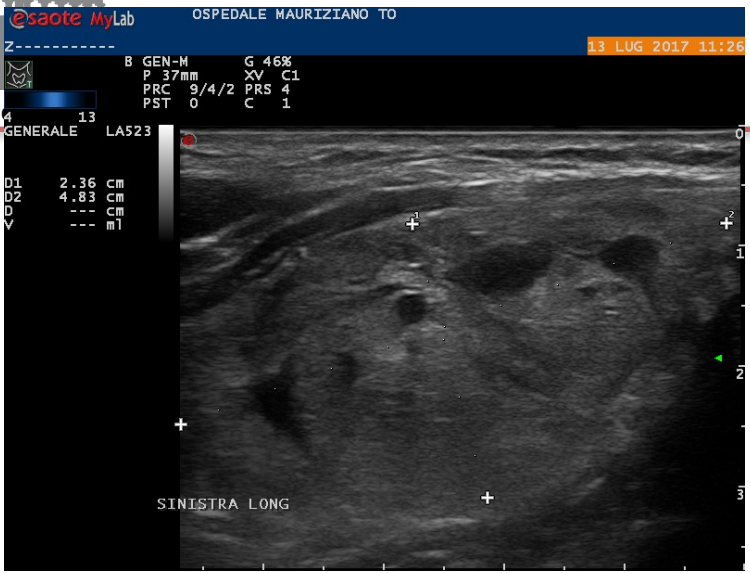
Complications encountered in ultrasonography-guided radiofrequency ablation of benign thyroid nodules and recurrent thyroid cancers

Cherry Kim^{1,2} · Jeong Hyun Lee¹ · Young Jun Choi¹ · Won Bae Kim³ · Tae Yon Sung⁴ · Jung Hwan Baek¹



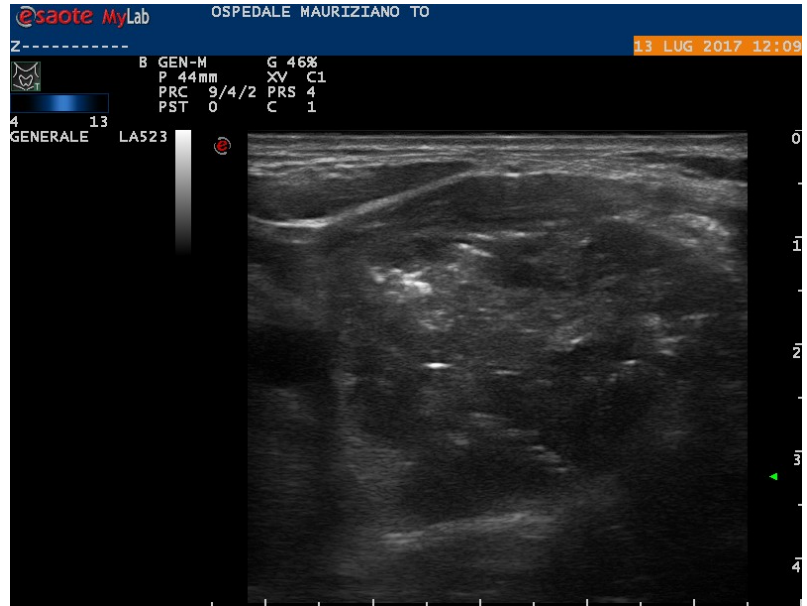
ITALIAN CHAPTER

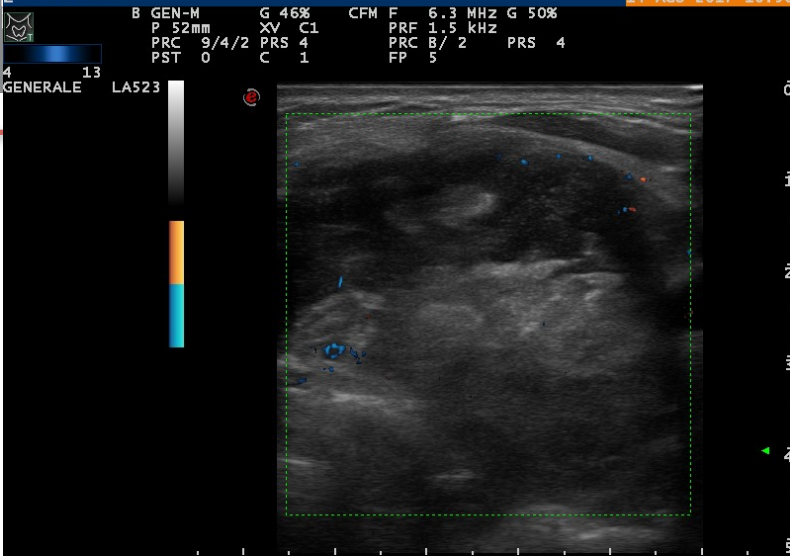
Roma, 8-11 m



Marta, 36 aa, architetto,
con nodo tiroideo sinistro
compressivo in crescita
(volume 23 ml)

Immagine del nodo a fine
trattamento (acquisizione
dietro al capo della
paziente)



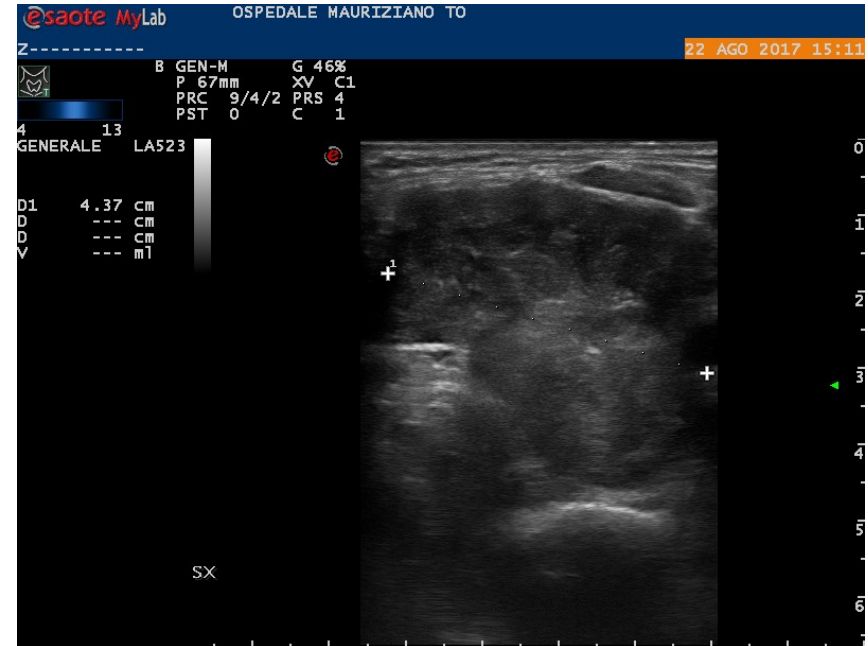


Dopo 4 settimane

Poco sintomatica -> steroide
 (acquisizione di fronte al
 paziente)

Dopo 5 settimane

Sintomatica -> steroide +
 antibiotico per 30 gg
 (acquisizione di fronte al
 paziente)

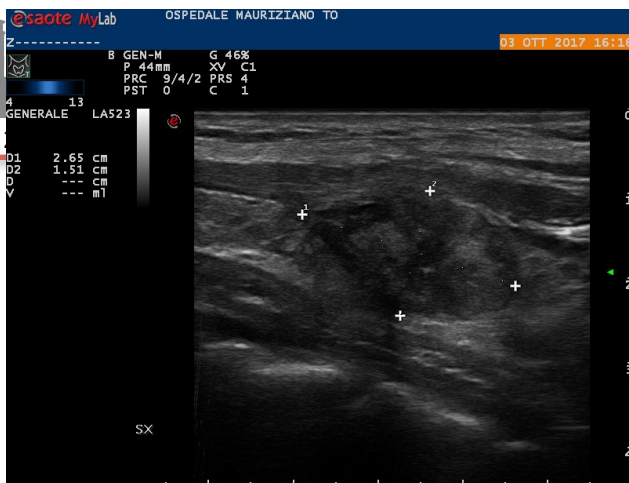




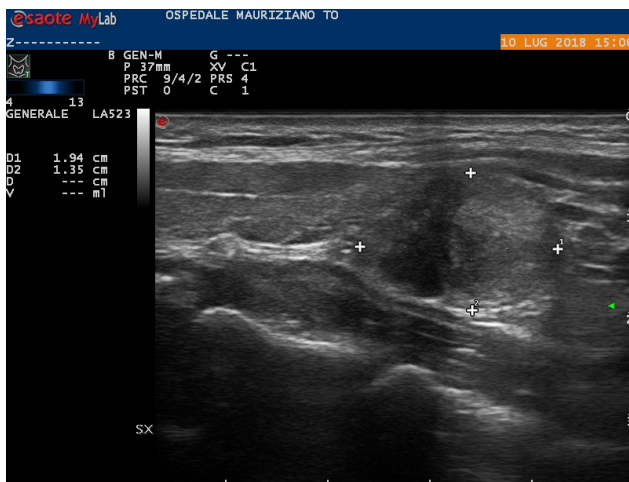
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Dopo 3 mesi
Asintomatica
Volume 5.9 ml



Dopo 12 mesi
Asintomatica
Volume 2.2 ml



Noduli tiroidei: trattamenti mininvasivi



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ITALIAN CHAPTER

List of complications	SIR class	Total (n = 875)		Benign thyroid nodules (n = 746)		Recurrent thyroid cancers (n = 129)		P-value
		n	%	n	%	n	%	
Minor complications ^a		17	1.9	14	1.9	3	2.3	0.728
Voice change <1 month	B	2	0.2	1	0.1	1	0.8	0.273
Nodule rupture with conservative treatment	A	2	0.2	2	0.3	0	0	>0.999
Transient hypothyroidism	B	1	0.1	1	0.1	0	0	>0.999
Mild transient confusion, probably due to lidocaine complication	B	1	0.1	0	0	1	0.8	0.147
Haematoma	B	7	0.8	6	0.8	1	0.8	>0.999
Hypertension treated with medication	B	4	0.5	4	0.5	0	0	>0.999

Complications encountered in ultrasonography-guided radiofrequency ablation of benign thyroid nodules and recurrent thyroid cancers

Cherry Kim^{1,2} · Jeong Hyun Lee¹ · Young Jun Choi¹ · Won Bae Kim³ · Tae Yon Sung⁴ · Jung Hwan Baek¹



Noduli tiroidei: trattamenti mininvasivi



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List of complications	SIR class	Total (n = 875)		Benign thyroid nodules (n = 746)		Recurrent thyroid cancers (n = 129)		P-value
		n	%	n	%	n	%	
Side effects ^a		61	7	52	7	9	7	>0.999
Muscle twitching, probably due to lidocaine complication	N/A	1	0.1	1	0.1	0	0	>0.999
Pain	N/A	7	0.8	5	0.7	2	1.6	0.276
Oedema	N/A	25	2.9	24	3.2	1	0.8	0.157
Vasovagal reaction	N/A	7	0.8	6	0.8	1	0.8	>0.999
Hypertension observed without medication	N/A	8	0.9	6	0.8	2	1.6	0.335
Vomiting/nausea	N/A	4	0.5	3	0.4	1	0.8	0.472
Coughing	N/A	11	1.3	8	1.1	3	2.3	0.213

Complications encountered in ultrasonography-guided radiofrequency ablation of benign thyroid nodules and recurrent thyroid cancers

Cherry Kim^{1,2} · Jeong Hyun Lee¹ · Young Jun Choi¹ · Won Bae Kim³ · Tae Yon Sung⁴ · Jung Hwan Baek¹

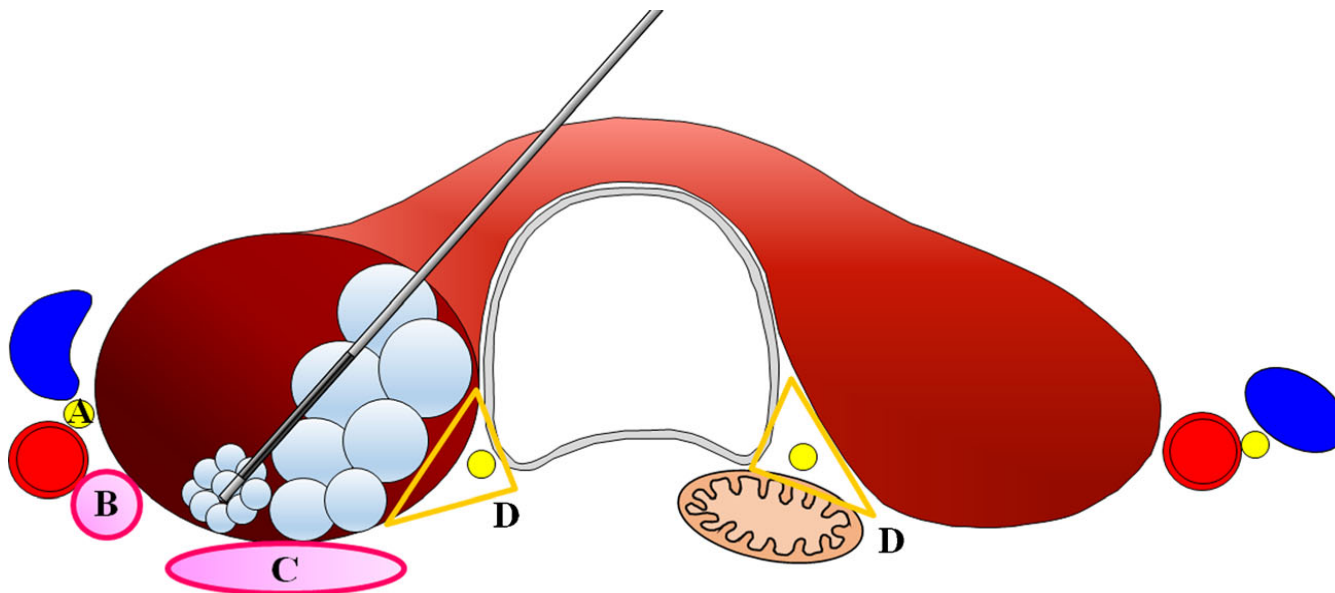


Noduli tiroidei: trattamenti mininvasivi



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- A: Medial type vagus nerve
- B: Middle cervical sympathetic ganglion and/or posterior type vagus nerve
- C: Recurrent laryngeal nerve variations
- D: Danger triangle (recurrent laryngeal nerve and esophagus)



Noduli tiroidei: trattamenti mininvasivi



ITALIAN CHAPTER

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Complications Encountered in the Treatment of Benign Thyroid Nodules with US-guided Radiofrequency Ablation: A Multicenter Study¹

Radiology 2012; 262:335–342

nodule rupture. The major complication rate was significantly lower in patients treated by experienced operators than in patients treated by less-experienced operators (0.7% vs 2.9%, $P = .007$). The total complication rate was also lower for experienced operators than for less-experienced operators, but this difference was not significant (2.0% vs 3.9%, $P = .051$). Early complications were significantly more common than delayed complications (46 vs 2; $P .001$).



Noduli tiroidei: trattamenti mininvasivi



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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	
Permanent				0





Noduli tiroidei: trattamenti mininvasivi



TABLE 3. COMPLICATIONS AND SIDE EFFECTS OF THE PERCUTANEOUS LASER ABLATION PROCEDURE ON 122 PATIENTS WITH COLD, SOLID BENIGN THYROID NODULES

<i>Type of reaction</i>	<i>No. of cases</i>	<i>%</i>	<i>SIR class^a or equivalent^b</i>
Intraoperative			
Pain			
Mild	14	11.5	A ^b
Intense	10	8.2	B ^b
Bleeding			
Intranodular	9	7.4	A ^b
Pericapsular	3	2.5	A ^b
Vasovagal reaction	4	3.3	A ^b
Vasovagal reaction with 14'' asystolia	1	0.8	A ^b
Cough	6	4.9	A ^b

LTA

Percutaneous Laser Ablation of Cold Benign Thyroid Nodules: A 3-Year Follow-Up Study in 122 Patients



Noduli tiroidei: trattamenti mininvasivi



TABLE 3. COMPLICATIONS AND SIDE EFFECTS OF THE PERCUTANEOUS LASER ABLATION PROCEDURE ON 122 PATIENTS WITH COLD, SOLID BENIGN THYROID NODULES

<i>Type of reaction</i>	<i>No. of cases</i>	<i>%</i>	<i>SIR class^a or equivalent^b</i>
Immediate postoperative (within 24 hours)			
Stridor	1	0.8	A ^a
Swelling	11	9.0	A ^a
Cutaneous burn	1	0.8	A ^a
Laryngeal dysfunction	2	1.6	B ^a

LTA

Percutaneous Laser Ablation of Cold Benign Thyroid Nodules: A 3-Year Follow-Up Study in 122 Patients



Noduli tiroidei: trattamenti mininvasivi



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<i>Type of reaction</i>	<i>No. of cases</i>	<i>%</i>	<i>SIR class^a or equivalent^b</i>
Periprocedural (within 30 days)			
Bruise	3	2.5	A ^a
Fever (37.5°C–38.5°C)	5	4.1	A ^a
Persistent pain	9	7.4	B ^a
Pseudocystic transformation	6	4.9	B ^a
Pseudocyst with fasciitis	3	2.5	C ^a

LTA

Percutaneous Laser Ablation of Cold Benign Thyroid Nodules: A 3-Year Follow-Up Study in 122 Patients

Roberto Valcavi,¹ Fabrizio Riganti,¹ Angelo Bertani,¹ Debora Formisano,² and Claudio M. Pacella³



Noduli tiroidei: trattamenti mininvasivi



ITALIAN CHAPTER

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

Complications and Side Effects, n, % ^b					
Time of Detection					
Type of Complications (SIR Class) ^a	Intraoperatively	Immediately Postoperatively (Within 24 h)	Periprocedural (Within 30 d)	Delayed (After 30 d)	Time to Recovery, d
Major					
Voice change	(C)		8 (0.5) ^c		2–84
Minor					
Hematoma	(B)		8 (0.4)		2–10
Skin burn	(B)		1 (0.1)		10
Side effects					
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
Vasovagal reaction	(A)	12 (0.7)			
Cough	(A)	1 (0.1)			
Fever (37.5°C–38.5°C)	(A)		141 (7.7)		1–4

Pacella et al, 2015



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Trattamenti mininvasivi - Conclusioni



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I trattamenti mininvasivi sono metodiche efficaci nel trattamento dei nodi tiroidei benigni, gravate da modesta incidenza di effetti collaterali

Queste metodiche hanno dei limiti di ordine «generale» e di ordine «tecnico»

Un'adeguata conoscenza di tali limiti (alcuni dei quali sono peraltro «relativi», in quanto possono soltanto ridurre parzialmente l'efficacia del trattamento) è in ogni caso necessaria per un'adeguata selezione dei casi, al fine di ottenere risultati ottimali



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Acknowledgements

