

Reunión Anual SOCIEDAD ESPAÑOLA DE **NEURORRADIOLOGÍA**



20 - 22 de octubre de 2022

ZARAGOZA

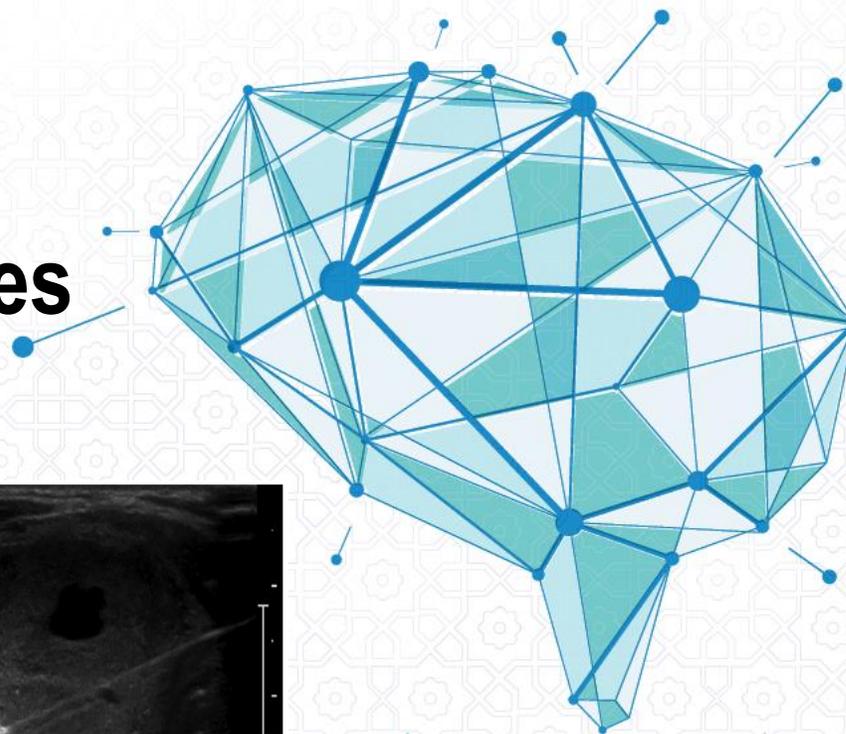
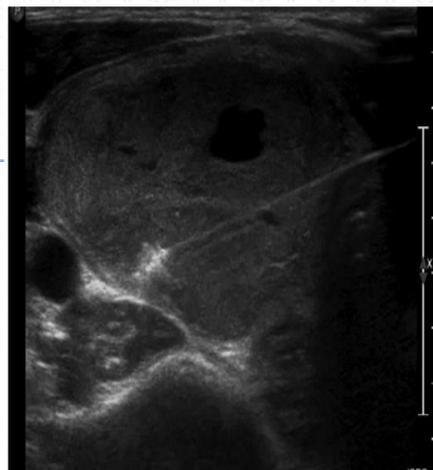
Sede: Cámara de Comercio

Ablación de tiroides y paratiroides

Jesús Aldea Martínez

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Hospital Universitario de Burgos



Importancia

Nódulos tiroideos son muy frecuentes y su detección está en aumento.

Se encuentran en el 40-50% de autopsias y por encima del 67% de las ecografías cervicales.

Palpables en el 3-7% de la población general.

La incidencia de nuevos nódulos es de 0,1%/año.

Más frecuentes en mujeres.

Su frecuencia aumenta con la edad.

La incidencia aumenta en las regiones bajas en I y exposición a radiaciones ionizantes.

Importancia

Nódulos tiroideos son muy frecuentes y su detección está en aumento.

Se e

67%

Palpo

La ir

Más

La mayoría (95%) de los nódulos tiroideos son **benignos**, pequeños, **asintomáticos**, y **no requieren tratamiento**.

el

Su frecuencia aumenta con la edad.

La incidencia aumenta en las regiones bajas en I y exposición a radiaciones ionizantes.

Diagnóstico y tratamiento de patología tiroidea

“COLABORACIÓN MULTICICLIPLINAR”

Clínicos: Endocrinólogos, Internistas, médicos de familia.

Radiólogos: Generales, intervencionistas.

Anatomopatólogos.

Cirujanos.

Médicos Nucleares

CLÍNICOS

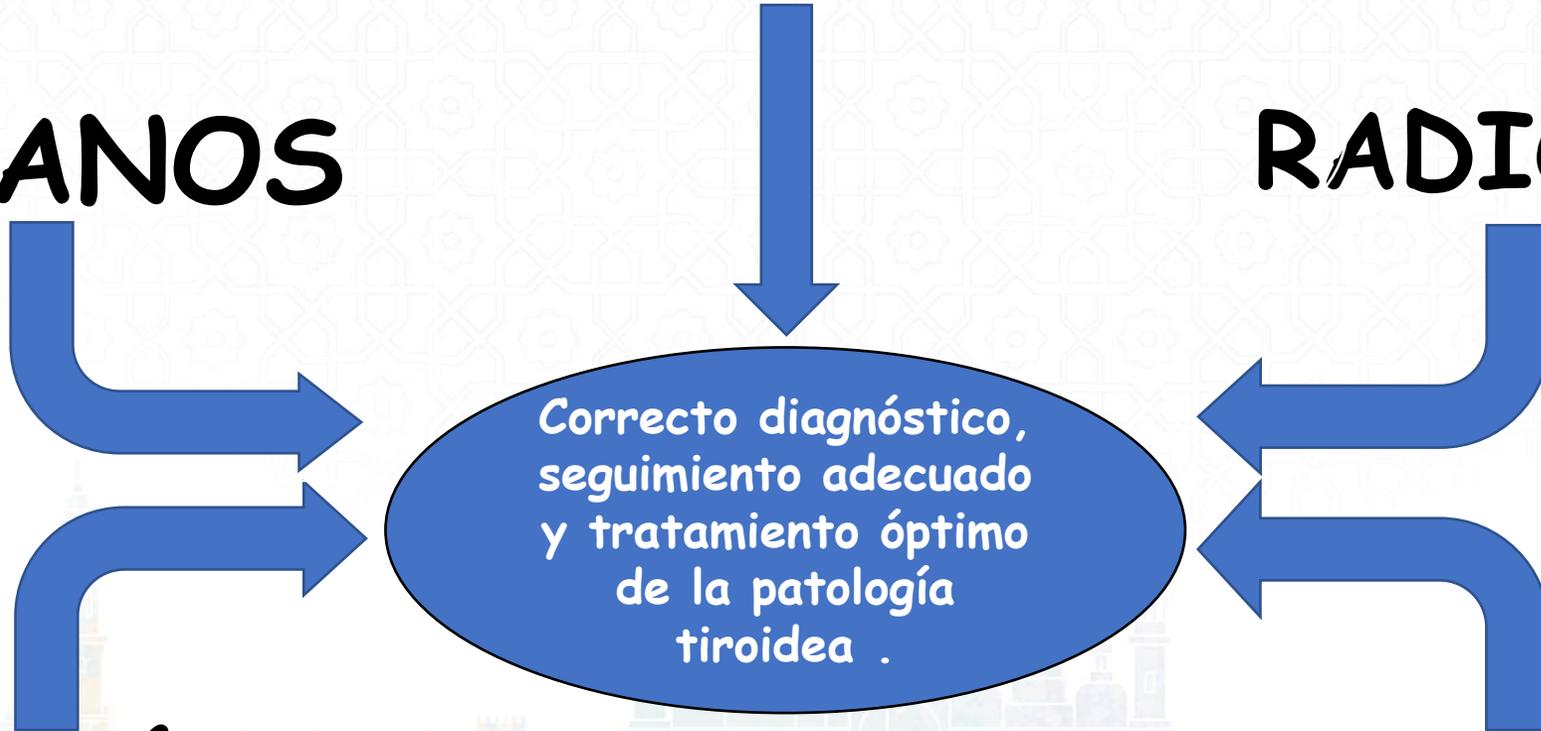
CIRUJANOS

RADIÓLOGOS

Correcto diagnóstico,
seguimiento adecuado
y tratamiento óptimo
de la patología
tiroidea .

**MÉDICOS
NUCLEARES**

**ANATOMO-
PATÓLOGOS**



TRATAMIENTO ABLATIVO DE UN NÓDULO TIROIDEO

Original Article | Thyroid

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Korean J Radiol 2018;19(1):167-174



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

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Objective: To assess the efficacy and safety of thyroid radiofrequency (RF) ablation for benign thyroid nodules by trained radiologists according to a unified protocol in a multi-center study.

Materials and Methods: From 2010 to 2011, 345 nodules from 345 patients (M:F = 43:302; mean age \pm SD = 46.0 \pm 12.7 years, range = 15–79) who met eligibility criteria were enrolled from five institutions. At pre-ablation, the mean volume was 14.2 \pm 13.2 mL (1.1–80.8 mL). For 12 months or longer after treatment, 276 lesions, consisting of 248 solid and 28 predominantly cystic nodules, were followed. All operators performed RF ablation with a cool-tip RF system and two standard techniques (a transisthmus approach and the moving-shot technique). Volume reduction at 12 months after RF ablation (the primary outcome), therapeutic success, improvement of symptoms as well as of cosmetic problems, and complications were evaluated. Multiple linear regression analysis was applied to identify factors that were independently predictive of volume reduction.

Results: The mean volume reduction at 12 months was 80.3% (n = 276) and at the 24-, 36-, 48-, and 60-month follow-ups 84.3% (n = 198), 89.2% (n = 128), 91.9% (n = 57), and 95.3% (n = 6), respectively. Our therapeutic success was 97.8%. Both mean symptom and cosmetic scores showed significant improvements (p < 0.001). The rate of major complications was 1.0% (3/276). Solidity and applied energy were independent factors that predicted volume reduction.

Conclusion: Radiofrequency ablation performed by trained radiologists from multiple institutions using a unified protocol and similar devices was effective and safe for treating benign thyroid nodules.

Keywords: Radiofrequency ablation; Thyroid; Nodule; Tumor; Neoplasm; Ultrasound; Intervention; Prospective study

J Ultrasound (2015) 18:423–430
DOI 10.1007/s40477-015-0169-y



LETTER TO THE EDITOR

Radiofrequency ablation for thyroid nodules: which indications? The first Italian opinion statement

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Giuseppe Bocuzzi⁵ · Flavio Boraso⁶ · Giorgio Borretta⁷ · Giuseppe Caruso⁸ ·
Maurilio Deandrea⁹ · Milena Freddi¹⁰ · Gabriella Gallone¹¹ · Giovanni Gandini¹² ·
Guido Gasparri¹⁰ · Carlo Gazzera¹² · Ezio Ghigo¹ · Maurizio Grosso¹³ · Paolo Limone⁹ ·
Mauro Maccario¹ · Luigi Mansi¹⁴ · Alberto Mormile⁹ · Pier Giorgio Nasi¹⁵ ·
Fabio Orlandi¹⁶ · Donatella Pacchioni¹⁷ · Claudio Maurizio Pacella¹⁸ · Nicola Palestini¹⁰ ·
Enrico Papini¹⁹ · Maria Rosa Pelizzo²⁰ · Andrea Piotto²⁰ · Teresa Rago²¹ ·
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TRATAMIENTO ABLATIVO DE UN NÓDULO TIROIDEO

Received: 1 D
DOI: 10.1002/

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WILEY

ORIGINAL ARTICLE

Radiofrequency ablation and related ultrasound-guided ablation technologies for treatment of benign and malignant thyroid disease: An international multidisciplinary consensus statement of the American Head and Neck Society Endocrine Surgery Section with the Asia Pacific Society of Thyroid Surgery, Associazione Medici Endocrinologi, British Association of Endocrine and Thyroid Surgeons, European Thyroid Association, Italian Society of Endocrine Surgery Units, Korean Society of Thyroid Radiology, Latin American Thyroid Society, and Thyroid Nodules Therapies Association

Lisa A. Orloff MD¹ | Julia E. Noel MD¹  | Brendan C. Stack Jr MD²  |
Marika D. Russell MD³ | Peter Angelos MD, PhD⁴ | Jung Hwan Baek MD, PhD⁵ |
Kevin T. Brumund MD⁶ | Feng-Yu Chiang MD⁷ | Mary Beth Cunnane MD⁸ |

TABLE 1 Summary of recommendations

Recommendation 1	US-guided ablation procedures may be used as a first-line alternative to surgery for patients with benign thyroid nodules contributing to compressive and/or cosmetic symptoms
Recommendation 2	Although less efficacious than surgery or RAI in normalizing thyroid function, thermal ablation procedures can be a safe therapeutic alternative in patients with an autonomously functional thyroid nodule and contraindications to first-line techniques
Recommendation 3a	US-guided ablation procedures may be considered in patients with suitable primary papillary microcarcinoma who are unfit for surgery or decline surgery or active surveillance
Recommendation 3b	US-guided ablation procedures may be considered in patients with suitable recurrent papillary thyroid carcinoma who are unfit for surgery or decline surgery or active surveillance
Recommendation 3c	Preprocedural biochemical and imaging assessment aid in determining curative versus palliative treatment intent for treatment of recurrent papillary thyroid carcinoma
Recommendation 4a	Subjective voice assessment should be undertaken prior to performance of US-guided ablation procedures in any candidate
Recommendation 4b*	Patients with voice impairment or relevant prior surgical history warrant a laryngeal evaluation and assessment of vocal fold mobility
Recommendation 4c	Laryngeal exam should be performed prior to ablation on the contralateral side after ipsilateral ablation
Recommendation 5a	Prior to pursuing US-guided ablation procedures, complete radiographic, biochemical, medical, and symptomatic evaluation should be performed and may be facilitated by completion of a checklist
Recommendation 5b	Prior to pursuing US-guided ablation procedures, discussion should be held with the patient regarding expected outcome(s) and potential risks
Recommendation 6**	When patient comorbidities and disposition permit, performance of US-guided ablation procedures under local anesthesia allows for monitoring of periprocedural complications
Recommendation 7	Hydrodissection creates distance between the target lesion and vital structures, thereby minimizing patient discomfort and reducing unintended thermal spread
Recommendation 8a	In performance of RFA, utilization of the moving shot technique via the transisthmic approach and delivery of energy only when the needle tip is visualized by US is paramount to effective ablation
Recommendation 8b	The moving shot technique via the transisthmic approach minimizes inadvertent thermal injury to surrounding critical structures

Indicaciones de tratamiento ablativo de un nódulo tiroideo

HEAD&NECK, 2022, VOL 44, nº3: 633-660

ORLOFF ET AL.

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Ablación en la glándula tiroidea. Indicaciones

- 1. Tratamiento de nódulos benignos sintomáticos (95%).**
- 2. Adenoma tóxico.**
- 3. Cáncer recurrente tiroideo (R. local/ R. adenopática).**
- 4. Cáncer primario tiroideo.**

Nódulos benignos sintomáticos:

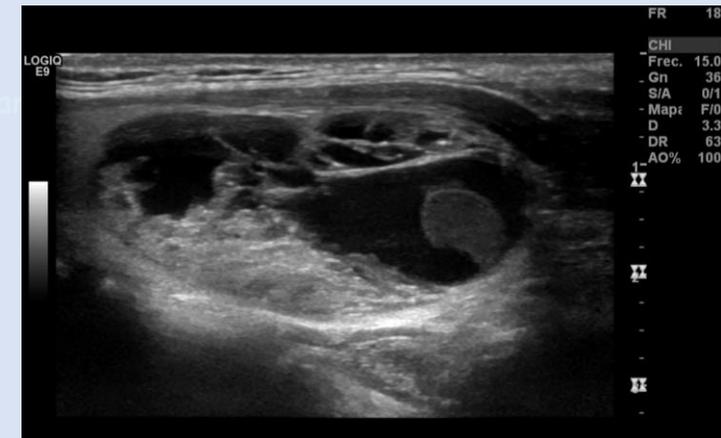
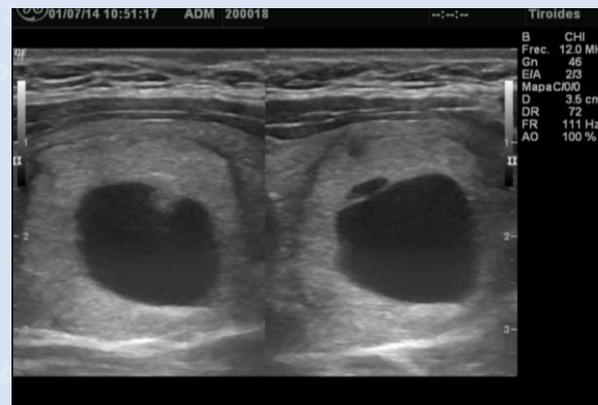
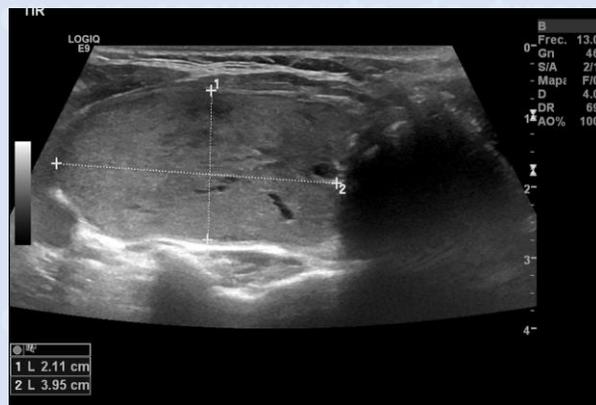
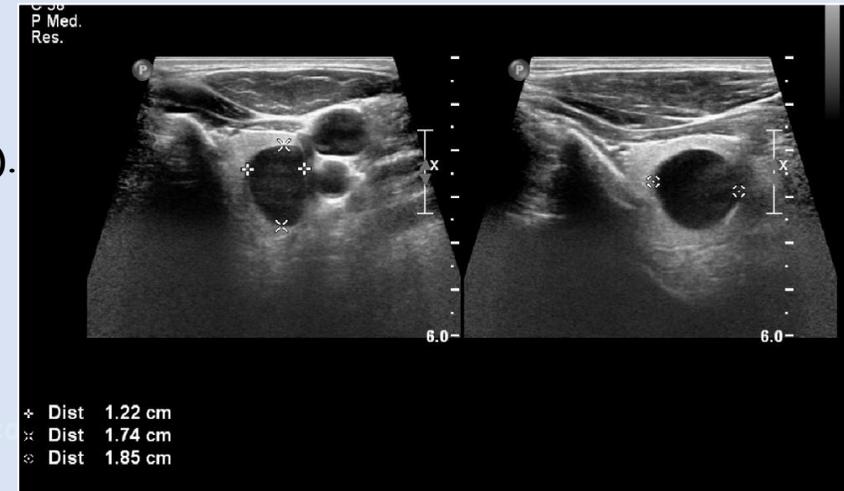
Ecografía con características de nódulo benigno.

Citología benigna confirmada con al menos 2 PAAF o BAG (Bethesda II).

Sintomático.

Tamaño >2 cm o volumen >20 ml o <20 ml sintomáticos.

Tratamiento mínimamente
invasivo/cirugía



HEAD&NECK, 2022, VOL 44, nº3: 633-660

communicate and facilitate long-term follow-up with a care team specializing in management of nodular thyroid disease

*Indicates statement did not reach consensus among author voting panel. Seven of 39 voting authors voted “neutral” or “disagree”

**Indicates statement was borderline for meeting consensus among author voting panel. Three of 39 voting authors voted “neutral” or “disagree”

In accordance with previous guidelines, a benign cytologic diagnosis must be confirmed via two ultrasound-guided fine needle aspiration biopsies (FNAB) or core needle biopsies (CNB) prior to ablation of a benign thyroid nodule.^{2,3,51,61} When ultrasonographic features are highly specific for benignity, as in spongiform and purely cystic nodules, the second FNAB may be omitted. FNAB is not a prerequisite in functional nodules. Caution should be taken in ablating nodules with suspicious ultrasound features so as not to overlook and delay treatment of a malignant lesion. Retrosternal extension should be carefully assessed with cross-sectional imaging, and, if significant, renders the patient unsuitable for ablation.

4.2 | Cytologically indeterminate thyroid nodules

There is very little literature regarding treatment of cyto-

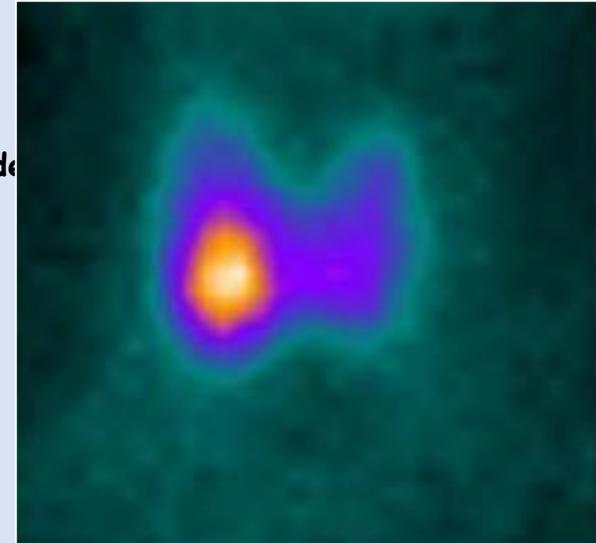
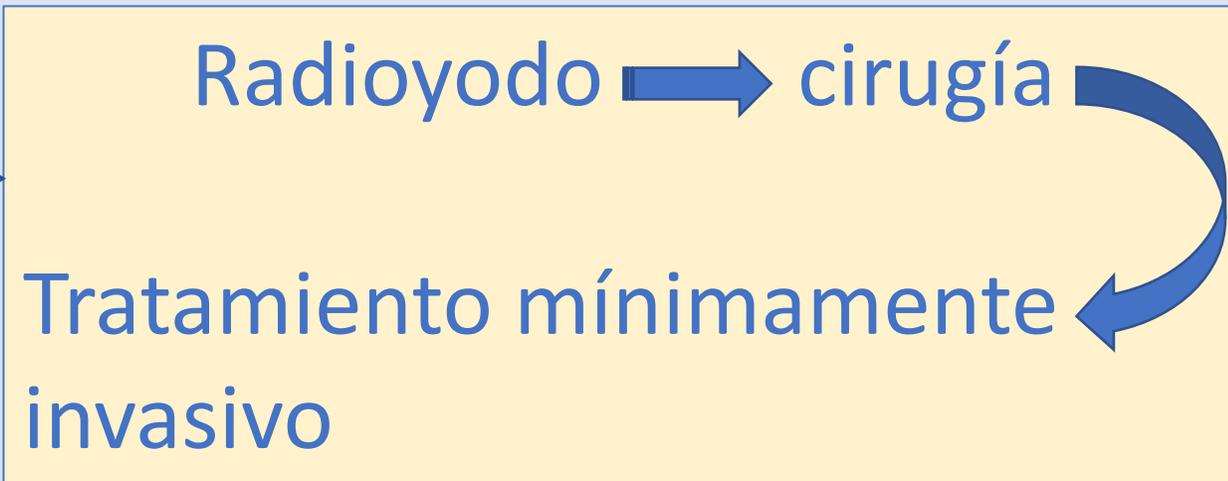
4.3 | Malignant disease

Surgery is the standard treatment for patients with primary and recurrent well-differentiated thyroid cancer, although RFA may be an option when surgery is contraindicated or declined. At present, the role of RFA in the treatment of thyroid malignancy remains an area of active debate. RFA has been utilized in the setting of recurrent papillary thyroid carcinoma^{2,51} and has shown promising results in papillary thyroid microcarcinoma (PTMC).⁶⁷⁻⁶⁹ Prior to proceeding with RFA of metastatic lesions, malignancy should be confirmed via FNAB or CNB with thyroglobulin washout as needed. The serum thyroglobulin and thyroglobulin antibody levels are also determined to assess treatment response during extended follow-up.

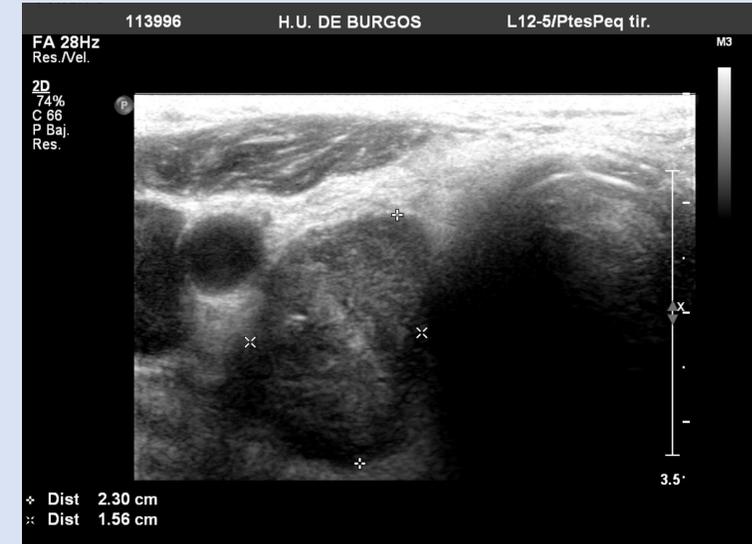
An important distinction in the ablation of recurrent malignancy is the treatment intent. For a curative strategy, the number of lesions must be limited (<3 per

Adenoma tóxico tiroideo:

En los pequeños y medianos (<20ml de volumen) y previa normofunción con antitiroideos.
Cuando la cirugía o RadioI está contraindicado.
En los > 20 ml en combinación con el RadioI.



Indicaciones de tratamiento ablativo en tiroides



Cáncer recurrente de tiroides:

Cuando rechaza o alto riesgo quirúrgico (varias cirugías previas, función pulmonar o cardiovascular al límite, pacientes muy mayores).

Recurrencia local.

Recurrencia adenopática.

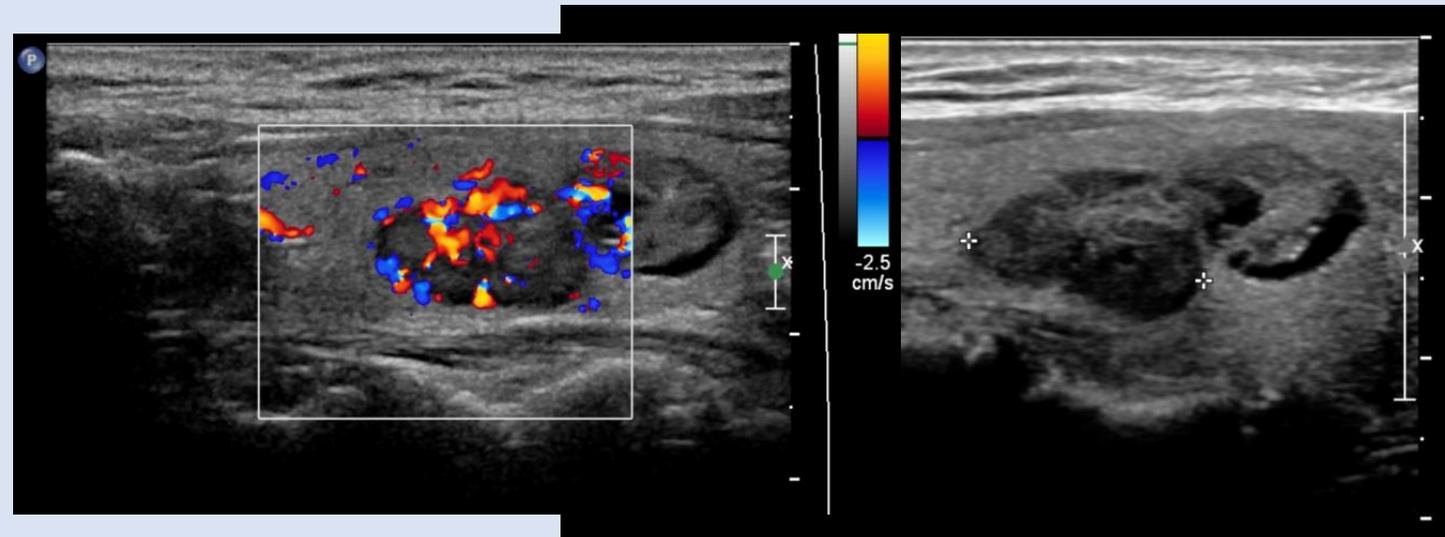
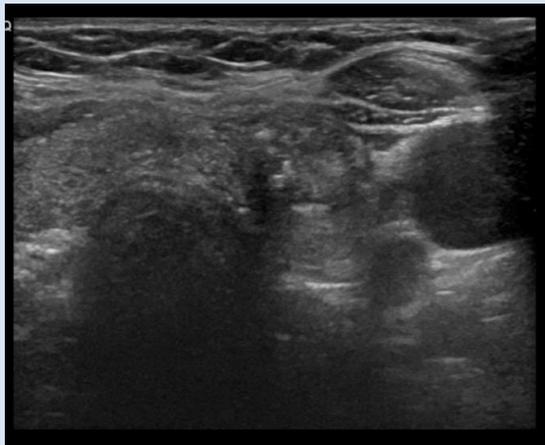
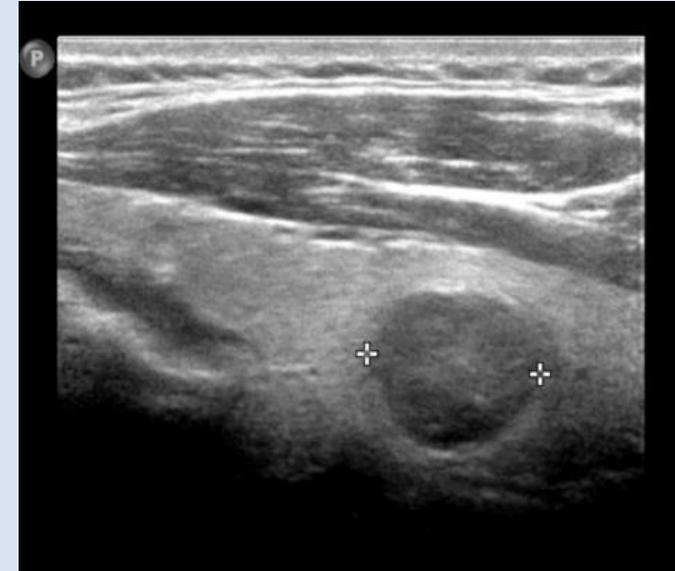
Cirugía → Tratamiento
mínimamente invasivo

Cáncer primario tiroideo:

No es una 1ª línea de tratamiento pero puede utilizarse cuando:

- Contraindicación de la cirugía.
- Microcarcinoma papilar unifocal.
- Tratamiento paliativo.

Cirugía ➔ Tratamiento
mínimamente invasivo



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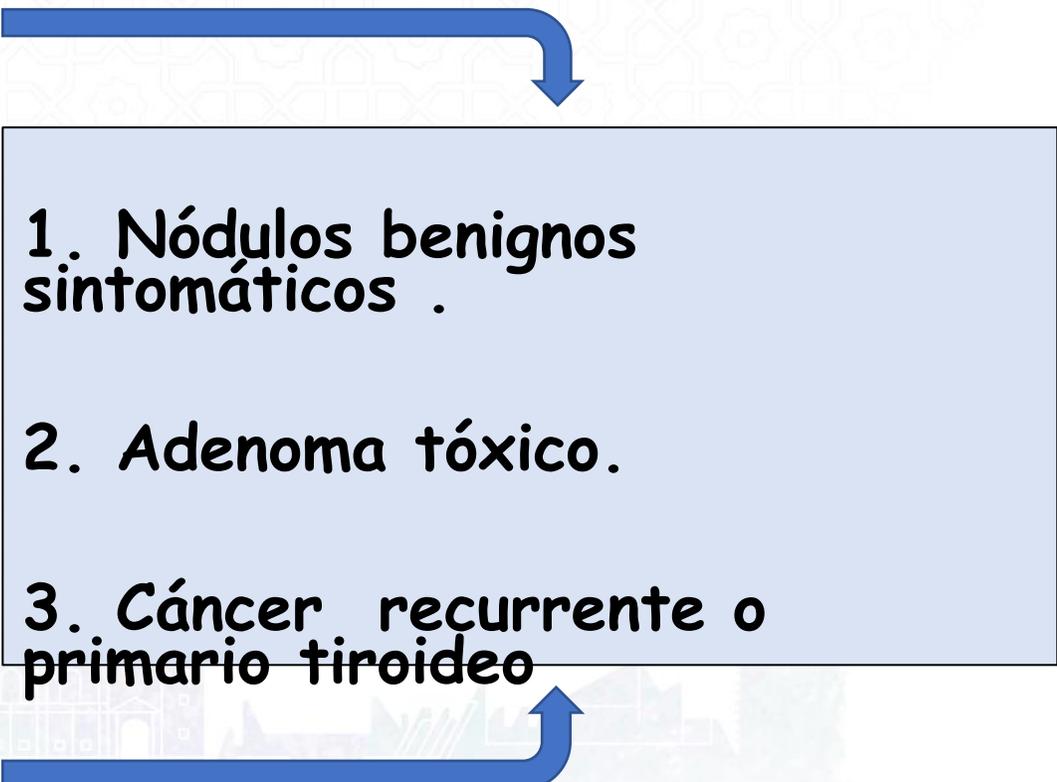
An important distinction in the ablation of recurrent malignancy is the treatment intent. For a curative strategy, the number of lesions must be limited (≤ 3 per patient), confined to the neck, and with maximum tumor diameter below 1.5–2 cm.^{48,70,71} If the strategy is palliative, larger tumors can be targeted with RFA when it is judged that size reduction would reduce symptoms and improve quality of life due to relationship with critical structures. In either case, ultrasonographic assessment of the target nodule(s) is required to determine size, vascularity, and proximity to adjacent structures. In patients deemed to be at risk for more extensive locoregional or distant metastatic disease, cross-sectional and/or functional imaging may be required to detect metastatic disease and help define the treatment purpose. These steps are summarized in Table 2.

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Opciones de tratamiento de un nódulo tiroideo

- Cirugía.
- Tratamiento supresor con T4.
- RadioI
- Técnicas mínimamente invasivas:
 - Esclerosis con alcohol.
 - Láser.
 - Radiofrecuencia (RF).
 - Microondas (MW).
 - HIFU.

- 
1. Nódulos benignos sintomáticos .
2. Adenoma tóxico.
3. Cáncer recurrente o primario tiroideo

¿E. alcohol? ¿Láser? ¿Radiofrecuencia?
Microondas?



TABLE 5 Comparison of efficacy and complexity of ablative techniques

	Solid/ predominantly solid benign nodule	Cystic/ predominantly cystic benign nodule	Functional nodule	Primary malignancy (PTMC)	Recurrent malignancy
Radiofrequency	√√√	√√	√	√√	√
EtOH	N/A	√√√	√	√√	√
Microwave	√√	√	√	√√	√
Laser	√√	√√	√	√√	√
HIFU	√√	N/A	√	N/A	N/A

Note: √, √√, or √√√ to designate efficacy of technology for each clinical condition (√√√ is most efficacious). N/A implies insufficient data to assess.

Tratamiento percutáneo de nódulo tiroideo benigno sintomático



VÍA CLÍNICA PARA TRATAMIENTO ABLATIVO DE UN NÓDULO TIROIDEO

NÓDULO TIROIDEO
"EN SEGUIMIENTO" por Servicio de
Endocrinología

- Exploración manual del nódulo.
- Controles analíticos.
- Ecografía.
- Citología del nódulo.



**¿El nódulo tiroideo cumple criterios de inclusión para
Tratamiento mediante Ablación por RF?**

VÍA CLÍNICA PARA TRATAMIENTO POR RADIOFRECUENCIA DE UN NÓDULO TIROIDEO

NÓDULO TIROIDEO
"EN SEGUIMIENTO" por Servicio de
Endocrinología

- Exploración manual del nódulo.
- Controles analíticos.
- Ecografía.
- Citología del nódulo.

¿El nódulo tiroideo cumple criterios de inclusión para
Tratamiento mediante Ablación por RF?

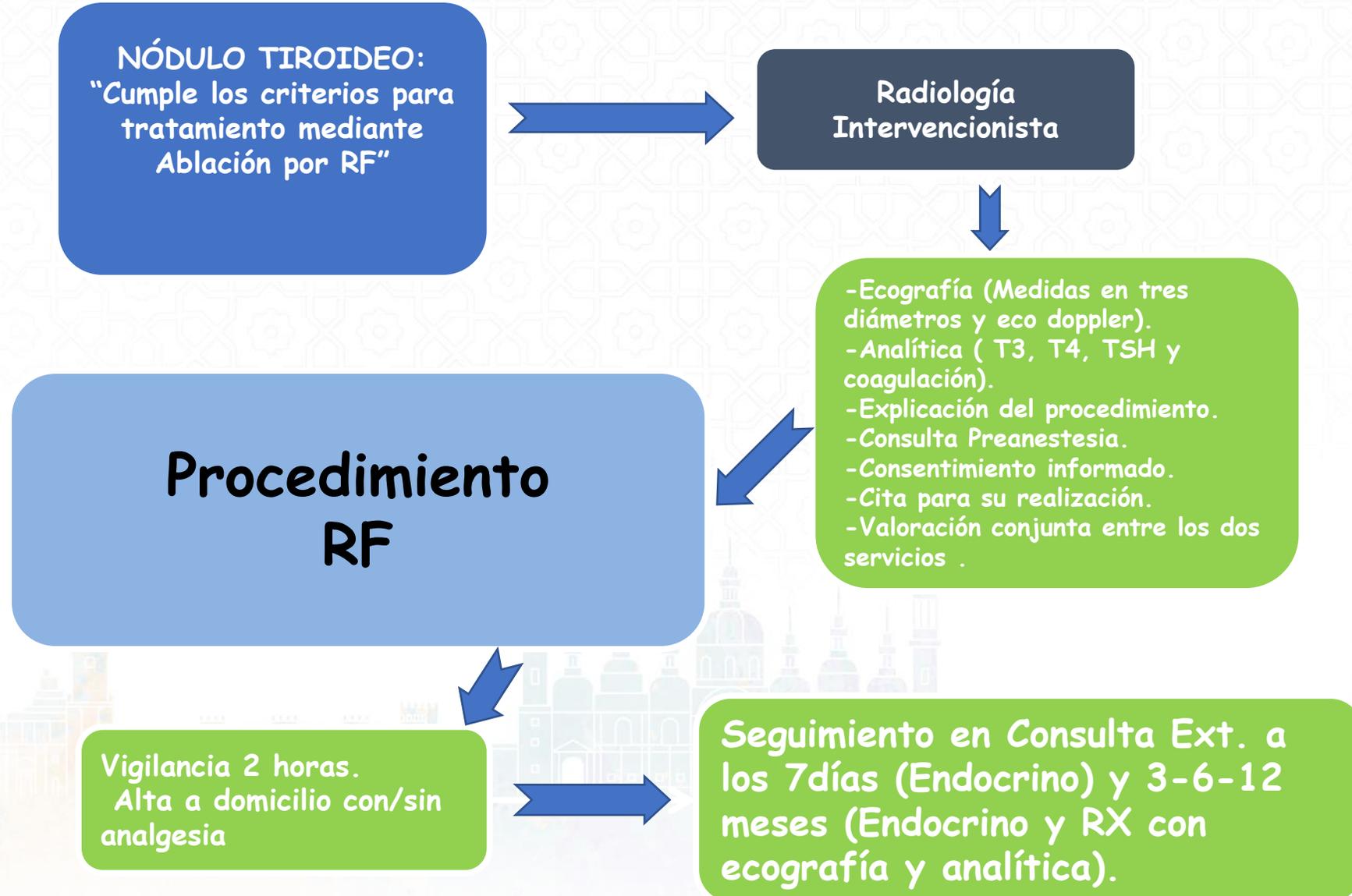
**Radiología Vascolar
e Intervencionista**

Sí

No

- Seguimiento.
- Cirugía.
- RadioI.

VÍA CLÍNICA



Procedimiento: Ablación

“Aplicación directa de calor producido por un circuito cerrado de corriente alterna dirigido a la erradicación o destrucción de tumores”



Ablación

No es una técnica nueva, sino que lleva ya utilizándose en medicina desde 1980 como tratamiento de determinadas arritmias cardiacas, y, como terapia antitumoral desde 1990 (Hepatocarcinoma, carcinoma de células renales y osteoma osteoide).

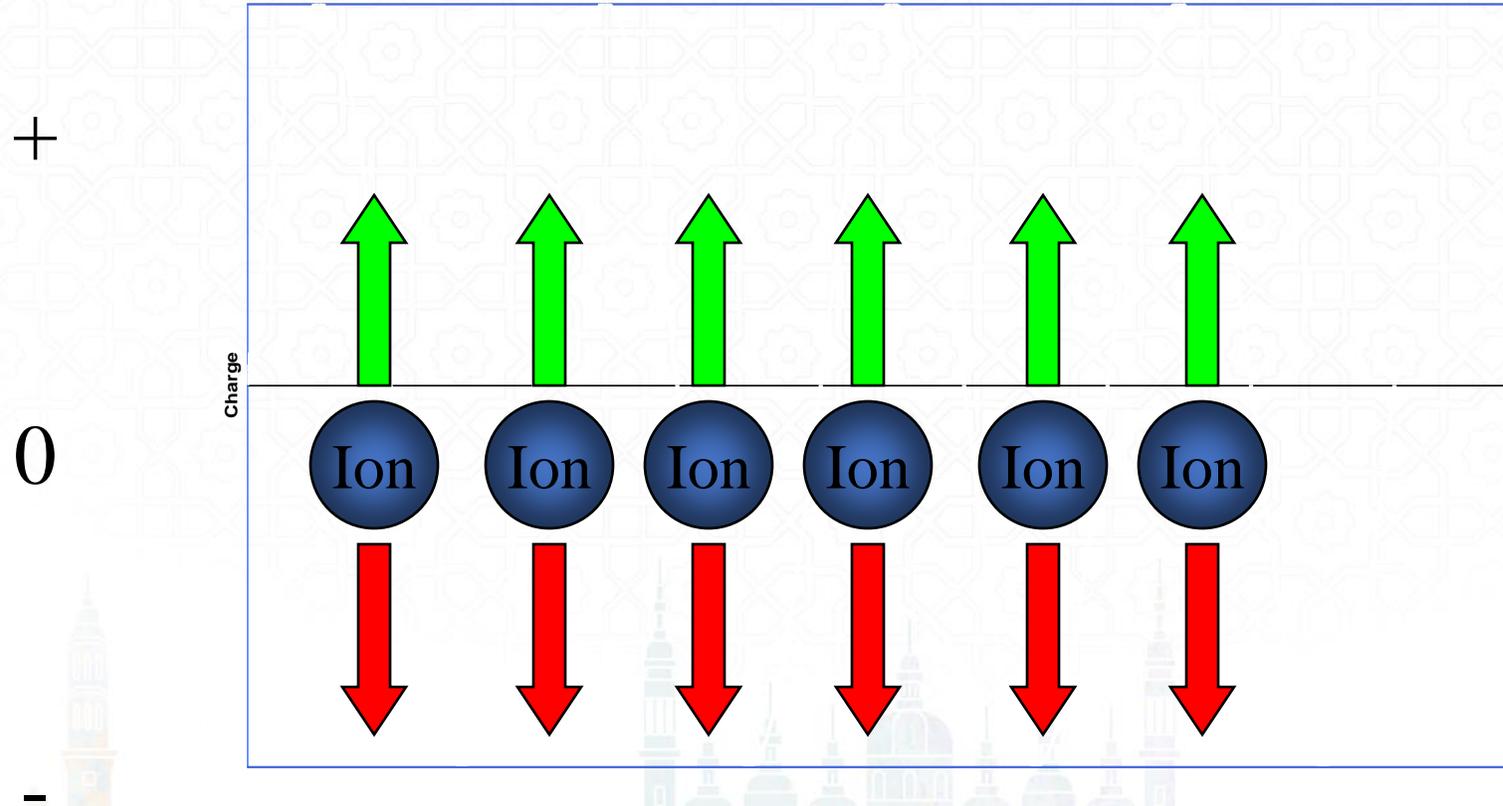
En el tiroides desde 2006 se demuestra la eficacia en el tratamiento de los nódulos benignos y en el 2012 se empieza a incluir en las guías clínicas de tratamiento, ampliando las indicaciones.

Es una técnica que produce calor local en la zona donde se coloca el electrodo (punta de la aguja), sin producir estimulación de nervios o músculos.

Utiliza corriente alterna de alta frecuencia mediante agitación iónica

Agitación de iones

Ionic Agitation



- La corriente alterna atrae y repele los iones
- La interferencia entre los iones oscilantes genera calor

Efecto del calor en las células

- 42-45°C - hipertermia:
 - No hay destrucción celular, pero las células son más susceptibles de ser dañadas por quimioterapia o radiación
- 60-80 °C - Citotoxicidad:
 - Desnaturalización de las proteínas e inicio de la coagulación
- 90 °C - Deseccación celular:
 - Pierde su contenido de agua, pero conserva su arquitectura.
- +100 °C - Vaporización:
 - La célula explota
- 200 °C - Carbonización

Anatomía patológica

Debido al calor producido por la corriente, el tejido sufre una necrosis por coagulación, con ausencia visible de núcleos dentro de las células muertas.

Se demuestran dos zonas:

- zona blanca de ablación, formada por tejido coagulado.
- zona roja de hiperemia o periférica, que es el límite entre la zona muerta y el tejido normal circundante

Ablación en los nódulos tiroideos

Decúbito supino, con hiperextensión cervical.

Sedación consciente por parte de anestesia.

Anestesia local.

Incisión en la piel.

Elegir la aguja con parte activa adecuada en función del tamaño y localización del nódulo.

Entrada transístmica.

Técnica de manos libres.

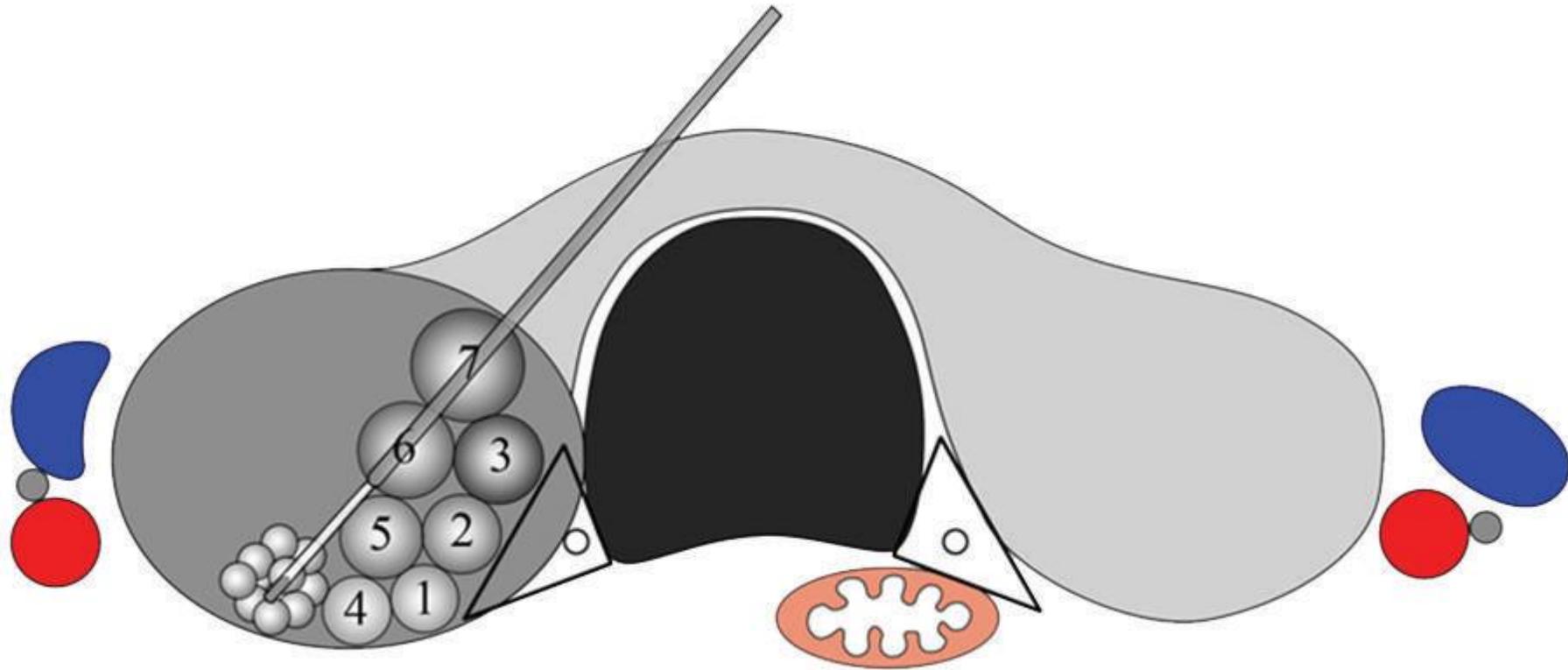
Si el tumor es quístico, primero sacar el líquido con una aguja chiba de 22G.

Si el tumor es pequeño, una sola sesión. Si es grande, se compartimenta el procedimiento, generalmente de abajo a arriba y de profundo a superficial.

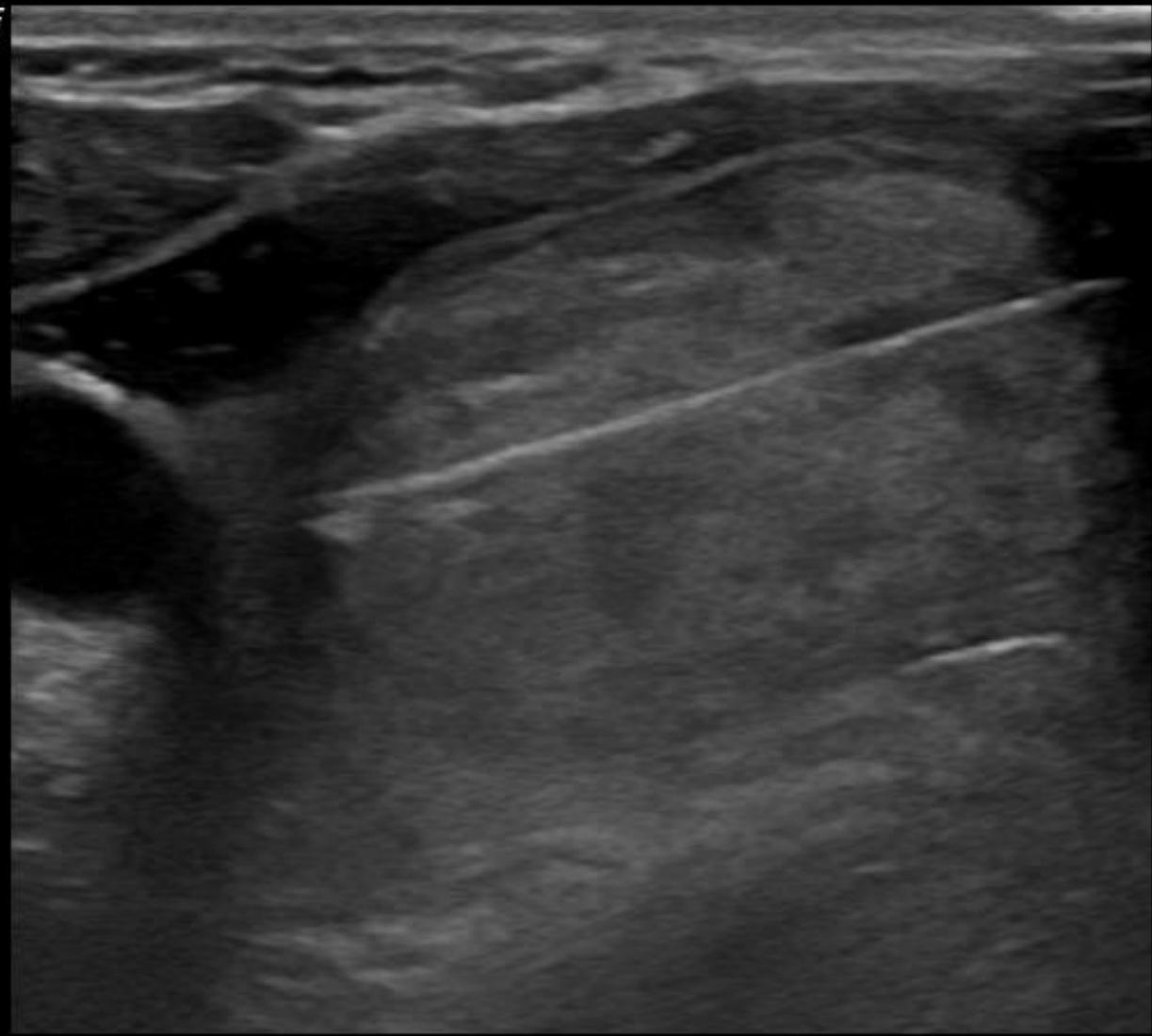
En RF recomiendo no pasar de 60W (empezar por 30W e ir subiendo 10W cada minuto) y en el MW no pasar de 50W.

Si son nódulos grandes o se realiza con MW == hidrosección peritiroideo, para disimular complicaciones (con dextrosa al 5% en RF y suero salino en el MW).

Ablación



GE
P6



B CHI
- Frec. 12.0 M
Gn 46
- E/A 2/3
Mapa C/I/O
- D 3.5 c
DR 75
- FR 109 H
AO 100 %

1-

II

2-

3-



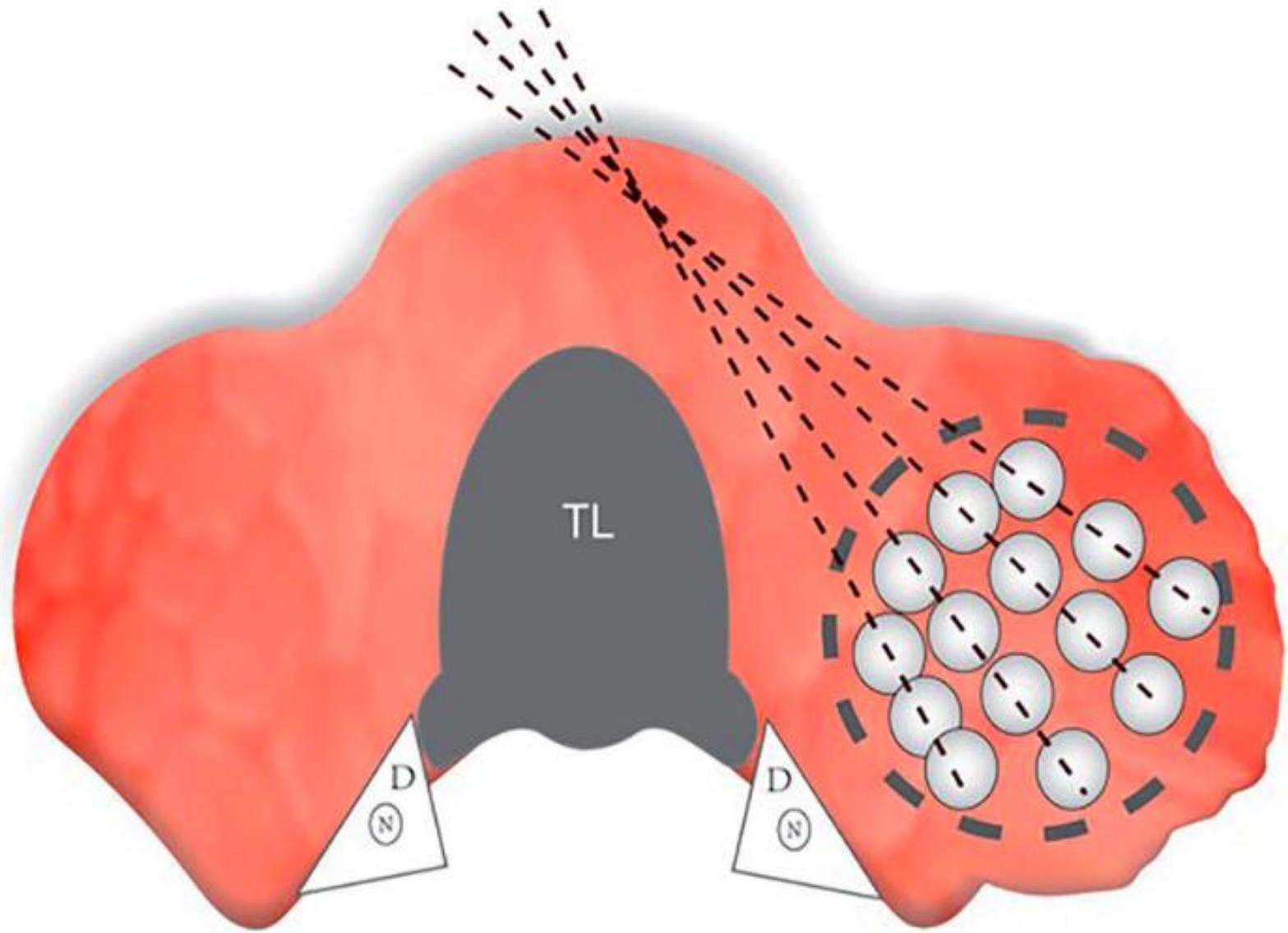
Técnica de ablación

Ablación móvil o "disparo móvil" o "moving shot": (Grupo coreano).

Pequeñas ablaciones respetando el triángulo de riesgo.

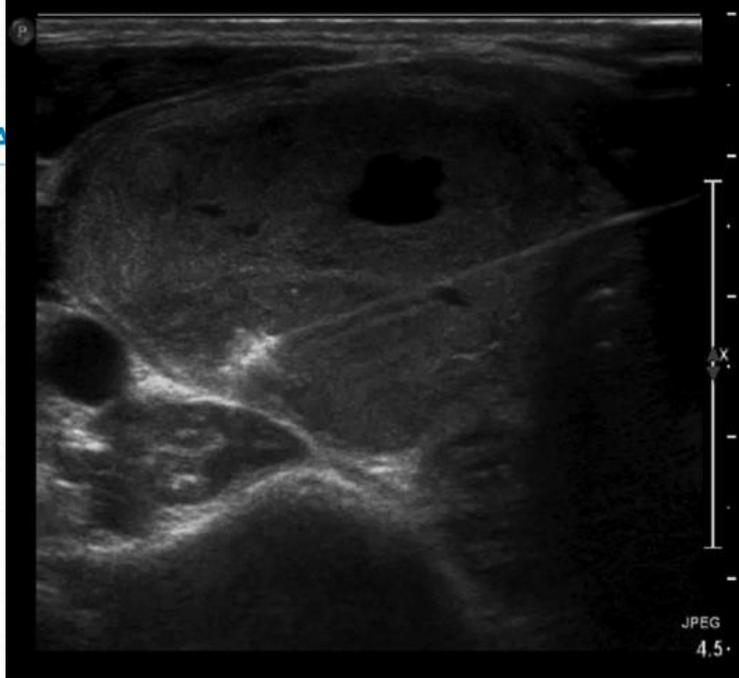
Ablación
coreana

Peque



rupo

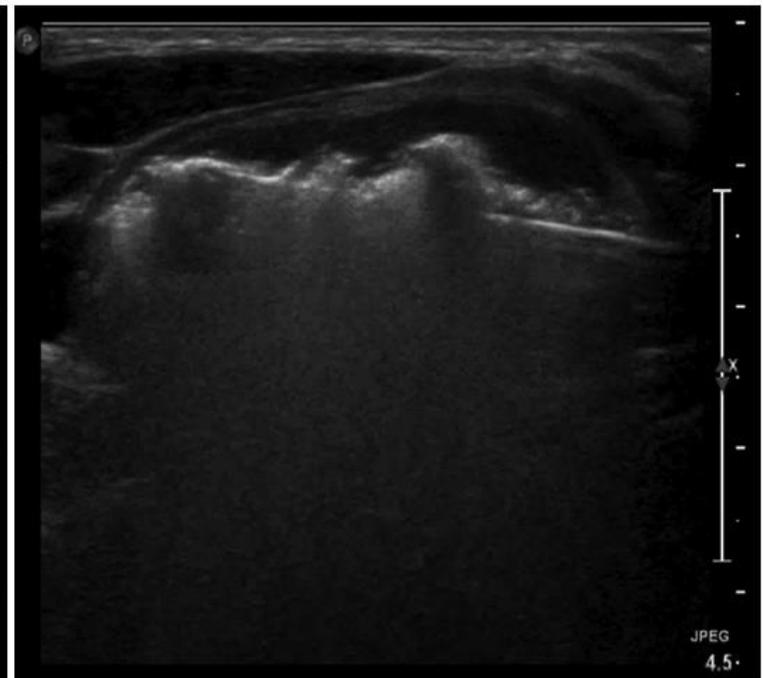
sgo.



A



B



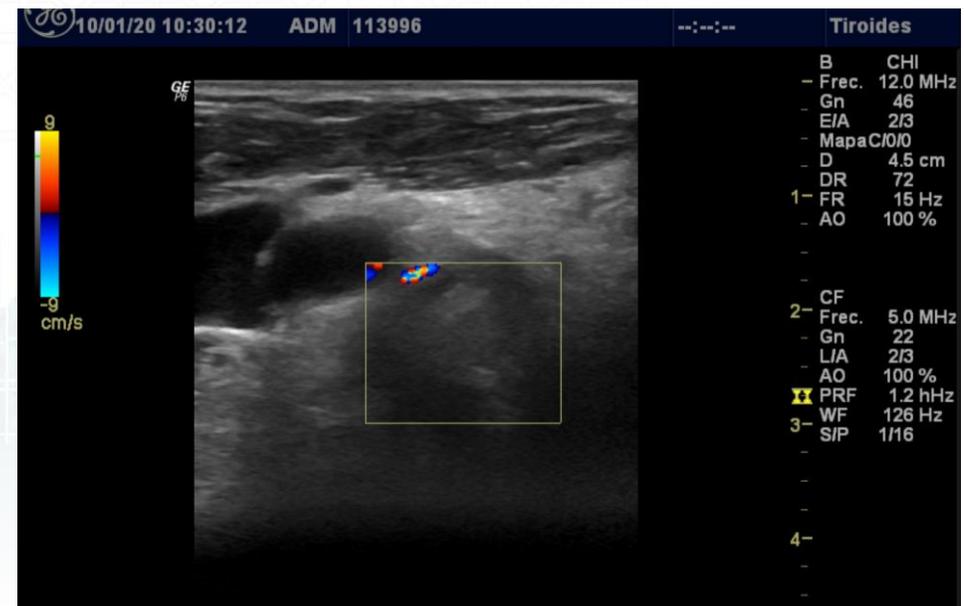
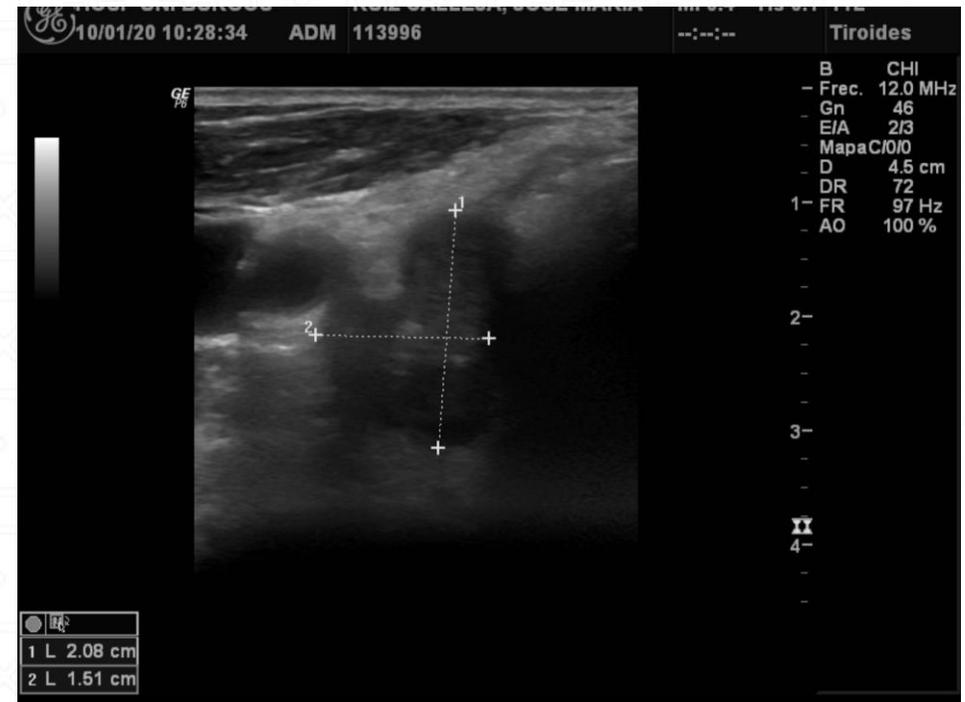
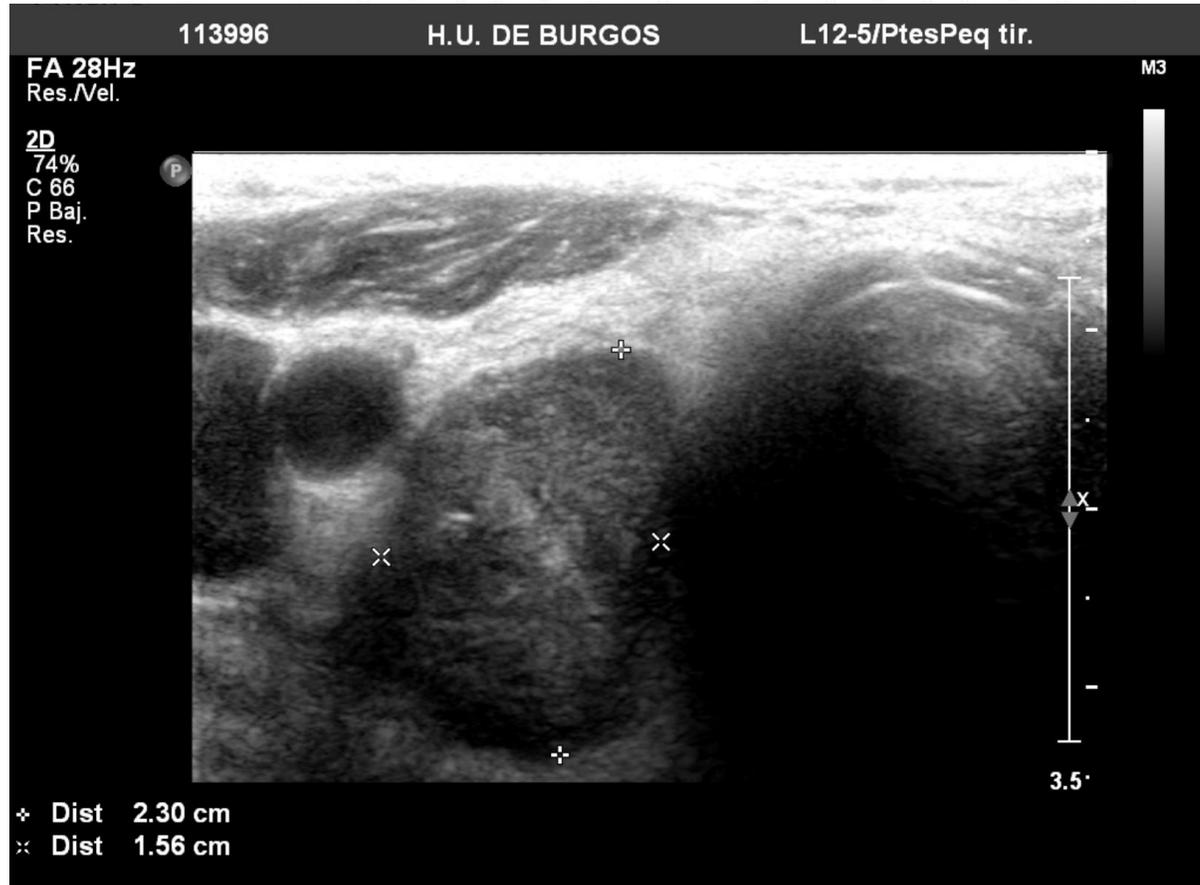
HEAD&NECK, 2022, VOL 44, nº3: 633-660

ORLOFF ET AL.

WILEY | 639

TABLE 1 Summary of recommendations

Recommendation 1	US-guided ablation procedures may be used as a first-line alternative to surgery for patients with benign thyroid nodules contributing to compressive and/or cosmetic symptoms
Recommendation 2	Although less efficacious than surgery or RAI in normalizing thyroid function, thermal ablation procedures can be a safe therapeutic alternative in patients with an autonomously functional thyroid nodule and contraindications to first-line techniques
Recommendation 3a	US-guided ablation procedures may be considered in patients with suitable primary papillary microcarcinoma who are unfit for surgery or decline surgery or active surveillance
Recommendation 3b	US-guided ablation procedures may be considered in patients with suitable recurrent papillary thyroid carcinoma who are unfit for surgery or decline surgery or active surveillance
Recommendation 3c	Preprocedural biochemical and imaging assessment aid in determining curative versus palliative treatment intent for treatment of recurrent papillary thyroid carcinoma
Recommendation 4a	Subjective voice assessment should be undertaken prior to performance of US-guided ablation procedures in any candidate
Recommendation 4b*	Patients with voice impairment or relevant prior surgical history warrant a laryngeal evaluation and assessment of vocal fold mobility
Recommendation 4c	Laryngeal exam should be performed prior to ablation on the contralateral side after ipsilateral ablation
Recommendation 5a	Prior to pursuing US-guided ablation procedures, complete radiologic, biochemical, medical, and symptomatic evaluation should be performed and may be facilitated by completion of a checklist
Recommendation 5b	Prior to pursuing US-guided ablation procedures, discussion should be held with the patient regarding expected outcome(s) and potential risks
Recommendation 6**	When patient comorbidities and disposition permit, performance of US-guided ablation procedures under local anesthesia allows for monitoring of periprocedural complications
Recommendation 7	Hydrodissection creates distance between the target lesion and vital structures, thereby minimizing patient discomfort and reducing unintended thermal spread
Recommendation 8a	In performance of RFA, utilization of the moving shot technique via the transisthmic approach and delivery of energy only when the needle tip is visualized by US is paramount to effective ablation
Recommendation 8b	The moving shot technique via the transisthmic approach minimizes inadvertent thermal injury to surrounding critical structures



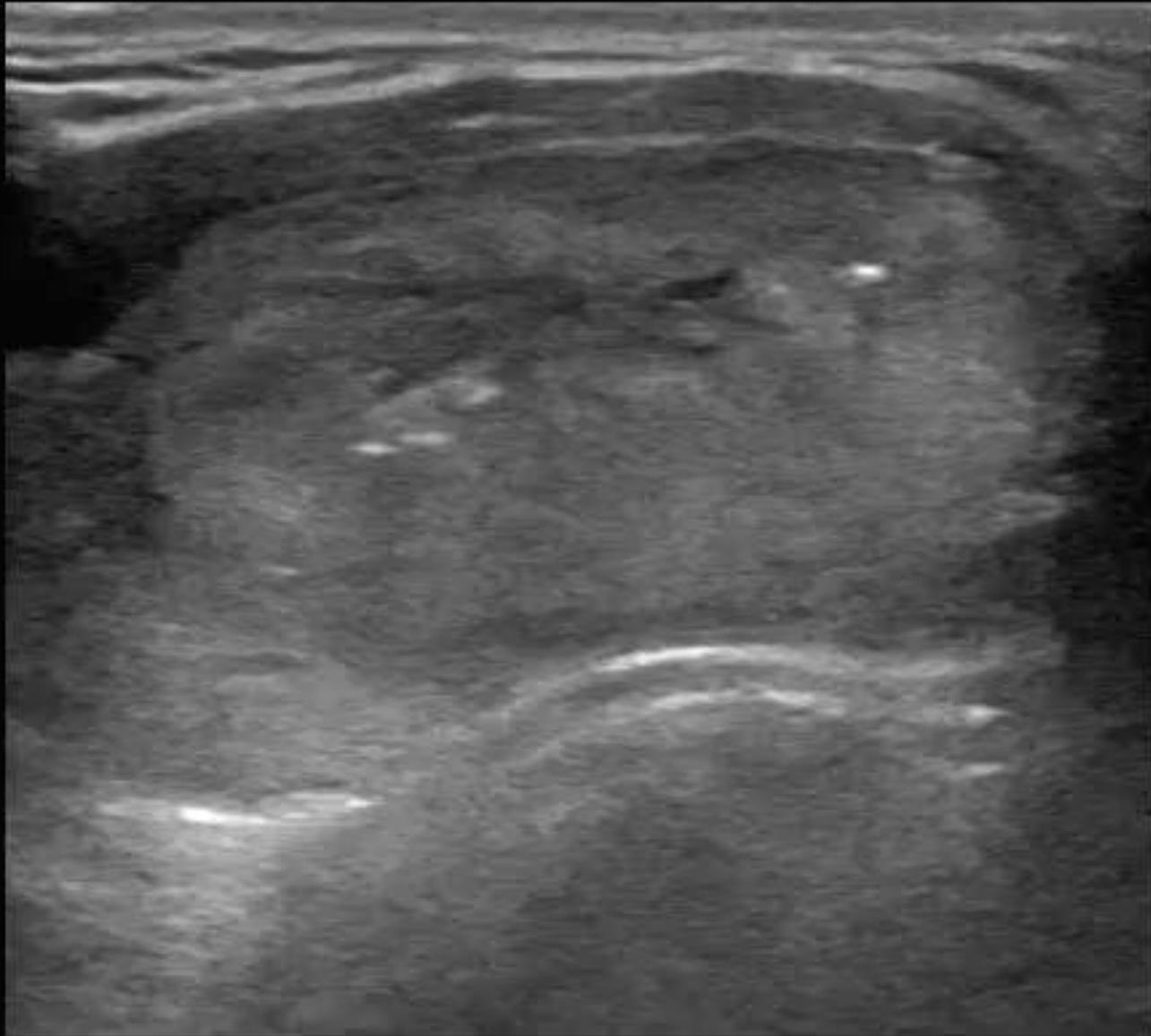
GE
P6



1-
II

2-

3-



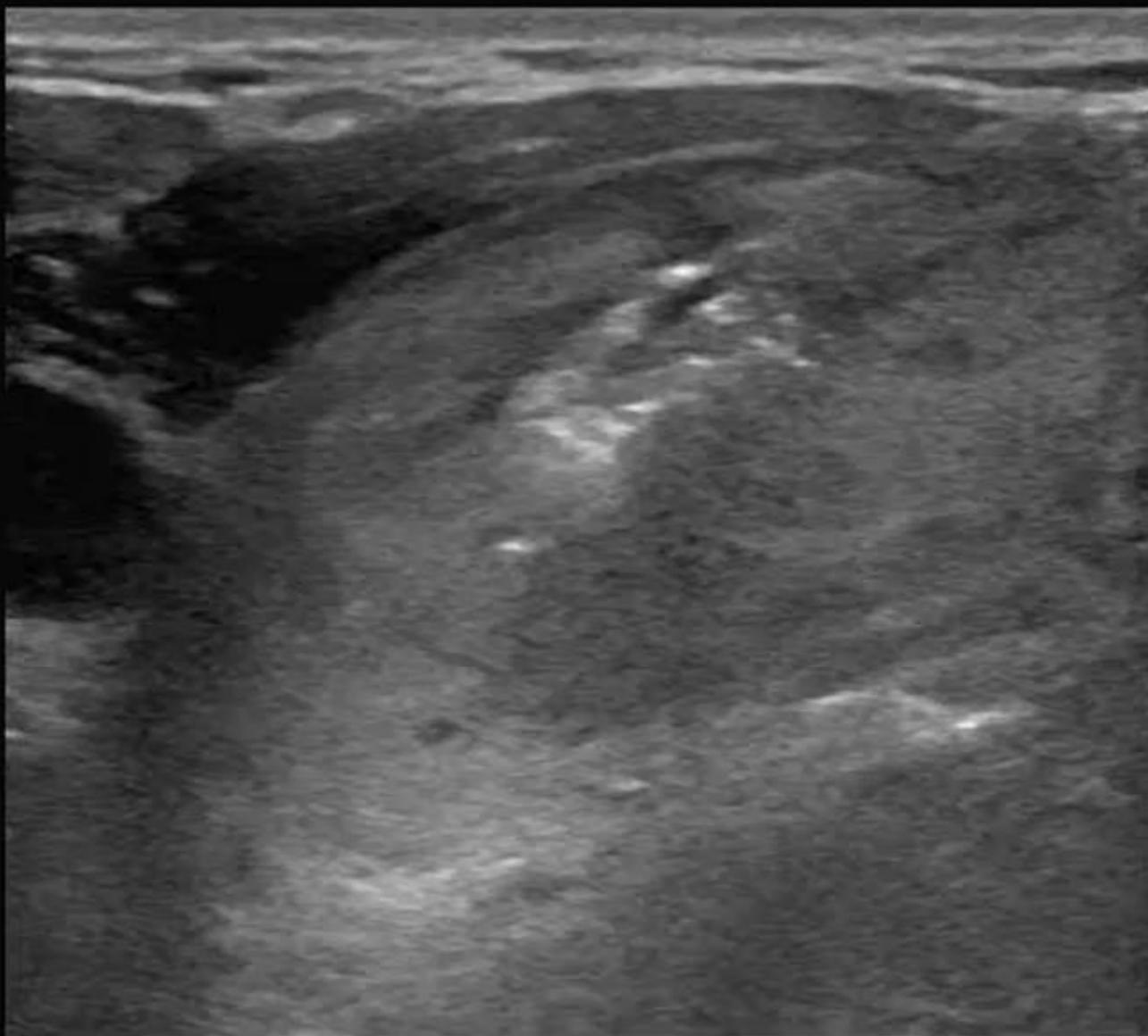
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2

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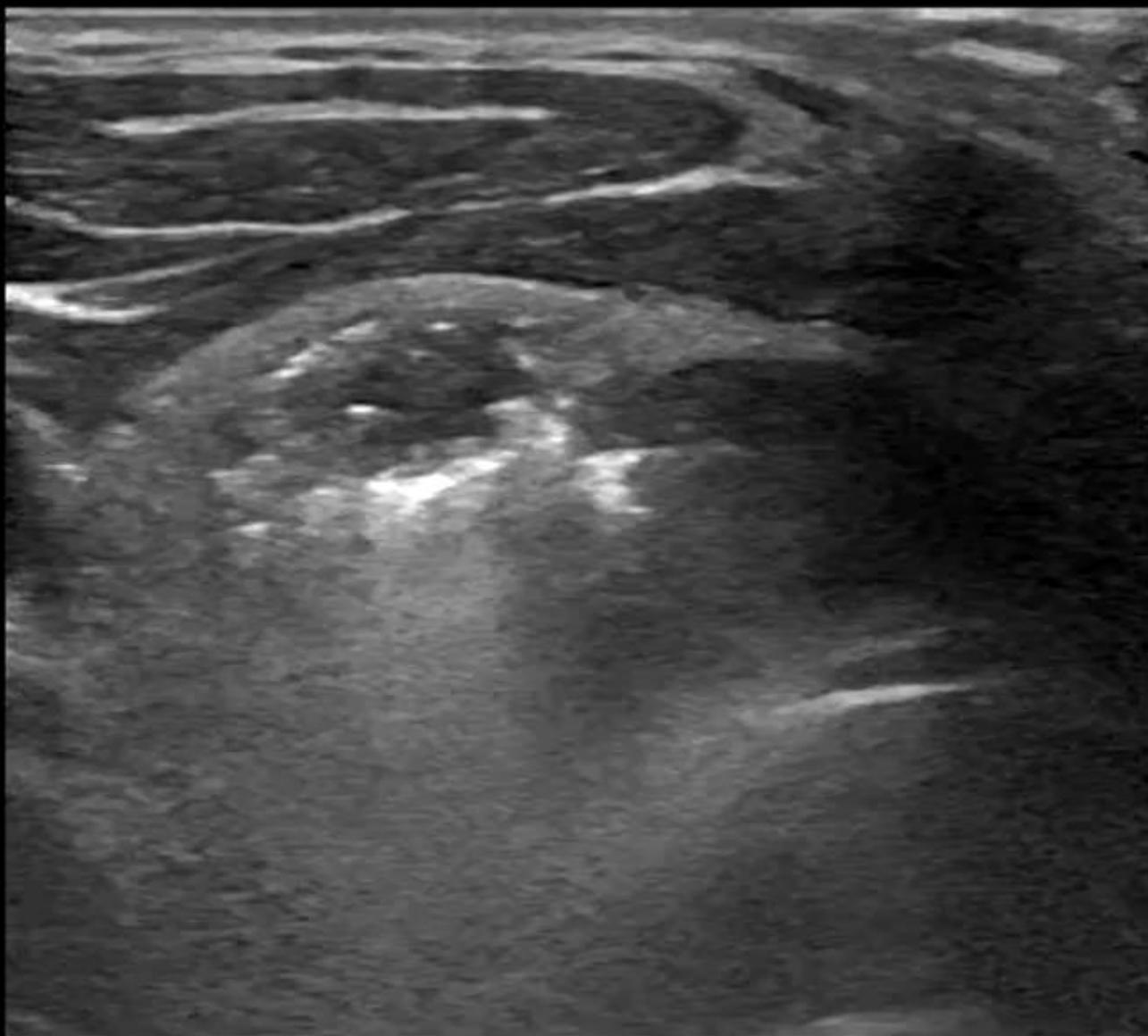


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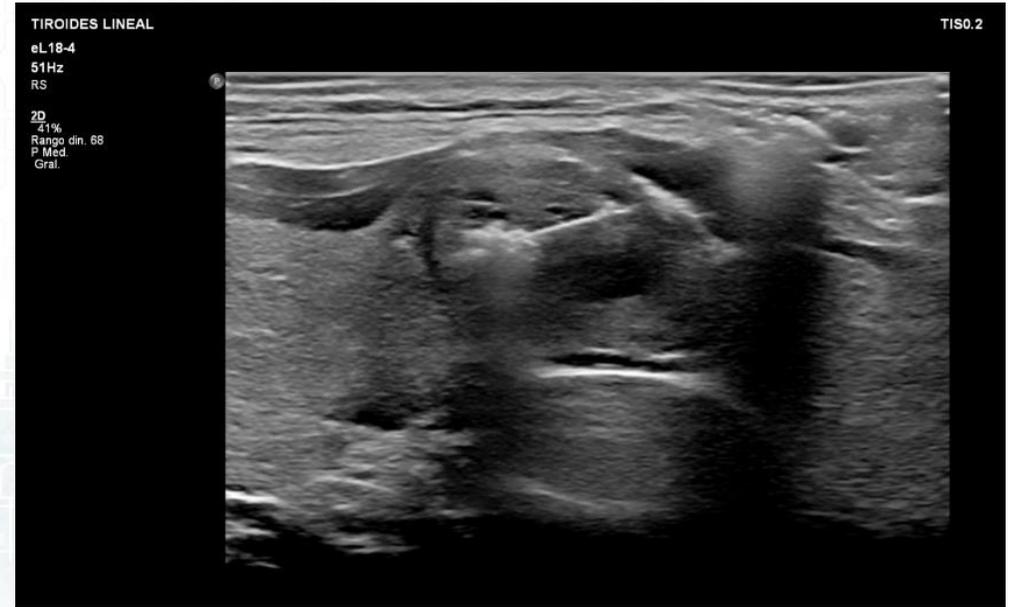
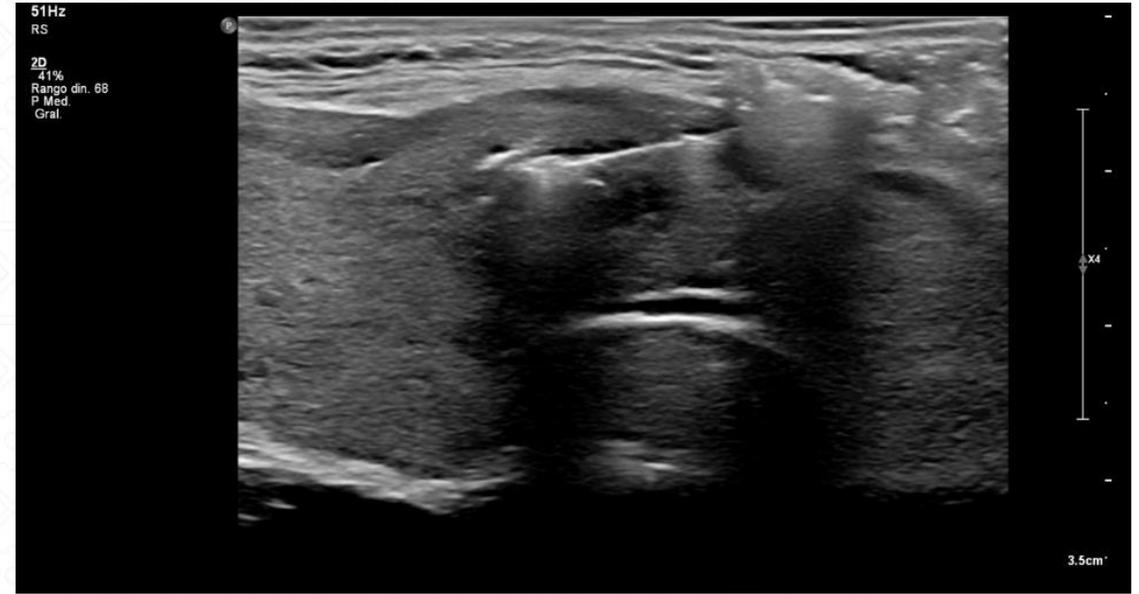
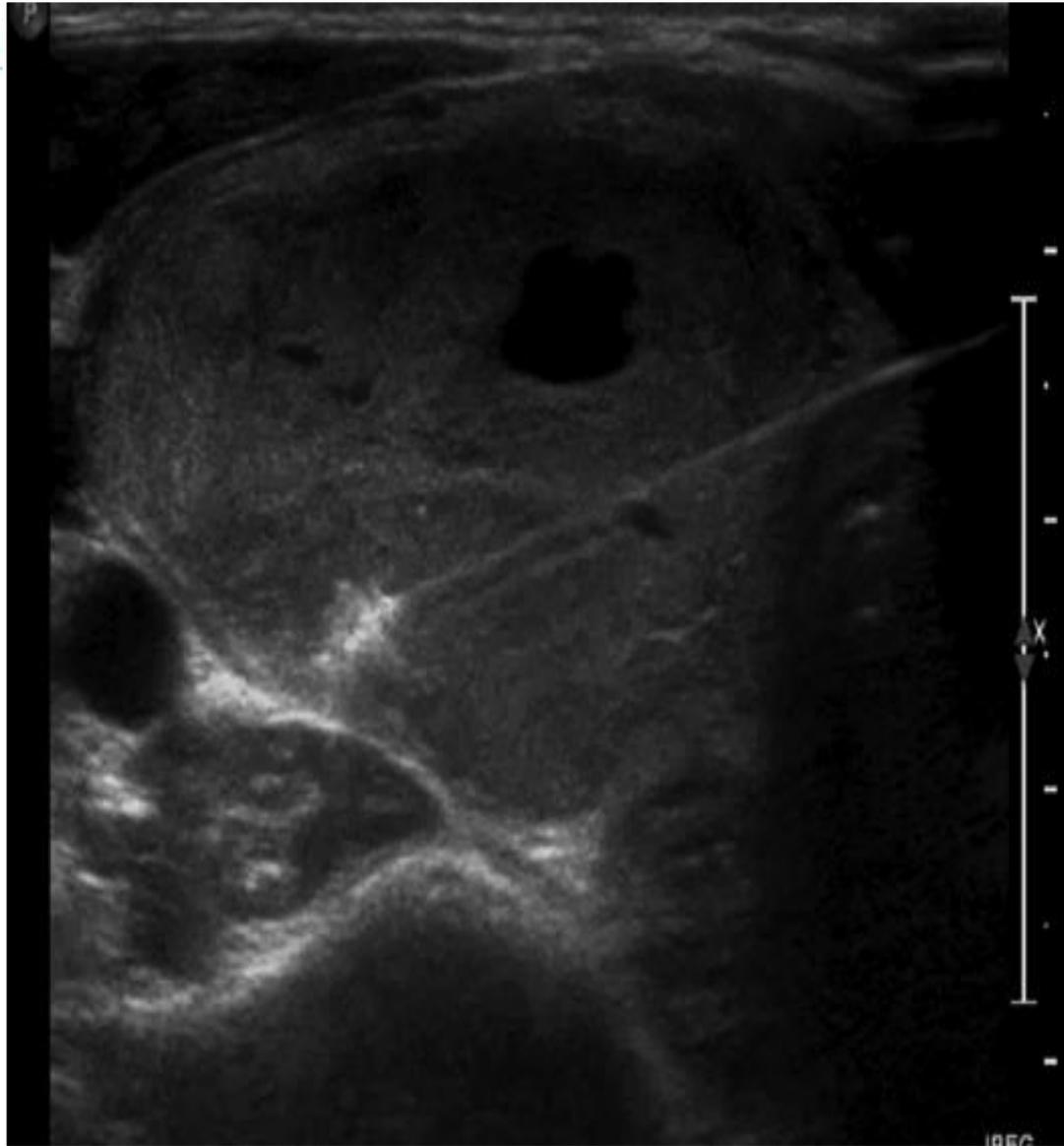


1-
II

2-

3-





TIROIDES LINEAL

eL18-4
47Hz
RS

2D
63%
Rango din. 68
P Med.
Gral.

P

HÍGADO IZQ. SAG.

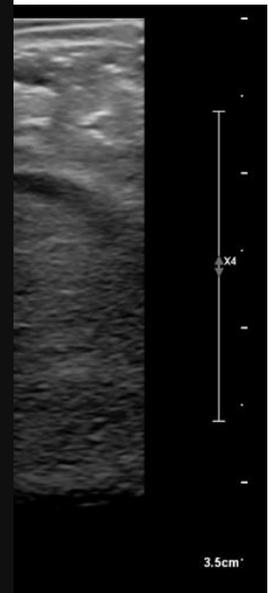


TISO.2 MI 0.7



5.0cm

*** lpm



Características técnicas recomendadas y agujas

Agujas con punta de diamante.

Agujas cortas (7 - 10 cm).

Diferentes longitudes de punta activa (3-15 mm).

Control automático de la potencia de salida.

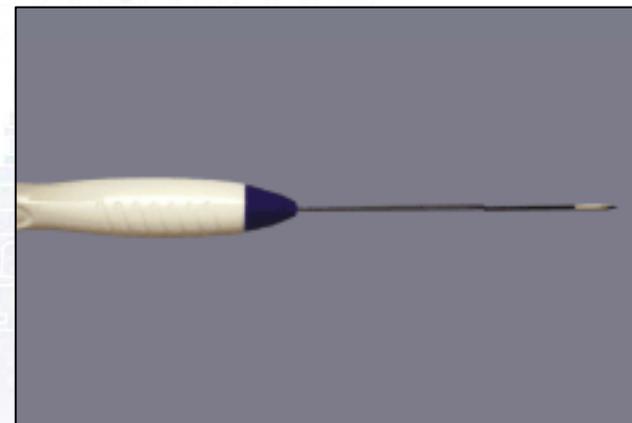
Buena visibilidad bajo ultrasonido.

Refrigeración interna.

Cánula centimetrada.

Uso múltiple por paciente.

Características técnicas recomendadas y agujas



Objetivo

Reducir el tamaño del nódulo, para minimizar lo más posible los síntomas compresivos, estéticos o funcionales del nódulo.

Reducir el Vol. Tumoral, paliativo o curativo.

Reducir la funcionalidad del nódulo, en el adenoma tóxico

Table 1 Published data about RF treatment of benign thyroid nodules

References	Journal	Treated nodules	Control group	US pattern (% of fluid component)	Scintiscan	Nodule volume at baseline (ml)	RF electrode type	RF session no.	Follow-up months	Volume reduction (%)
Kim [19]	<i>Thyroid</i>	35	No	Solid, mixed, cystic	Cold	6.3	17G c-e	1	6.4	73
Spiezia [22]	<i>J Am Geriatr Soc</i>	39	No			24	14G m-e	1-3	6	74
Jeong [20]	<i>Eur Radiol</i>	302	No	Solid, mixed, cystic		6.1	17G c-e	1-6	6	85
Baek [21]	<i>Thyroid</i>	1	No	Mixed	Hot	5.1	17G c-e		19	97
Deandrea [23]	<i>Ultrasound Med Biol</i>	33	No	Solid or mixed (<30 %)	23 Hot-10 cold	22.6-39.3	14G m-e	1	6	52-46
Spiezia [24]	<i>Thyroid</i>	94	No	Solid or mixed (<30 %)	28 Hot-66 cold	32.7-21.1	14G m-e	1-3	12	78
Spiezia [24]	<i>Thyroid</i>	Of whom 52	No	Solid or mixed (<30 %)			14G m-e	1-3	24	79
Baek [25]	<i>World J Surg</i>	9	No	Solid, mixed, cystic	Hot	15	17-18G c-e	1-4	6	71
Baek [26]	<i>Am J Roentgenol</i>	15	Follow-up	Solid or mixed	Cold	7.5	18G c-e	1	6	80
Lee [35]	<i>World J Surg</i>	27	No	Cystic or mixed (>50 %)		14	18G c-e	1-4	6	92 PEI + RF
Sung [33]	<i>Am J Roentgenol</i>	21	RF vs PEI	Cystic		10.2	17-18G c-e	1-3	6	92
Jang [36]	<i>Eur J Radiol</i>	20	No	Cystic or mixed (>50 %)		11.3	18G c-e	1-2	6	91 PEI + RF
Huh [27]	<i>Radiology</i>	15 vs 15	1 vs 2 RF sessions	Solid or mixed (<50 %)	Cold	13.3 vs 13.0	18G c-e	1 vs 2	6	70 vs 78 (ns)
Faggiano [28]	<i>J Clin Endocrinol Metab</i>	20	Follow-up	Solid or mixed (<30 %)	10 Hot-10 cold	13.3	14G m-e	1	9	85
Lim [29]	<i>Eur Radiol</i>	126	No	Solid, mixed, cystic		9.8	17-18G c-e	1-7	49	93
Sung [34]	<i>Radiology</i>	25	RF vs PEI	Cystic		9.3	18G c-e	1	6	93
Turtulici [32]	<i>Ultrasound Med Biol</i>	45	No		Cold	13.5	18G c-e	1	6	72
Sung [37]	<i>Thyroid</i>	44	No	Solid or mixed (<90 %)	Hot	18.5	18G c-e	1-6	19.9	81
Cesareo [31]	<i>J Clin Endocrinol Metab</i>	42	Follow-up	Solid or mixed (<30 %)	Cold	24.5	17G c-e	1	6	68
Bernardi [30]	<i>Int J Endocrinol</i>	37	Surgery	Solid or mixed	12 Hot-25 cold	12.4	18G c-e	1-2	12	70

c-e Cooled electrode, m-e multined electrode

Resultados según las características ecográficas del nódulo

Table 10. Comparison of Efficacy of RFA between Cystic Thyroid Nodules and Solid Thyroid Nodules

Number	Authors	Cystic Nodules				Solid Nodules			
		Sample Size	Nodule Volume at Baseline (mL)	Nodule Volume after Treatment (mL)	VRR (%)	Sample Size	Nodule Volume at Baseline (mL)	Nodule Volume after Treatment (mL)	VRR (%)
1	Aysan et al. (125)	14	32.48	0.79	97.55	51	9.99	3.07	69.21
2	Kim et al. (6)	22	NA	NA	79.8	13	NA	NA	54.2
3	Lim et al. (116)	45	NA	NA	96	81	NA	NA	92

Table 11. Comparison of Efficacy for Cystic Thyroid Nodules between EA and RFA

Number	Authors	EA				RFA			
		Sample Size	Nodule Volume at Baseline (mL)	Nodule Volume after Treatment (mL)	VRR (%)	Sample Size	Nodule Volume at Baseline (mL)	Nodule Volume after Treatment (mL)	VRR (%)
1	Baek et al. (107)	24	14.7	2.45	83.1	22	8.6	1.1	87.1
2	Sung et al. (11)	36	13.83	0.95	93.1	21	10.19	0.79	92.2
3	Sung et al. (128)	25	12.2	0.38	96.9	25	9.3	0.62	93.3

EA = ethanol ablation

¿Factores que influyen en eficacia de la ablación de un nódulo tiroideo?



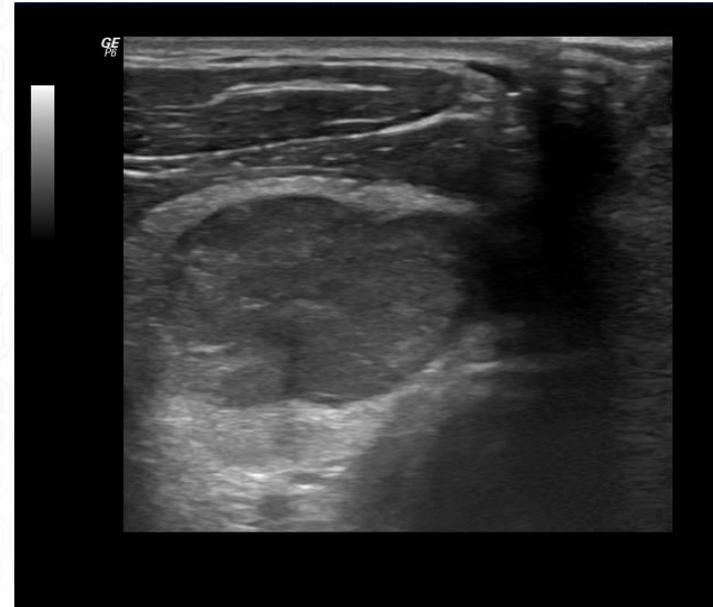
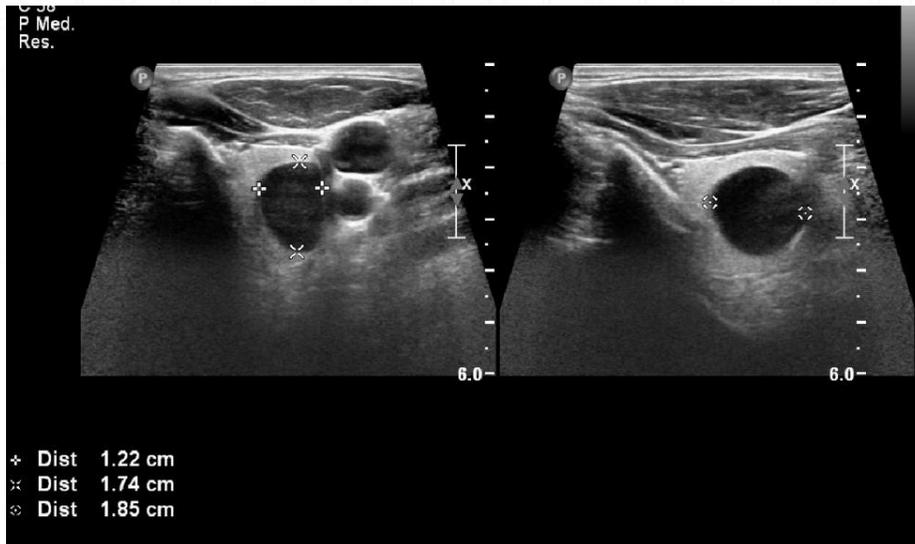
Márgenes mal definidos del nódulo.

Calcificaciones grumosas amplias.

**Presencia de conglomerados nodulares
(tienen peor respuesta que los únicos y solitarios).**

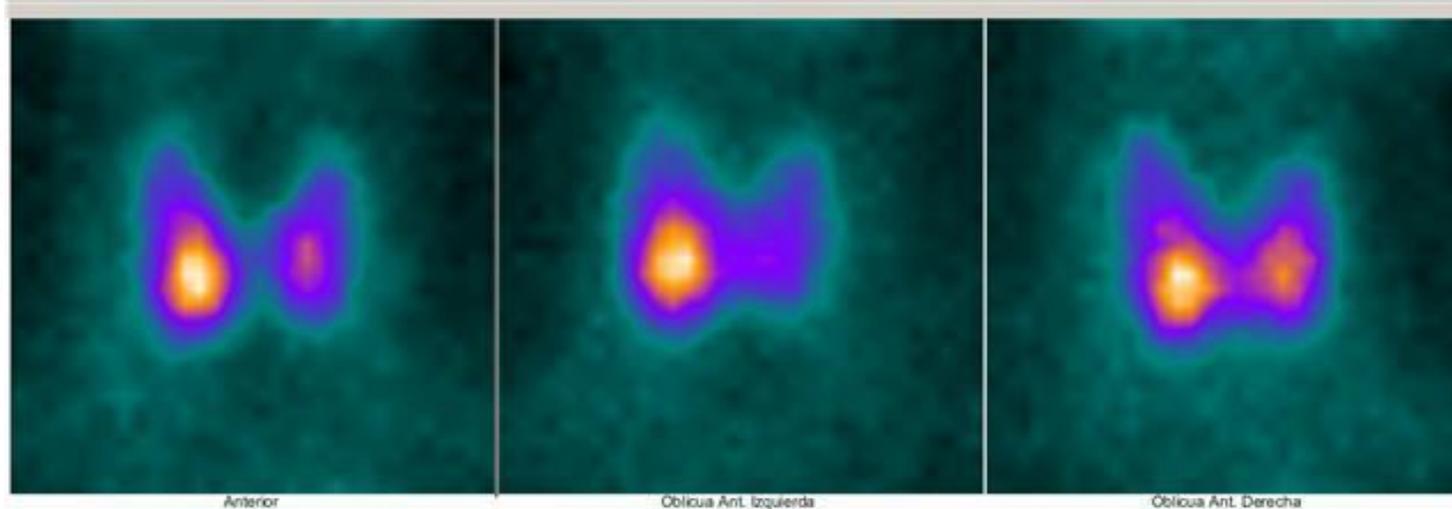
Los muy vascularizados.

Resultados según la funcionalidad del nódulo



En los nódulos sólidos y quísticos fríos, hay series que describen una reducción desde un 90-97% volumen (mejor respuesta en los quísticos).

Resultados según la funcionalidad del nódulo



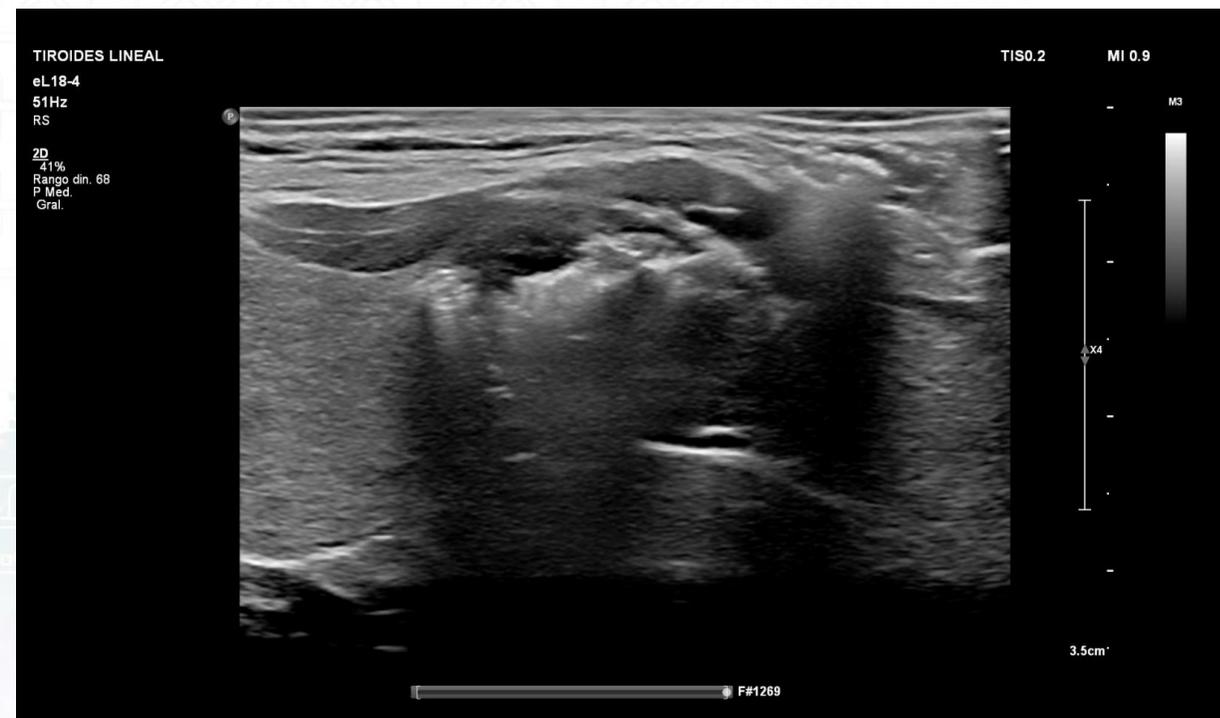
- En los nódulos calientes se puede reducir el volumen hasta un 88% y se puede reducir la necesidad de terapia antitiroidea en torno al 50% (generalmente los <de 20 ml de volumen).
- En los nódulos calientes hay riesgo de que las porciones no tratadas del nódulo suplan la hiperfunción.
- Si mide >20 ml, es casi seguro que va a necesitar más de un procedimiento.

¿La localización del nódulo contraindica el tratamiento ablativo?



NÓDULOS EN EL ITSMO

CRECIMIENTO ENDOTORÁCICO



Resultados en el HUBU

RESULTS - % of VRR over time (months)	1	3	6	12	24	36
Total	32.98	52.10	56.82	68.76	69.92	76.84
Solid	37.48	60.06	60.30	66.49	65.56	78.42
Mixed	28.03	41.75	52.31	71.26	74.29	75.58

Postprocedimiento

Valorar hematoma y cambios en la piel.

Disfunciones de cuerdas vocales.

Prescribir analgesia simple el primer día.

A los 7 días en consulta, se valorará contaje sanguíneo, función tiroidea y palpación del nódulo.

Ecografía al mes, 3, 6 meses y anual: volumen y vascularización.

Riesgos de la RF/MW

Complicaciones mayores (1,4%): afectación del nervio laríngeo, ganglio simpático cervical, plexo braquial, nervio accesorio espinal, rotura del nódulo.

Complicaciones menores (3,3%): hematoma, dolor, tirotoxicosis, tos, cambio de la voz temporal, vómitos, cicatriz piel, fiebre.

Complicaciones en el tratamiento del cáncer recurrente (6,71%).

Complicaciones RF-MW

Complications or side effects	RFA group No. (%)	MWA group No. (%)	P value
Major complications	31 (4.78)	40 (6.63)	p = 0.156
Voice change	29 (4.47)	35 (5.80)	
Nodule rupture with/without infection	2 (0.31)	4 (0.66)	
Sympathetic nerve injury	0 (0)	1 (0.17)	
Minor complications	13 (2.00)	15 (2.49)	p = 0.562
Hemorrhage/hematoma	13 (2.00)	12 (1.99)	
Vomiting	0	1 (0.17)	
Skin burn	0	1 (0.17)	
Hyperthyroidism	0	1 (0.17)	
Side effects	32 (4.93)	28 (4.64)	p = 0.812
Pain with oral analgesics	20 (3.08)	17 (2.82)	
Coughing	0	1 (0.17)	
Mild fever (37–38.1)	12 (1.85)	10 (1.66)	

Características ecográficas del nódulo post-tratamiento



¿Es útil la eco con contraste tras el procedimiento ablativo?

¿Aporta algo en el tratamiento de los nódulos benignos?

¿Y en los malignos?



INDICACIONES DE TRATAMIENTO ABLATIVO EN LAS GLÁNDULAS PARATIROIDES

Adenoma en pacientes con alto riesgo quirúrgico

Hiperplasia paratiroidea en la enfermedad renal terminal.

- En ambos casos se ha demostrado eficaz, en cuanto al descenso de niveles de PTH, calcio y fósforo.
- Las complicaciones son mínimas (hematoma, dolor, infección 2ª, lesión en el nervio laríngeo, hipocalcemia).

INDICACIONES DE TRATAMIENTO ABLATIVO EN LAS GLÁNDULAS PARATIROIDES

• Criterios de inclusión:

- Pacientes sintomáticos.
- Rechazo de la cirugía: IC severa, disfunción pulmonar severa, intolerancia a anestesia general.
- Elevación del Ca sérico mantenido.
- Riesgo elevado de fragilidad/fractura ósea.
- Reducción del aclaramiento de creatinina < 60ml/minuto.
- Edad < 50 años.
- Identificación de la glándula en la ecografía.
- Gammagrafía positiva.

TRATAMIENTO ABLATIVO EN LAS GLÁNDULAS PARATIROIDES

Consideraciones al procedimiento respecto al tiroides:

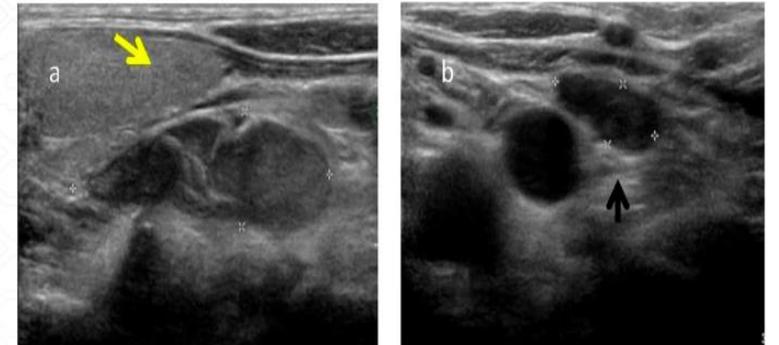
Trabajo en el triángulo peligroso

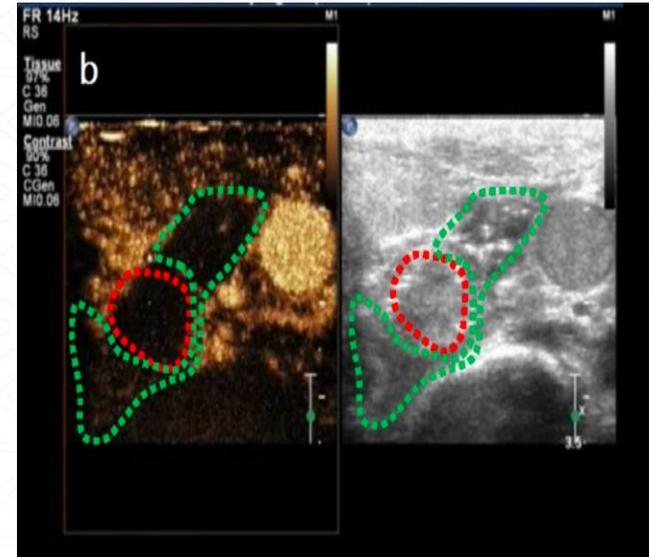
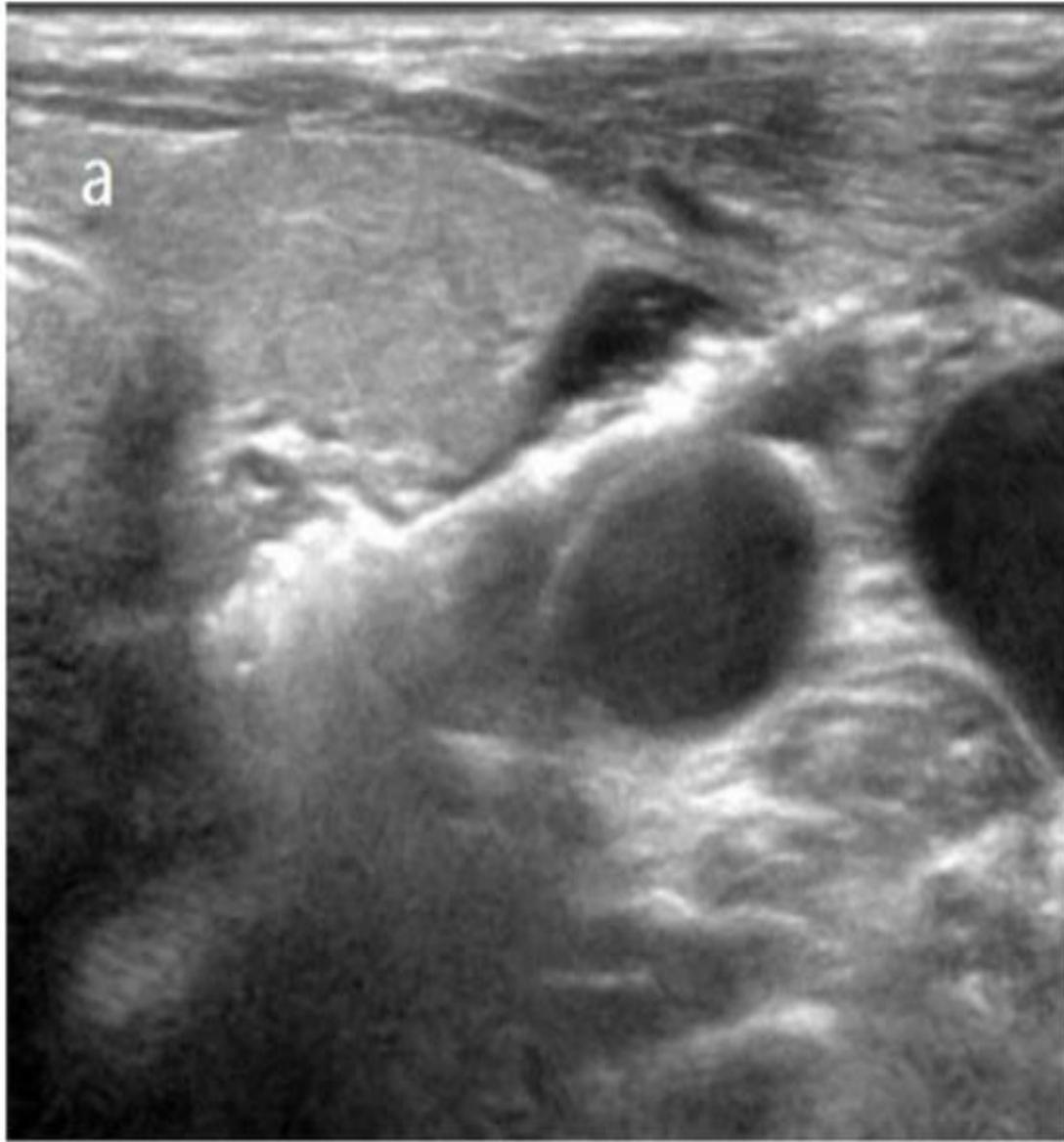
Siempre hidrosección.

Recomendable realizarlo en dos tiempos.

No transístmico.

Valoración de las cuerdas vocales previa y posterior al procedimiento por ORL.





Conclusiones en función de la experiencia y de la literatura

A favor

Escasas complicaciones

Técnica sencilla

Más barato que cirugía

Sin ingreso

Aval bibliográfico

En contra

- Eficacia limitada. No es radical. Hay que dejar margen de seguridad=Riesgo de recrecimiento = reablación en tiempo aproximado de 5 años.

- N° de procedimientos.

Conclusiones:

Se necesitan todavía estudios para determinar:

Riesgo de recrecimiento.

Nº óptimo de sesiones para disminuir el volumen del nódulo.

La ablación por RF de nódulos tiroideos, es una alternativa a la cirugía en nódulos benignos, hiperfuncionantes y en el cáncer recurrente de tiroides.

Es una técnica asequible para radiólogos que tienen experiencia en estos procedimientos.

Acorta la estancia hospitalaria y la morbilidad del tratamiento de esta patología.

Disminuye el gasto por proceso.

Las complicaciones son mínimas.

MUCHAS GRACIAS

