Thyroid Thermoablation

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Thermoablation

- Laser
- Radiofrequency
- Microwave
- High-intensity focused ultrasound therapy

Thermoablation

- ~~Laser~~
- **Radiofrequency**
- **Microwave**
- ~~High-intensity focused ultrasound therapy~~

We talk about… treatment

- Benign thyroid nodules (BTN)

  Large nodule (no cystic)
  Autonomously functioning thyroid nodule (AFTN)

- Cancer

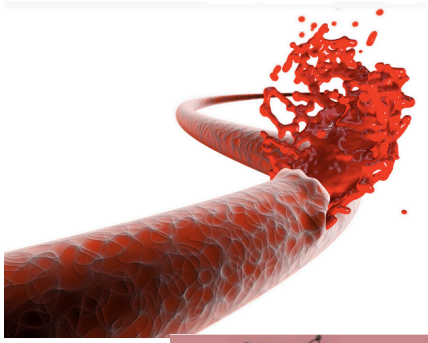
  in situ
  recurrent thyroid cancer (palliative) (validé par équipe italienne)

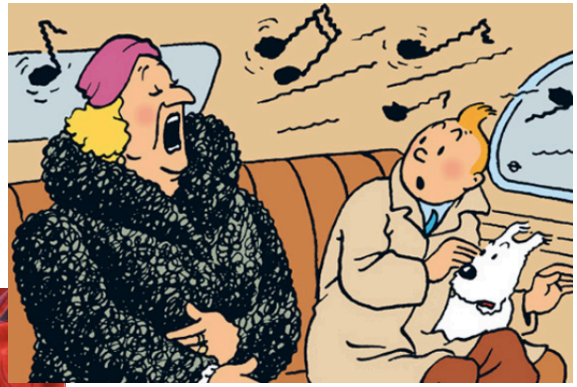
Today – BTN = surgery



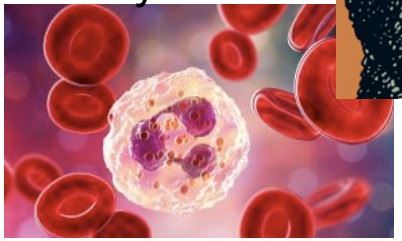


- General anesthesia
- Time hospitalisation ++
- Bleeding risk
- Nerve lesion (permanent voice change)
- Hematoma
- Hypothyroidism
- Hypoparathyroidism
- Inflammatory respond
- Long recovery













Today – AFTN = surgery or radiolode*

- Radiation exposure
- Hypothyroidism



*Comparison between radio iodine therapy and single-session radiofréquence ablation of autonomously functioning thyroid nodules: a retrospective study - Clinical Endocrinology 2019)

Alternative : thermoablation

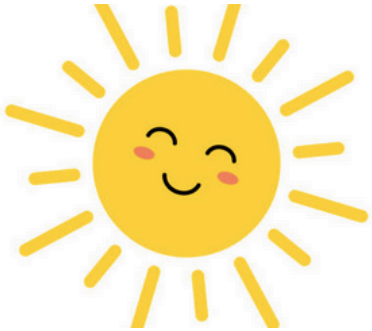
- Minimal invasive technique
- Us-guided
- Large efficacy
- Duration: 20’



Thermoablation

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Advantages



- One day hospitalisation
- Less cost (for health care and hospital)
- Less hypothyroidism
- Rapid recovery
- Local anesthesia
- No scar or minimal

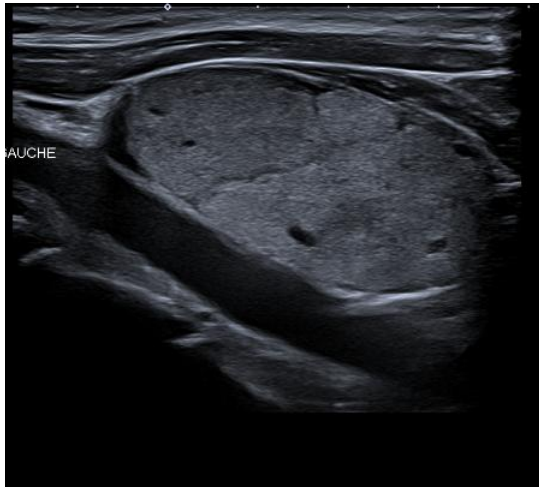


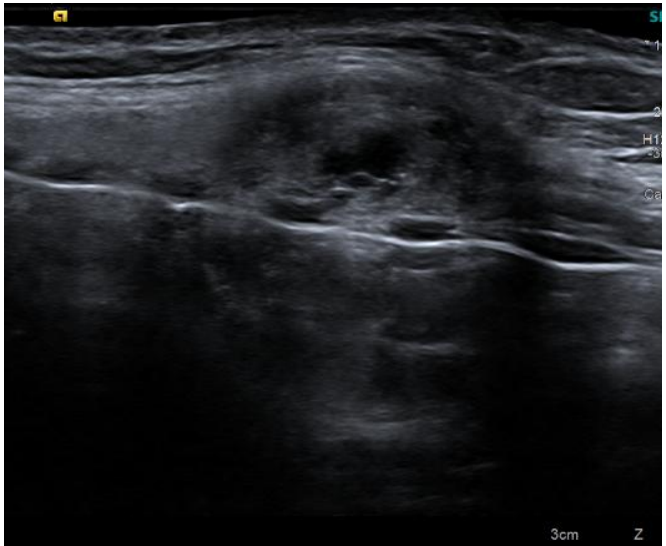


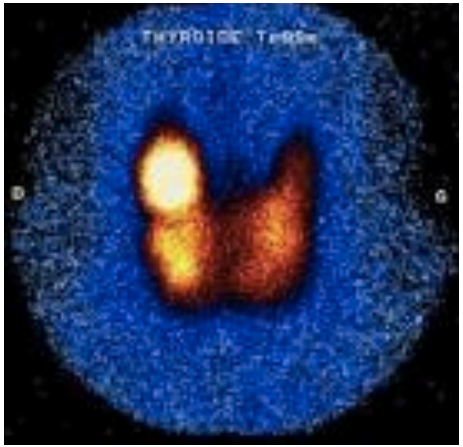


Indications

- Unique benign thyroid nodule, solid component
- Cosmetic
- Symptoms (dysphagia, neck discomfort, cough…)
- AFTN (first or second line?)
- Decline surgery

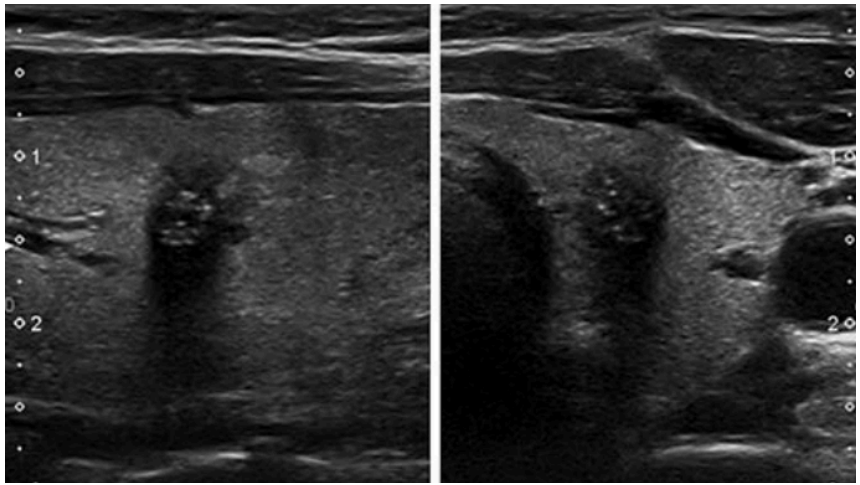


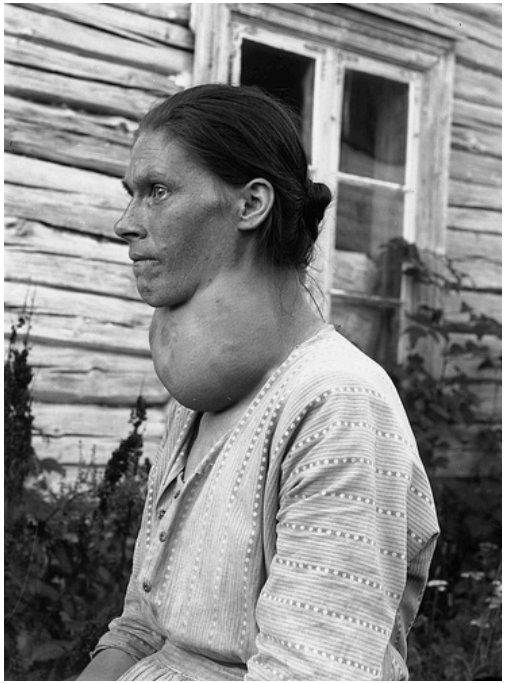


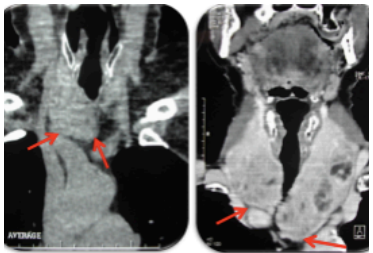


Exclusion

- Multinodular goitre
- EU-TIRADS 5 US criteriea – neoplasia
- Lack of access
- Pacemaker (if radiofrequency)
- Controlateral vocal cord palsy







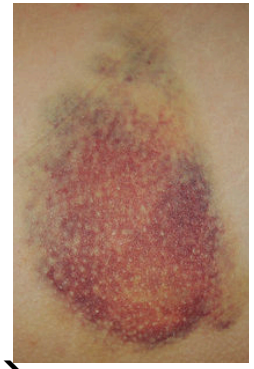
Complications

- Complication rate after RFA : **3,3%** with a major complication rate of 1,4% (Radiofrequency ablation of thyroid nodules: basics principles and clinical application 2012)

- 4% thermoabation MWA versus 14% surgery (ultrasound guided microwave ablation Benin thyroid noodles: effects on inflammatory factors and thyroid function 2021)
    - 150 patients, 75 in each group traditional surgery VS US-guided percutaneous MWA ablation.

Complications







- Pain (decrease rapidly when reduce power)
- Hematoma 3%
- Recurrent nerve lesion (recovery or permanent) <1% → avoid or reduce if undertreating the danger triangle or use the moving shot or fluid motion technique).
- Skin burn <1%
- Nodule rupture (neck bulging and pain) because of acute volume expansion
- Thyroid dysfunction (normalized 3 – 6 months after) 1,3%
- Re-growth









Complication

- About one major complication with the italian team (Dr Aliberti and Dr Casaril) :

NEVER TREAT BILATERAL NODULE IN THE SAME TIME

→ Oedema
→ Asphyxia
→ Intubation
→ Intensive care-unit



Results

- Volume reduction

  - Mean volume change 90% - final volume reduction rate 94% (but mainly cystic nodules were treated with best results). If lack of respond, they ablate again after 6 months. Power used 30-50 watts. CEUS « black hole sign »

  → Ultrasound-guided microwave ablation in treatment of benign thyroid nodules in 435 patients. Experimental Biology and Medicine 2017; 242: 1515-1523.

  - Is RFA better ? → carbonisation if high power

  → Z. Cheng, Y Che; US-guided percutaneous radiofrequency versus microwaveablation for benign thyroid nodules: a prospective multicenter sudy; scientific reports, 7: 955. 2017

- No thyroid function change (or transient)

RFA vs MWA

- Maximal diameter reduction ratio (MDRR)
- Volume ratio rate (VRR)
- Symptomatic score
- Cosmetic score
- Vascular score
- Therapeutic success rate

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SCIENTIFIC REPORTS

OPEN

US-Guided Percutaneous Radiofrequency versus Microwave Ablation for Benign Thyroid Nodules: A Prospective Multicenter Study

Received: 16 December 2016
Accepted: 31 July 2017
Published online: 25 August 2017

Zhigang Cheng[1], Ying Che[2], Songyuan Yu[3], Shurong Wang[4], Dengke Teng[5], Huixiong Xu[6], Jianwei Li[7], Desheng Sun[8], Zhiyu Han[1] & Ping Liang[1]

Compared with microwave ablation (MWA), percutaneous radiofrequency ablation (RFA) and laser ablation (LA) have been recommended as minimally invasive treatments for patients with symptomatic benign thyroid nodules (BTNs) because of the large number of clinical applications. This prospective multicenter study sought to evaluate the clinical outcomes of RFA and MWA for BTNs. In eight

Conclusion

Both RFA and MWA under percutaneous US guidance are safe and effective techniques for selected patients with BTNs due to their low incidence of complications and side effects, significant shrinkage of the nodular volumes and the significant improvement of patients' symptoms and cosmetic concerns related to the nodules. Larger MDRR and VRR can be achieved in the RFA group than those in the MWA group at 6 months and later follow-up.

RFA vs MWA

Conclusion

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studies, the mean VRRs of RFA, LA and MWA were 89.9 ± 10.2%[18], 72 ± 11%[27] and 65 ± 65%[15], respectively. A recent retrospective study[16] concluded that the VRRs achieved by RFA and MWA for the treatment of BTNs at 1, 3, 6 and 12 months follow-up were no statistical significance. To compare with the results of our study, except the influence of the number of the enrolled patients, a low microwave power output of 20–35 W might contribute to minimize the carbonization in the ablated nodules and increase the VRR of MWA group at follow-up.

Decreasing the power output during the MWA procedure might be an effective method to increase the MDRR and VRR when treating BTNs. In the present study, the mean power output for MWA was significantly less than that for RFA; however, it was still not enough to minimize carbonization. Thus, 20–30 W of microwave power output would be recommended in further applications. One of the possible causes of the longer procedure time in MWA was that microwaves need to be carried in waveguides, such as coaxial cables, which are typically more cumbersome than the fine wires used to feed energy to RF electrodes[24] and are inconvenient when performing the freehand moving shot technique. Furthermore, whether BTNs with a rich blood flow would be beneficial for the high central temperature during the MWA procedure should be further evaluated by a comparative clinical study.

Results*

- Nodule volume reduction is not immediate
  - Until 85-90% after 12 months (30-50% after 1 month and 50-85% after 6 months). Repeat if needed.

- Symptom improvement (90-95%)
- Cosmetic results : excellent (94%)
- No major complication (transcient NLR lesion is considered as minor)
- Rapid recovery
- Less inflammatory respond

* Radiofrequency ablation compared to surgery for the treatment of benign thyroid nodules. International journal of endicrinology; volume 2014, Article ID 934595, 10 pages. S. Bernardi, C. Dobrinja. Italy.

Results – AFTN*

- Until 85% is small nodule (< 12 mL) but 45% if large nodule (> 12 mL)*
- Correlation between restoration of normal thyroid function with a >80% reduction of initial volume*

- If larger nodule, combined treatment RAI + TA → better volume nodule reduction and significantly lower dose of RAI **

*R. Cesareo. Radiofrequency ablation on Autonomously functioning thyroid nodules: a criterial appraisal and review of the littérature. Font Endocrinol 2020; 11: 317

** E. Papini, H. Monpeyssen; 2020 European thyroid association clinical practice guideline for the use of imaged-guided ablation in benign thyroid nodule. European Thyroid Journal 2020;9:172-185

Inflammatory respond

Am J Transl Res 2021;13(12):13723-13731
www.ajtr.org /ISSN:1943-8141/AJTR0135382

Original Article

Ultrasound-guided microwave ablation of benign thyroid nodules: effects on inflammatory factors and thyroid function

Zheng Chen, Xin Guo, Xin Yin, Ke Wang, Sa Zhang, Jiaping Li

Interventional Ultrasound Department of Huazhong University of Science and Technology Union Shenzhen Hospital, Shenzhen, Guangdong, China

Received May 18, 2021; Accepted August 23, 2021; Epub December 15, 2021; Published December 30, 2021

Abstract: Objective: To explore the effects of ultrasound-guided microwave ablation on inflammatory factors and

Inflammatory respond

- Control group: 75 patients → surgery
- Study group: 75 patients → microwave

They compared clinical effect, quality of life scores, withe blood cell count (WBC), hypersensitive-c-reactive-protein (hs CRP), tumor necrosis factor alpha (TNF a), interleukin(IL)-6, epinephrin (E), norepinephrine (NE), visual analogue scale (VAS), serum levels of thyroid stunting hormone (TSH), FT3, FT4 and TT4.

→ **the total effective rate of the study group was significantly higher than that of the control group (96% vs 73,33%).**

€€€

MWA: needle price (800 -1400€) → for the patient !

Procedure

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Before treatment

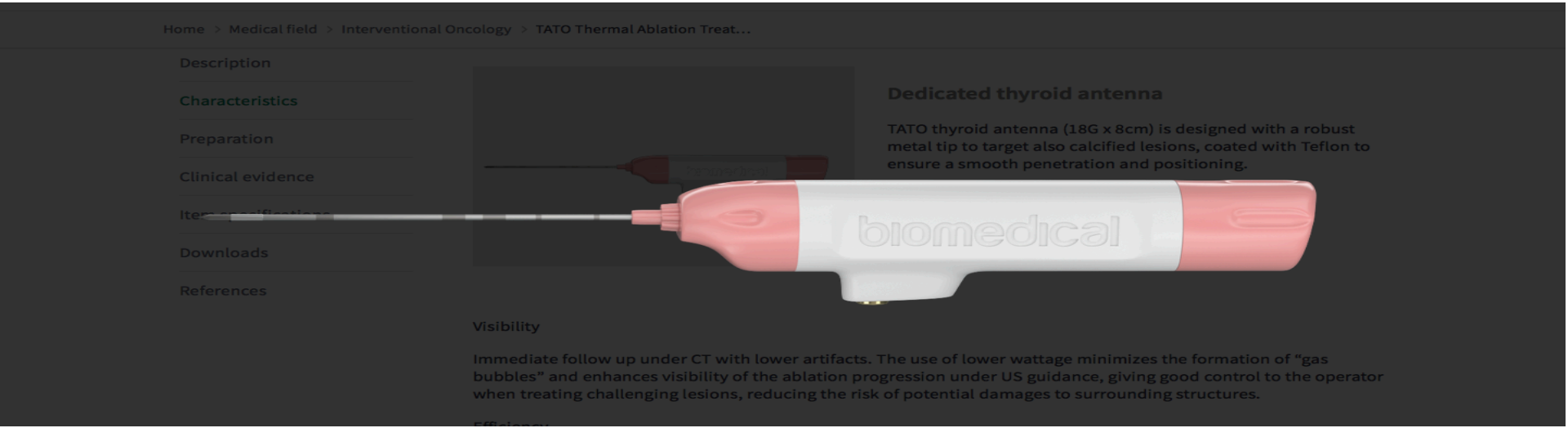
- Laboratory tests: a complete blood count, coagulation battery, TSH, T3, T4, thyroid antibodies, calcitonin
- Scintigraphy if AFTN
- Cytology (2x) US-guided fine needle
- Us examination (location, structure, access)

TATO

Thermal Ablation Treatments for Oncology



TATO – MWA

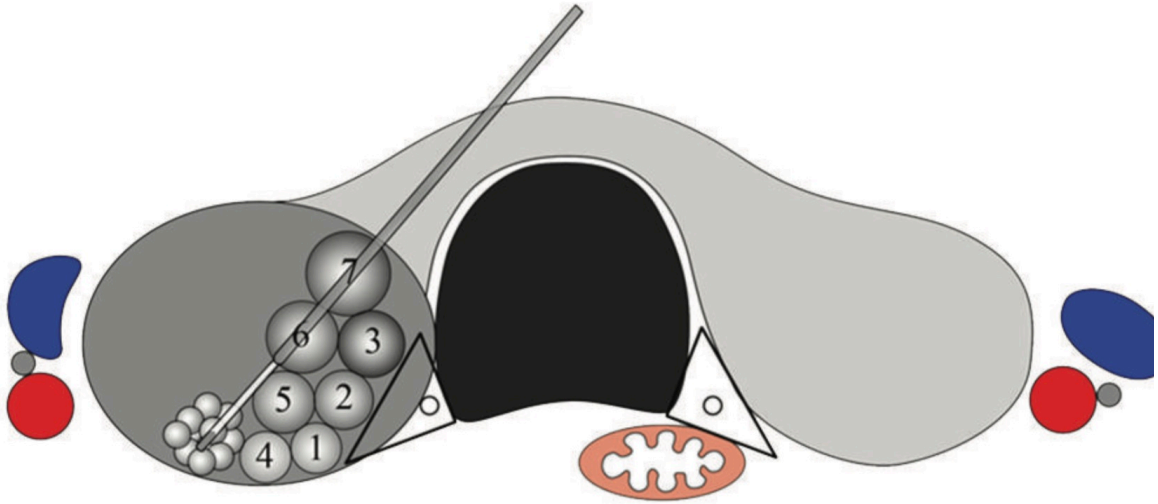


Antenne 18G – dédiée thyroide

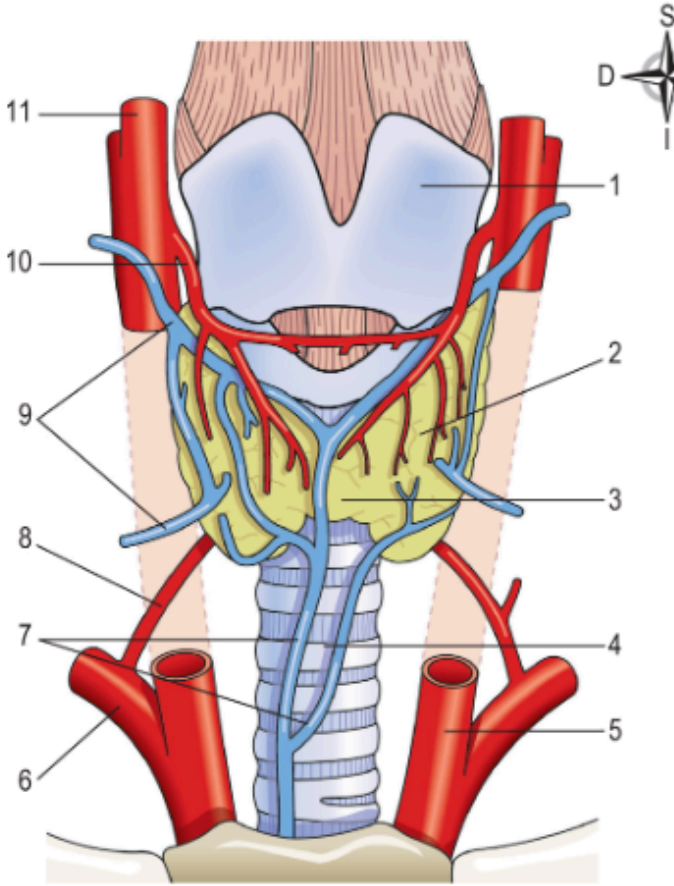




Installation



Anatomy – Danger triangle



Technique

- Local anesthesia (1-5 mL Linisol 2%)
  - Skin – capsule
  - Pain sensibility is a necessity to avoid burn
  - Communication with the patient
- Moving shot technique OR Fluid motion technique
  - Fluid motion technique → Low power 15 - 30 watt → Decrease the burn risk of nobles structures, decrease pain and decrease carbonisation.
- Hydrodissection

After

- 2-3h laying down
- Cool pads
- US control

Follow up

- Biological control
  - If thyroid dysfunction, control until 1 year
- US 1 – 3 – 6 – 12 months ?
- +/- scinti

- Control every year in the begining to prevent regrowth

- If failure → ablate again or surgery

Technique

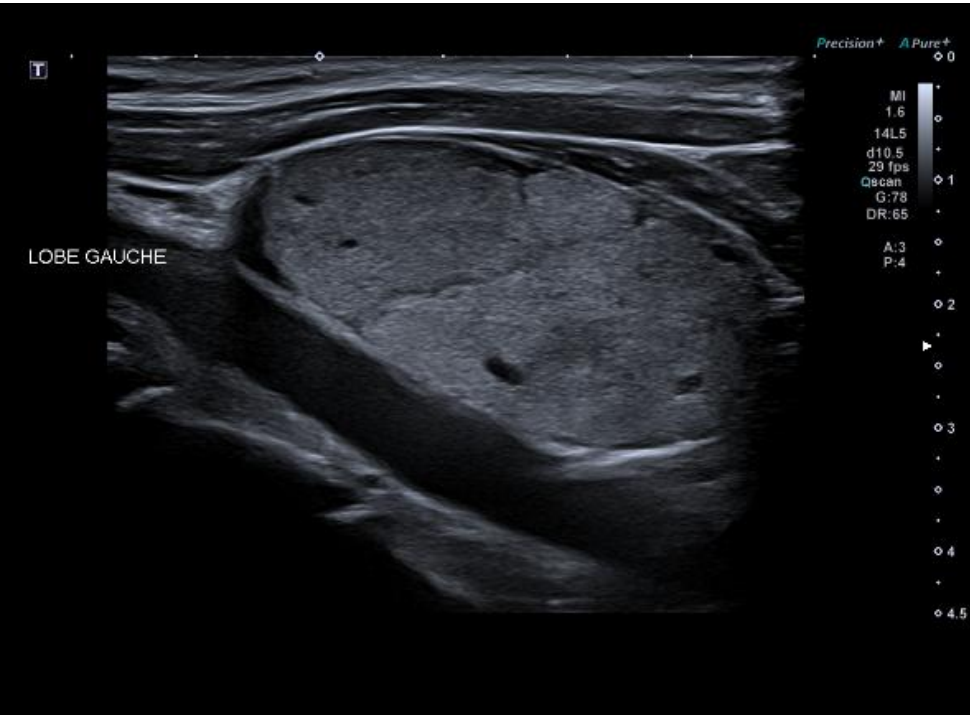
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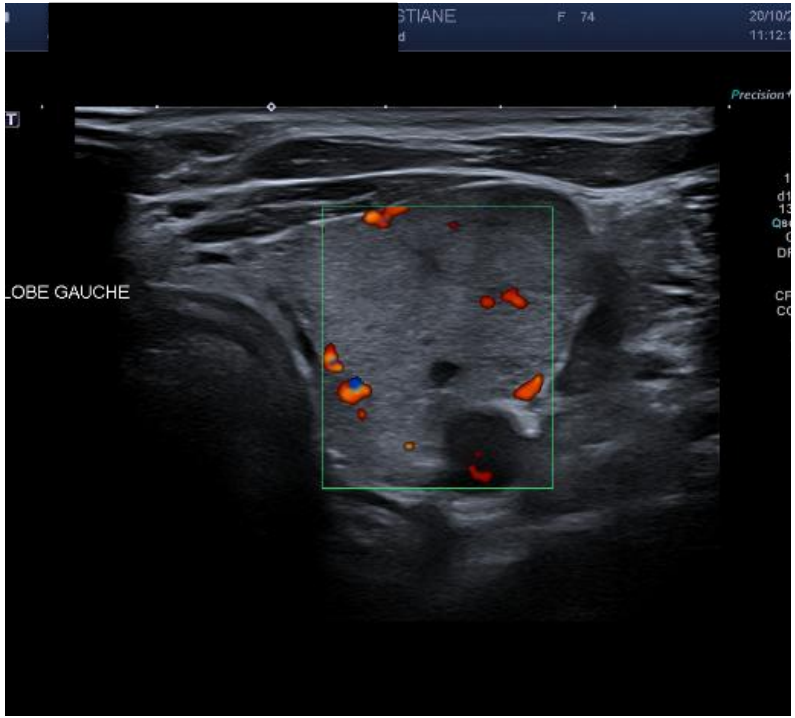
A few cases

Jolimont 2022



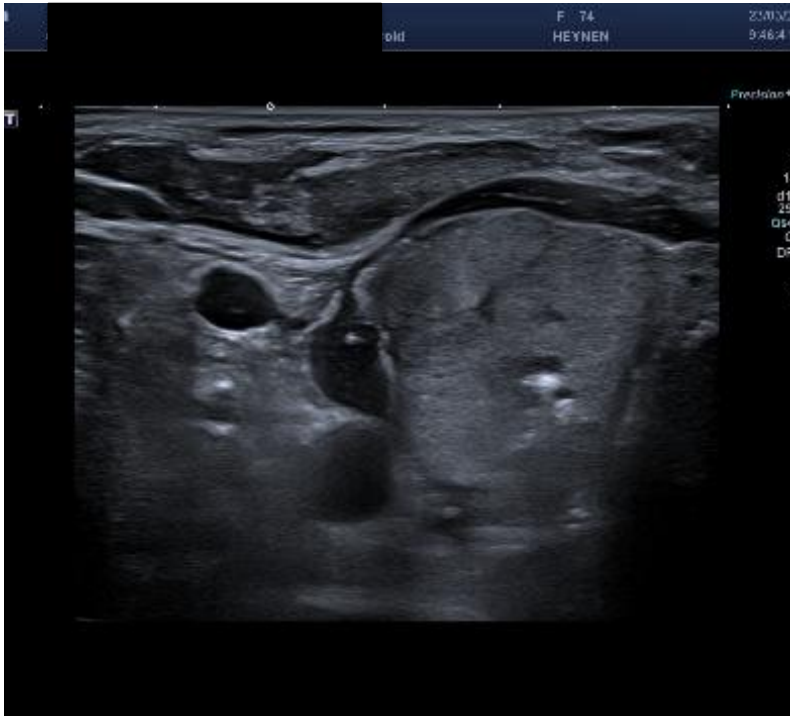
Cas 1 - AFTN


Precision+
A Pure+
MI
1.6
14L5
d10.5
29 fps
Qscan
G:78
DR:65
A:3
P:4
LOBE GAUCHE


LOBE GAUCHE

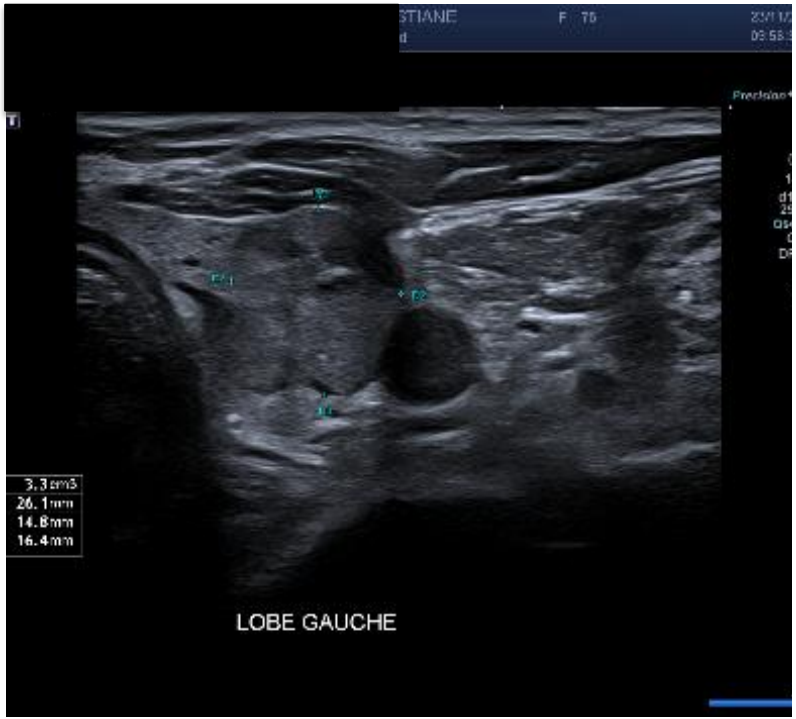
Cas 1 - AFTN



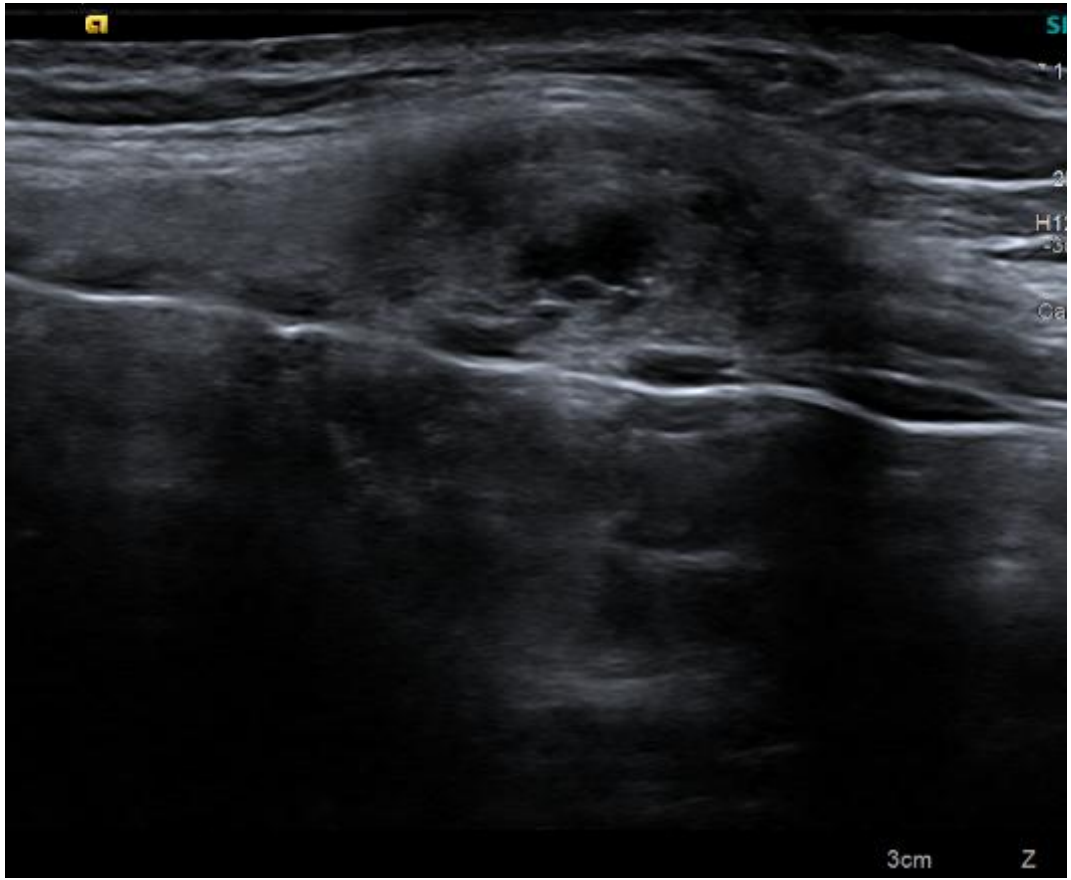


Cas 1 – 9 months later



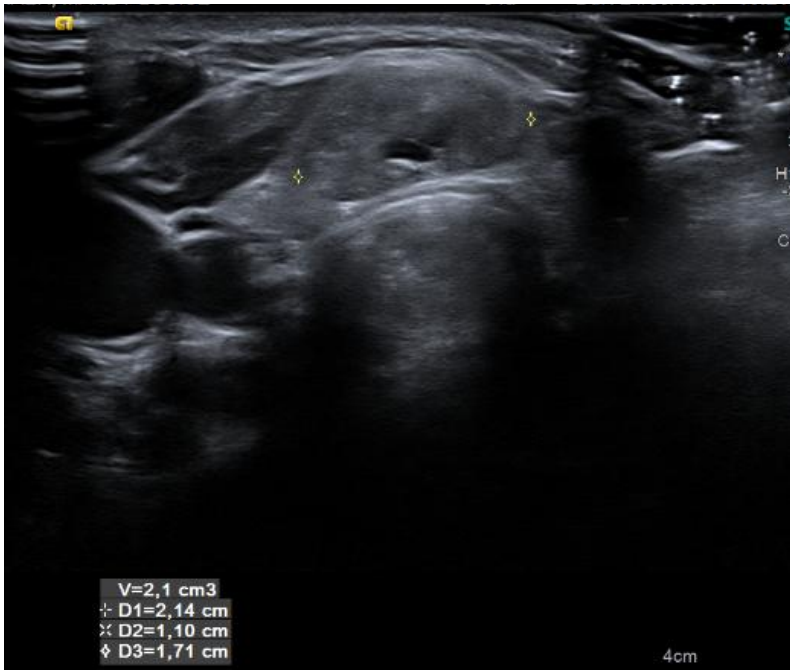


Cas 2 – Isthmic nodule



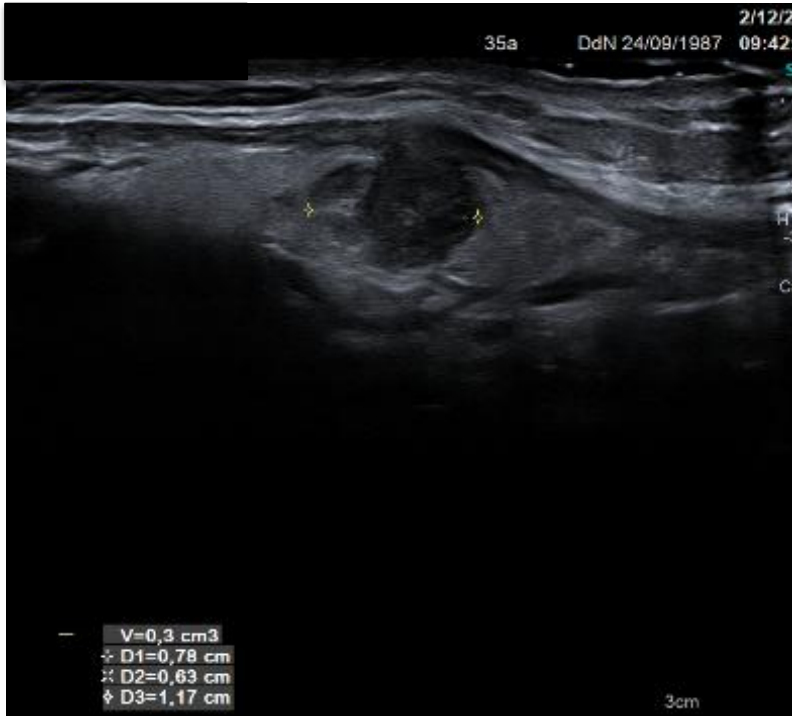
Cas 2


V=
D1=2,14 cm
D2=1,10 cm
D3=
4cm

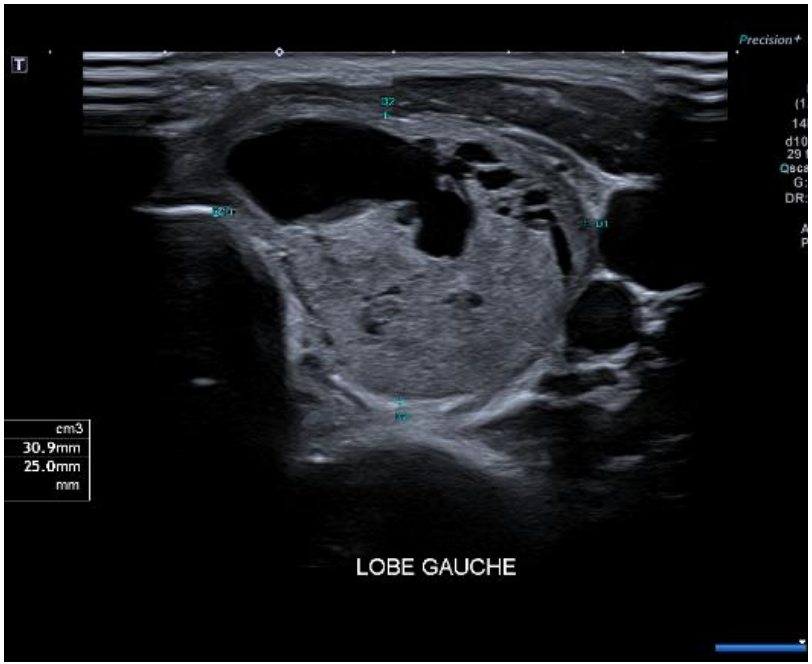

V=2,1 cm3
D1=2,14 cm
D2=1,10 cm
D3=1,71 cm
4cm

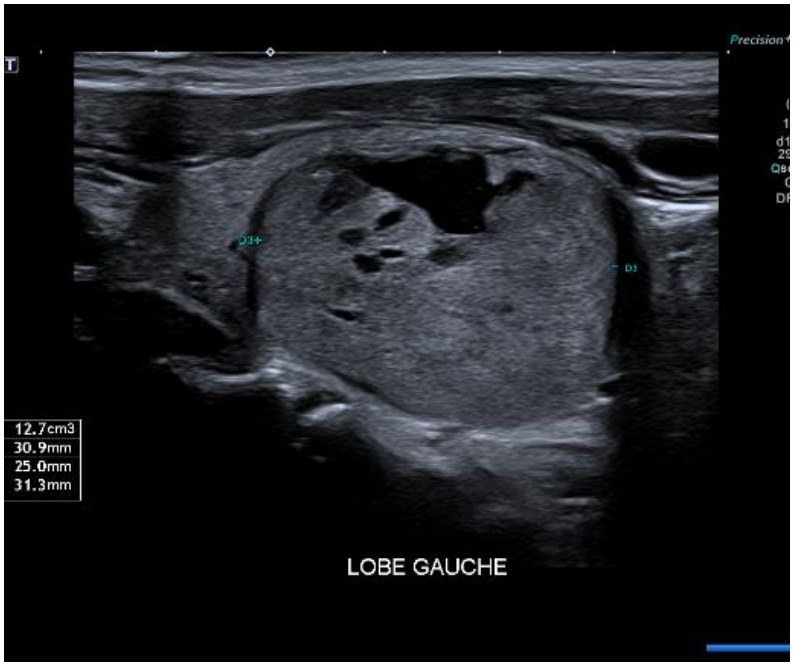
Cas 2 – 6 weeks later



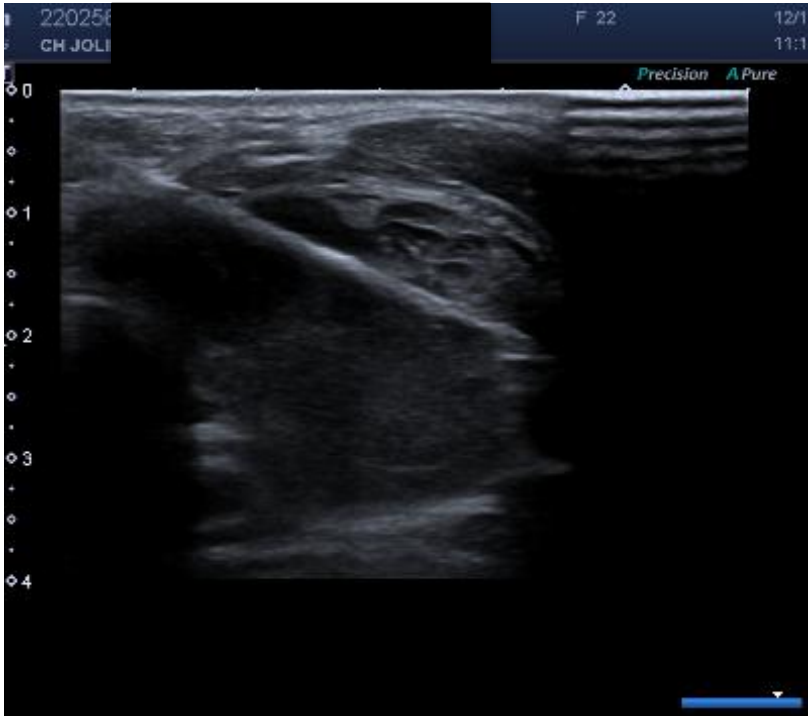


Cas 3 - AFTN


cm3
30.9mm
25.0mm
mm
LOBE GAUCHE

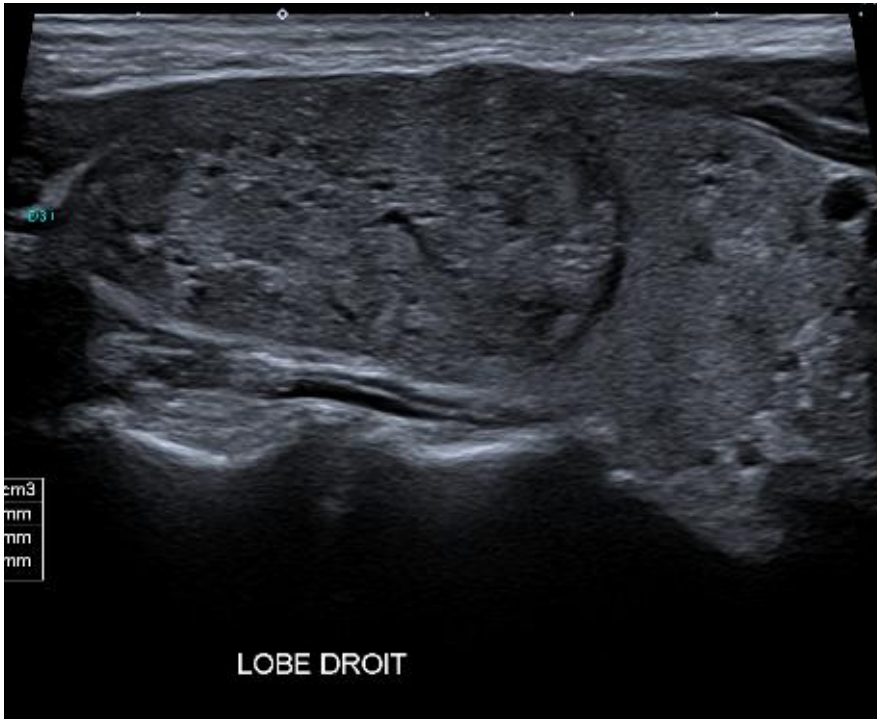

12.7cm3
30.9mm
25.0mm
31.3mm
LOBE GAUCHE

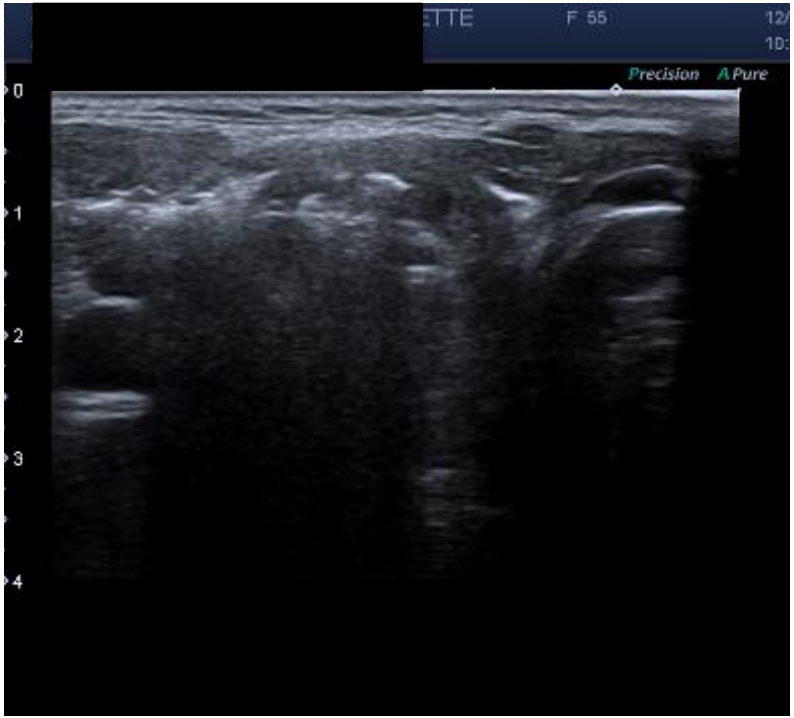
Cas 3 – AFTN – Amélioration progressive





Cas 4 - AFTN





Conclusion

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Conclusion

- Thermal ablation has proven efficacy and safety
- Good cost- and risk-effective alternative to surgery

- First-line treatment for benign thyroid nodules

  Excellent results for symptomatic and cosmetic issues

- Second line for AFTN > 12 mL
- ? First line AFTN < 12 mL ? → on study

- Rapid recovery
- ~~€€€~~ for patients

Bibliography

- E. Papini, H. Monpeyssen; 2020 European thyroid association clinical practice guideline for the use of imaged-guided ablation in benign thyroid nodule. European Thyroid Journal 2020;9:172-185
- Comparison between radio iodine therapy and single-session radiofréquence ablation of autonomously functioning thyroid nodules: a retrospective study - Clinical Endocrinology 2019)
- Ultrasound-guided microwave ablation in treatment of benign thyroid nodules in 435 patients. Experimental Biology and Medicine 2017; 242: 1515-1523.
- Ultrasound guided microwave ablation Benin thyroid nodules: effects on inflammatory factors and thyroid function 2021
- Radiofrequency ablation of thyroid nodules: basics principles and clinical application 2012
- Radiofrequency ablation compared to surgery for the treatment of benign thyroid nodules. International journal of endicrinology; volume 2014, Article ID 934595, 10 pages. S. Bernardi, C. Dobrinja. Italy.
- R. Cesareo. Radiofrequency ablation on Autonomously functioning thyroid nodules: a criterial appraisal and review of the littérature. Font Endocrinol 2020; 11: 317
- Z. Cheng, Y Che; US-guided percutaneous radiofrequency versus microwaveablation for benign thyroid nodules: a prospective multicenter sudy; scientific reports, 7: 9554
- …

The end !

Thank you

