NEW Thyroid Radiofrequency Ablation Guideline

Presenter:

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Interventional Radiologist

- Tirad Imaging Center
- Http://www.tiradsono.com

Table 3. Identifying Information and Availability

Category	Content
Date released	2009 (2012 revised)
Guideline developer(s)	Korean Society of Radiology, KSThR
Source(s) of funding	Korean Society of Radiology, KSThR, and grant of Korea health technology R&D project through KHIDI, funded by Ministry of Health & Welfare, Republic of Korea
Guideline committee	Committee on guidelines and task force team for thyroid RFA Composition of group that authored guidelines: Ji-hoon Kim, MD, PhD; Jung Hwan Baek, MD, PhD; Hyun Kyung Lim, MD; Hye Shin Ahn, MD; Seon Mi Baek, MD; Yoon Jung Choi, MD; Young Jun Choi, MD, PhD; Sae Rom Chung, MD; Eun Ju Ha, MD, PhD; Soo Yeon Hahn, MD; So Lyung Jung, MD, PhD; Dae Sik Kim, MD; Soo Jin Kim, MD; Yeo Koon Kim, MD; Chang Yoon Lee, MD; Jeong Hyun Lee, MD, PhD; Kwang Hwi Lee, MD; Young Hen Lee, MD, PhD; Jeong Seon Park, MD, PhD; Hyesun Park, MD; Jung Hee Shin, MD, PhD; Chong Hyun Suh, MD; Jin Yong Sung, MD; Jung Suk Sim, MD, PhD; Inyoung Youn, MD, PhD; Miyoung Choi, PhD; Dong Gyu Na, MD, PhD; for KSThR and Korean Society of Radiology
Financial disclosures/ conflicts of interest	No member of Guideline Committee has financial disclosure or conflict of interest except Dr. Baek JH. He has been consultant of two radiofrequency companies, STARmed and RF Medical, since 2017
Guideline status	This is current release of guidelines
Guideline availability	Electronic copies: available from KSThR website (http://www.thyroidimaging.kr)
Previous guidelines	Recommendation of RFA for thyroid nodules 1st edition (August 24, 2009, http://www.thyroidimaging.kr) RFA of thyroid nodule and recurrent thyroid cancer: consensus statement and recommendations 2nd edition (March 7, 2012)

KHIDI = Korea Health Industry Development Institute

TECHNIQUES ON THE MARKET

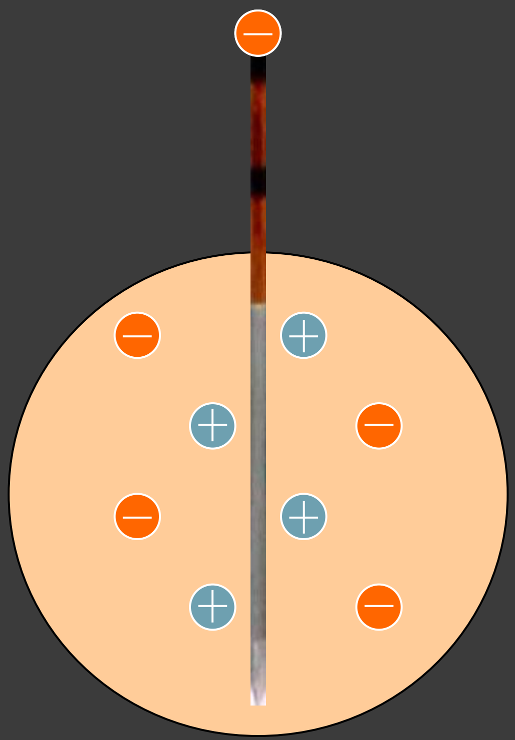
Different techniques can be classified according to energy type:

Electromagnetic - Thermal	• Radiofrequencies (RFA) • Microwaves (MWA) • Laser (LITT)
Electromagnetic - Biological	• Irreversible Electroporation (IRE)
Mechanical - Thermal	• High Intensity Focused Ultrasound (HIFU)
Thermal	• Cryoablation (CWA)
Chemical	• Percutaneous Ethanol Injection (PEI) • Transarterial Chemoembolization (TACE)

RF
W

M

RFA Basic Understanding

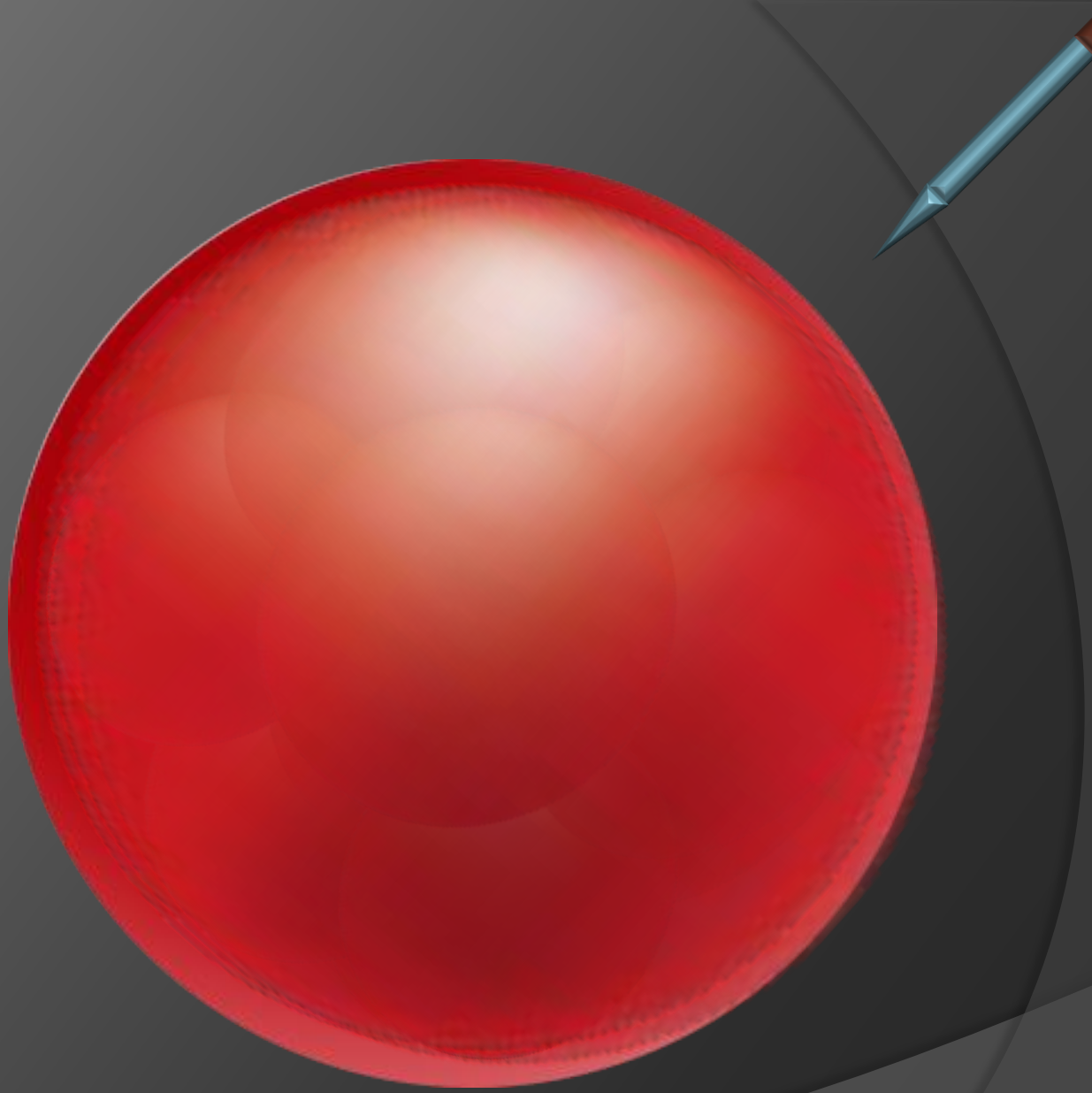


Positive ions are attracted to the direction of the electrode.

Negative ions are attracted to the direction of the electrode.

Negative ions are attracted to the opposite direction of the electrode.

Positive ions are attracted to the opposite direction of the electrode.



Targeting order: Upper pole -> Mid pole-> Lower pole
Deep-> Shallow

MW ablation

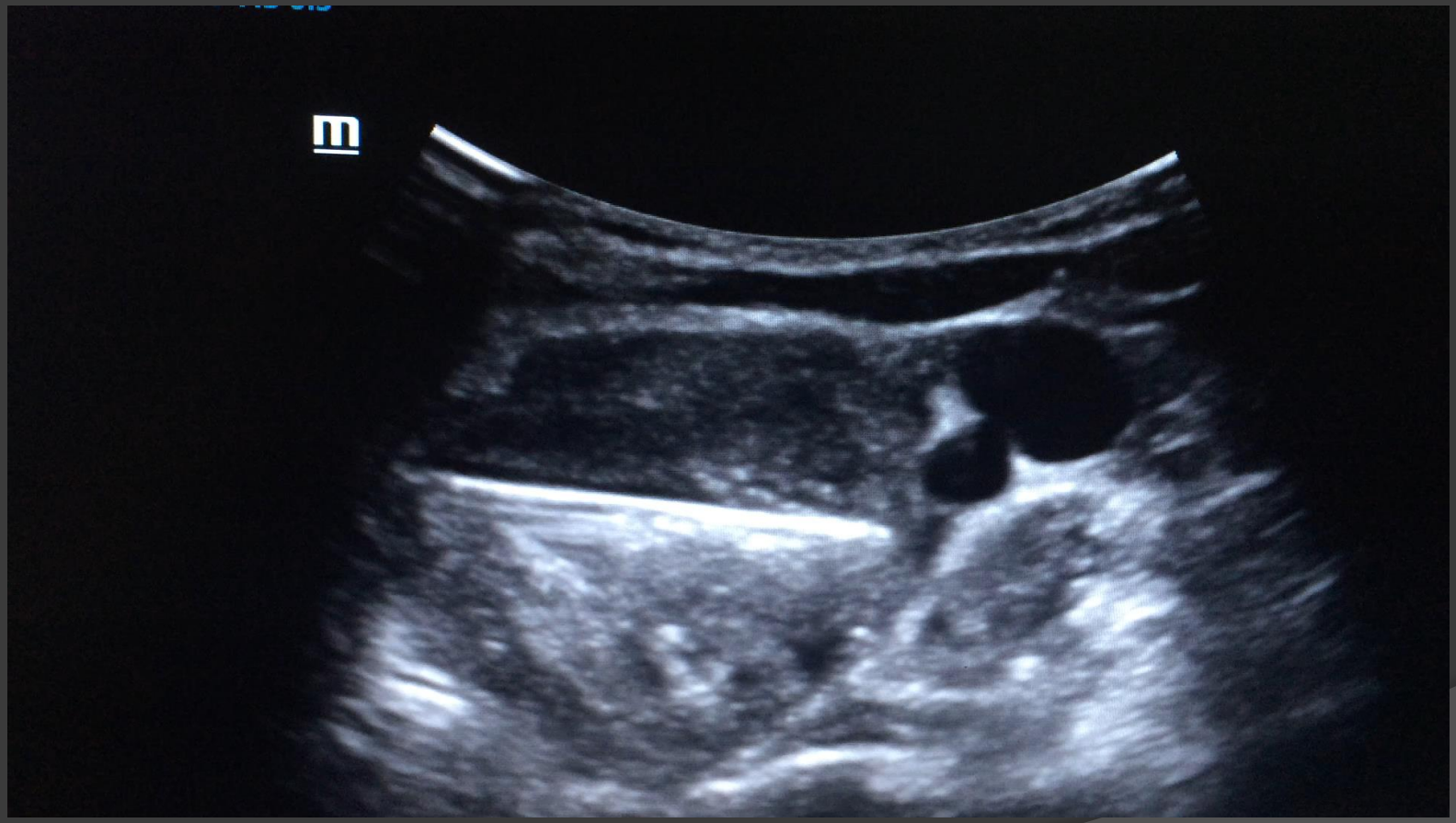


Table 5. Grading of Recommendations

Grading	Definition	Level of Evidence	Net Benefit (by Delphi Score)
Strong for recommendation	Benefit of intervention is greater than harm and evidence level is high, which can be strongly recommended in most clinical practice	High or moderate	Median: ≥ 7
Weak for recommendation	Benefit and harm of intervention may vary depending on clinical situation or patient/social value. It is recommended conditionally according to clinical situation	High or moderate	Median: 4–6
		Low	Median: ≥ 7
Against recommendation	Harm of intervention is greater than benefit, and evidence level is high or moderate; thus, intervention may not be recommended in clinical practice	High or moderate	Median: ≤ 3
Insufficient	It is not possible to determine recommendation grade owing to lack of evidence or low level of evidence, thus further evidence is needed	Low	Median: ≤ 6

What are indications for RFA for benign thyroid nodules?

1- RFA is indicated for patients with benign thyroid nodules complaining of symptomatic or cosmetic problems (>2cm)

2- Thyroid nodules should be confirmed as benign on at least two US-guided FNA or CNB before RFA

False negative rate <3

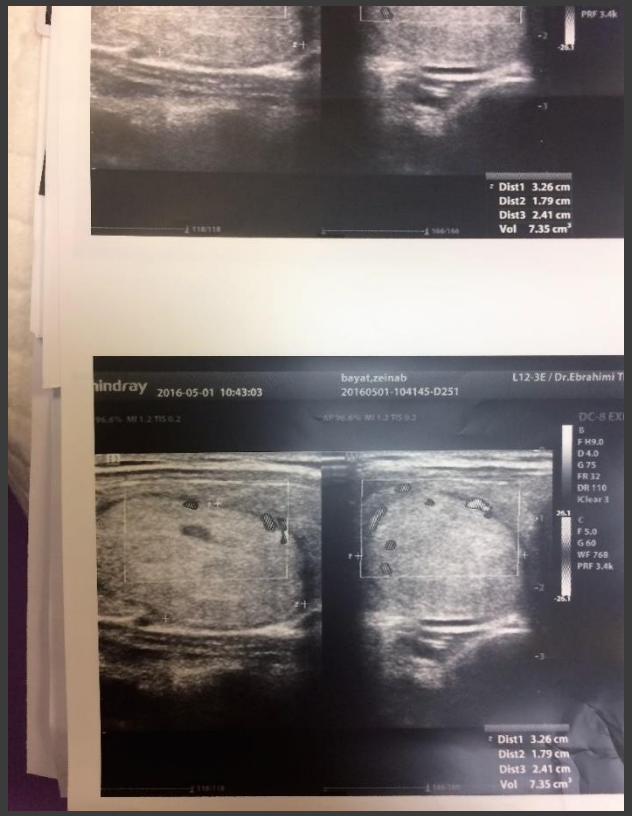
Nodule >4-5 cm suitable for RF

CNB sensitive for follicular neoplasm

- Single benign diagnosis on FNA or CNB is sufficient when the nodule has US features highly specific for benignity (isoechoic spongiform nodule or partially cystic nodules with intracystic comet tail artifact) and AFTN

What are indications for RFA for benign thyroid nodules?

- 1-5. RFA can be indicated for AFTN, either toxic or pre-toxic suitable for AFTN < 20 ml
- No hypothyroidism
- No radiation exposure
- No scar



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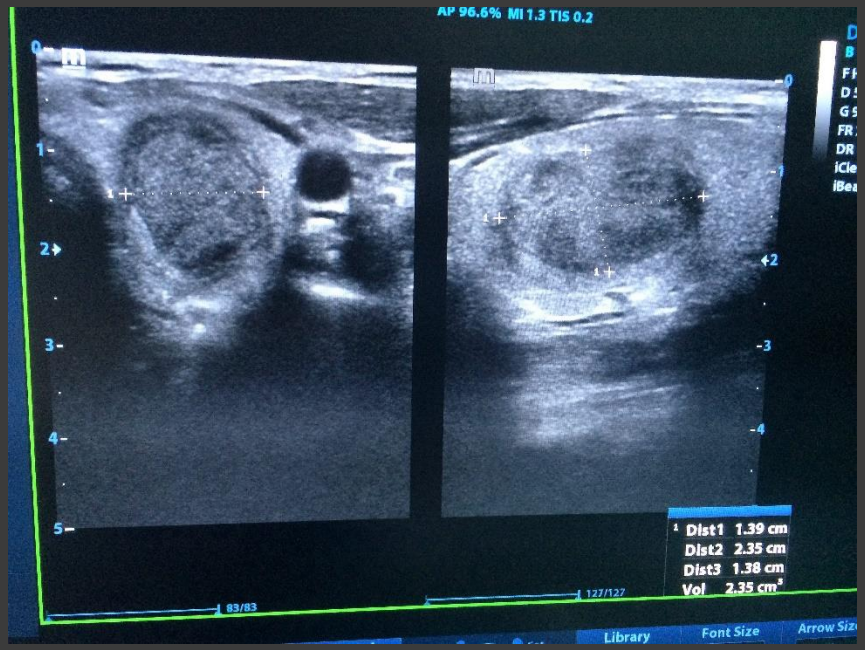
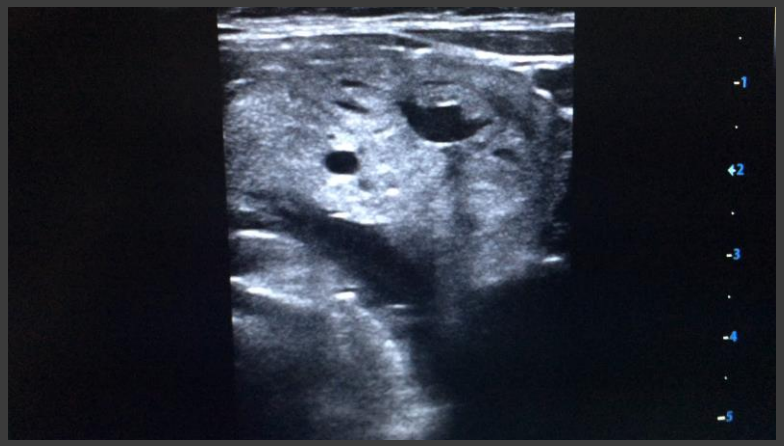
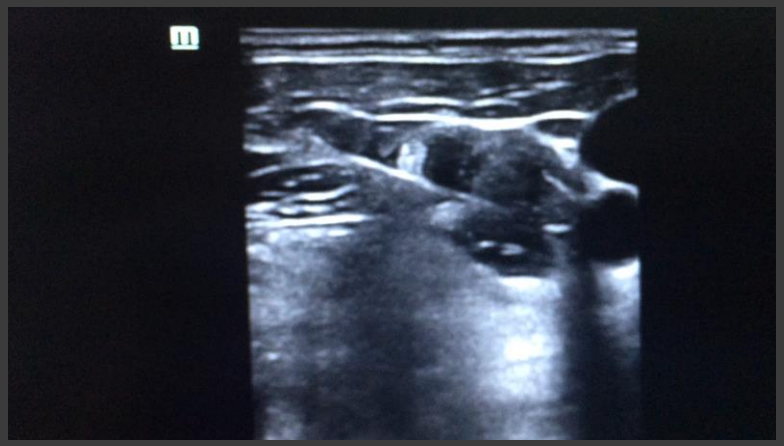


6 m follow

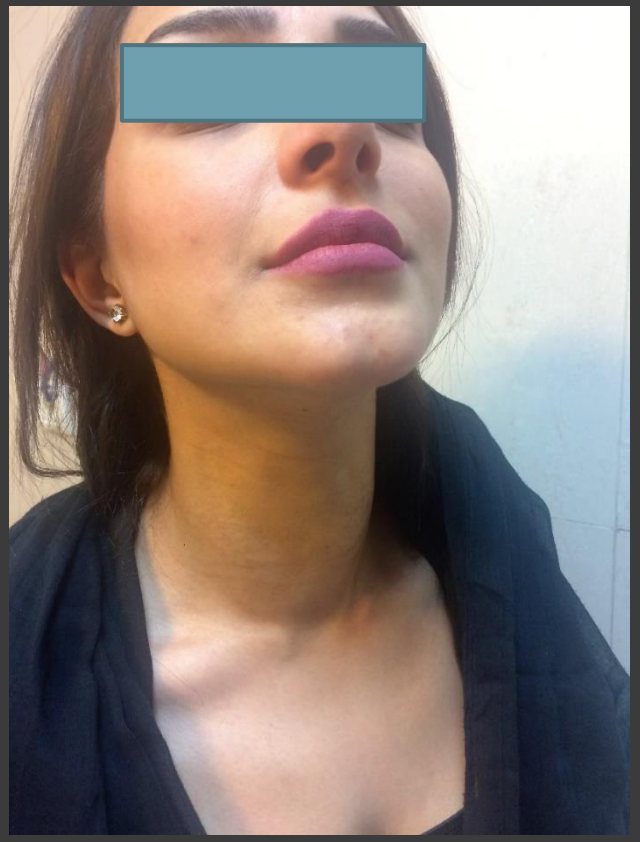
Dissection with salin

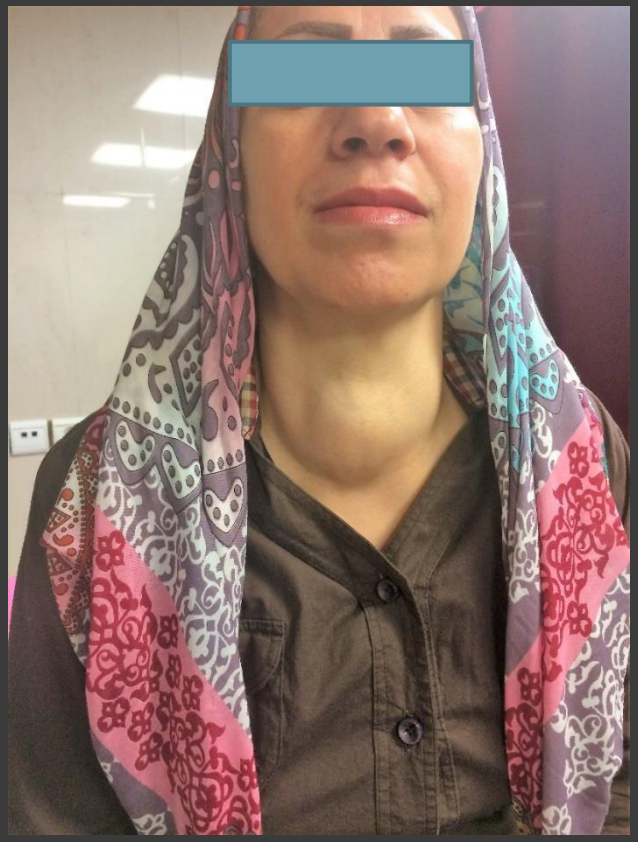


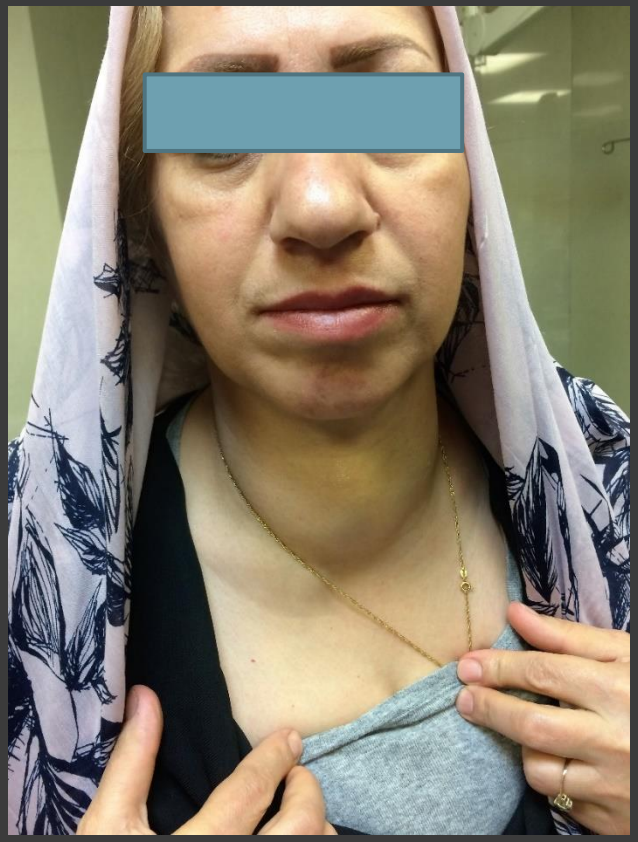


Location

A 23 y old girl from Kuwait







What are indications for RFA for recurrent thyroid cancers?

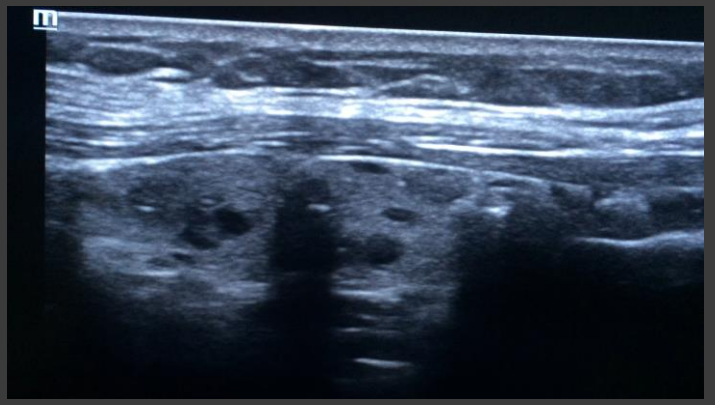
- RFA can be performed for curative or Palliative purposes in recurrent thyroid cancers at thyroidectomy bed and cervical lymph nodes for patients at high surgical risk or who refuse surgery

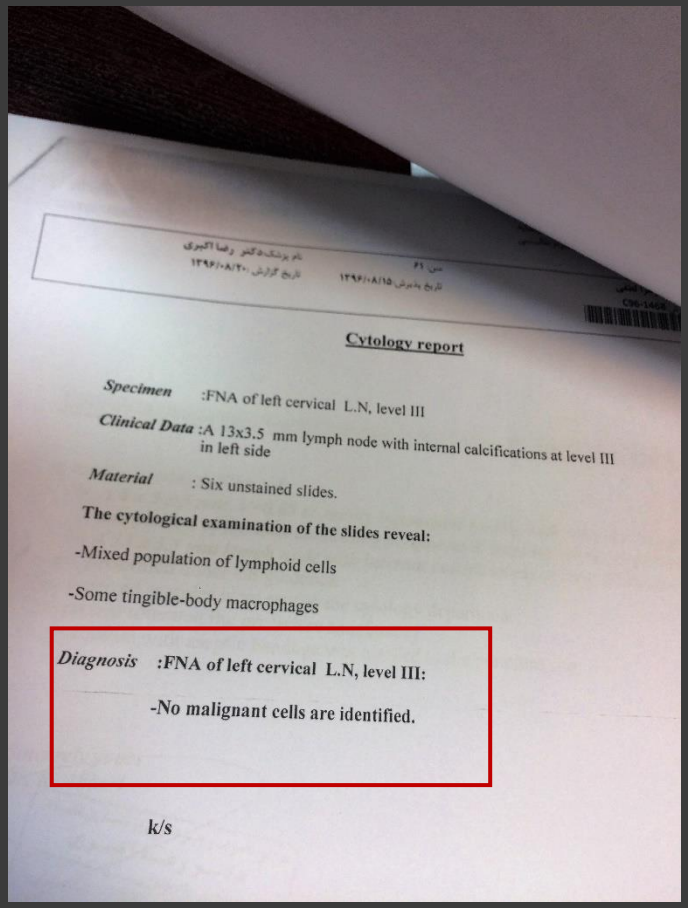
- Curative
- <2cm
- < 4 LN
- No metastasis beyond neck
- Palliative
- Repeat

Primary thyroid cancer

- The 2017 guideline recommends that RFA can be considered in selective patients (i.e., in patients who refuse surgery or who cannot undergo an operation).

- RFA remains an experimental tool that requires further investigation.





Cytology report

Specimen :FNA of left cervical L.N, level III

Clinical Data :A 13x3.5 mm lymph node with internal calcifications at level III in left side

Material : Six unstained slides.

The cytological examination of the slides reveal:

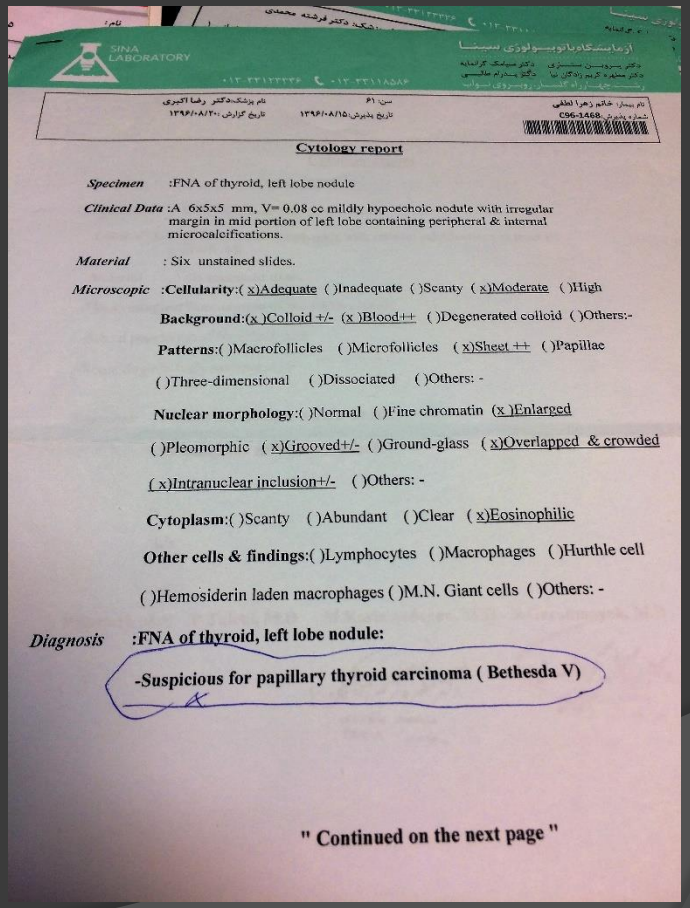
-Mixed population of lymphoid cells

-Some tingible-body macrophages

Diagnosis :**FNA of left cervical L.N, level III:**

-*No malignant cells are identified.*

k/s



SINA LABORATORY

آزمایشگاه پاتوبیولوژی سینا

Cytology report

Specimen :FNA of thyroid, left lobe nodule

Clinical Data :A 6x5x5 mm, V= 0.08 cc mildly hypoechoic nodule with irregular margin in mid portion of left lobe containing peripheral & internal microcalcifications.

Material : Six unstained slides.

Microscopic :**Cellularity**:(x)Adequate ( )Inadequate ( )Scanty (x)Moderate ( )High

Background:(x)Colloid +/- (x)Blood++ ( )Degenerated colloid ( )Others:-

Patterns:( )Macrofollicles ( )Microfollicles (x)Sheet ++ ( )Papillae

( )Three-dimensional ( )Dissociated ( )Others: -

Nuclear morphology:( )Normal ( )Fine chromatin (x)Enlarged

( )Pleomorphic (x)Grooved+/- ( )Ground-glass (x)Overlapped & crowded

(x)Intranuclear inclusion+/- ( )Others: -

Cytoplasm:( )Scanty ( )Abundant ( )Clear (x)Eosinophilic

Other cells & findings:( )Lymphocytes ( )Macrophages ( )Hurthle cell

( )Hemosiderin laden macrophages ( )M.N. Giant cells ( )Others: -

Diagnosis :**FNA of thyroid, left lobe nodule:**

-Suspicious for papillary thyroid carcinoma (Bethesda V)

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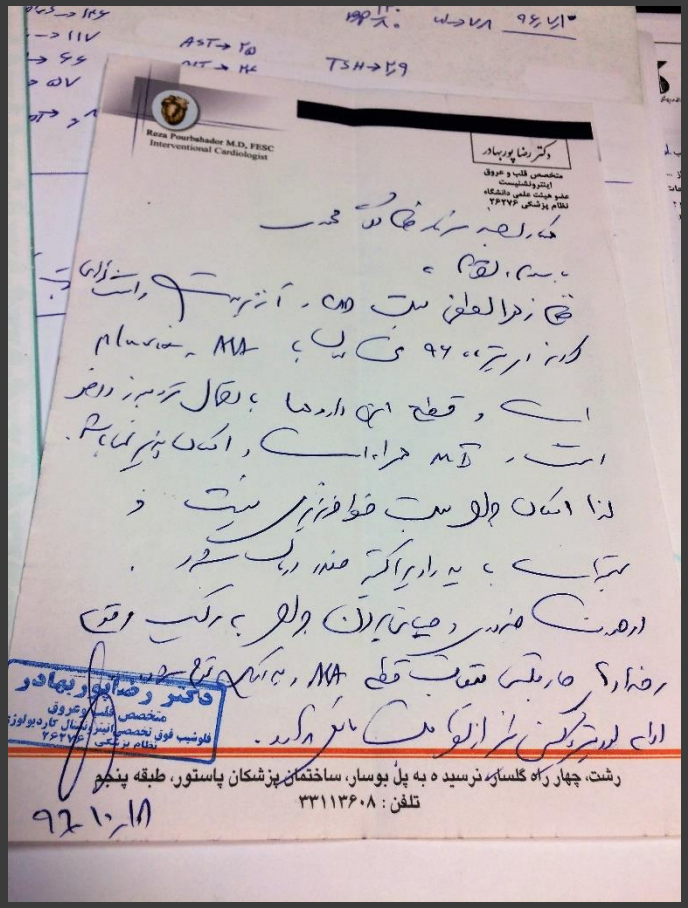

Reza Pourbahader M.D, FESC
Interventional Cardiologist

دکتر رضا پوربهادر
متخصص قلب و عروق
اینترونشنیست
عضو هیئت علمی دانشگاه
نظام پزشکی ۲۶۲۷۶

دکتر رضا پوربهادر
متخصص قلب و عروق
فلوشیپ فوق تخصصی اینترونشنال کاردیولوژی
نظام پزشکی ۲۶۲۷۶

رشت، چهار راه گلسار، نرسیده به پل بوسار، ساختمان پزشکان پاستور، طبقه پنجم
تلفن : ۳۳۱۱۳۶۰۸


.6% MI 1.3 TIS 0.1
DC-8 E
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iClear 3
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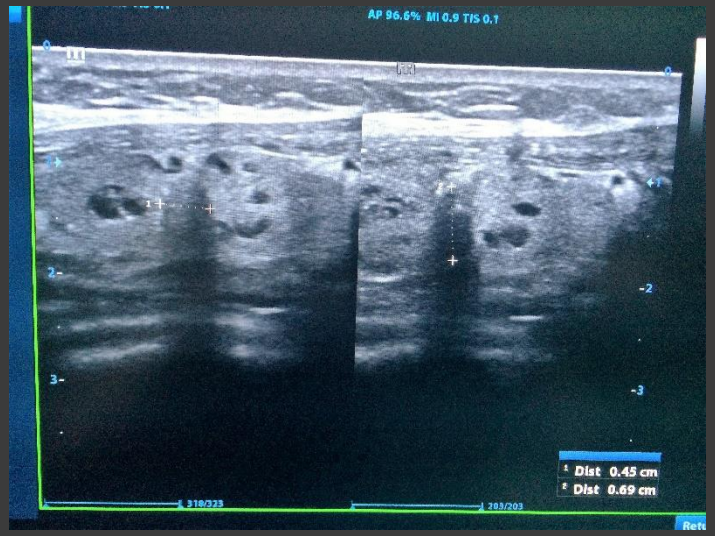
AP 96.6% MI 0.9 TIS 0.1
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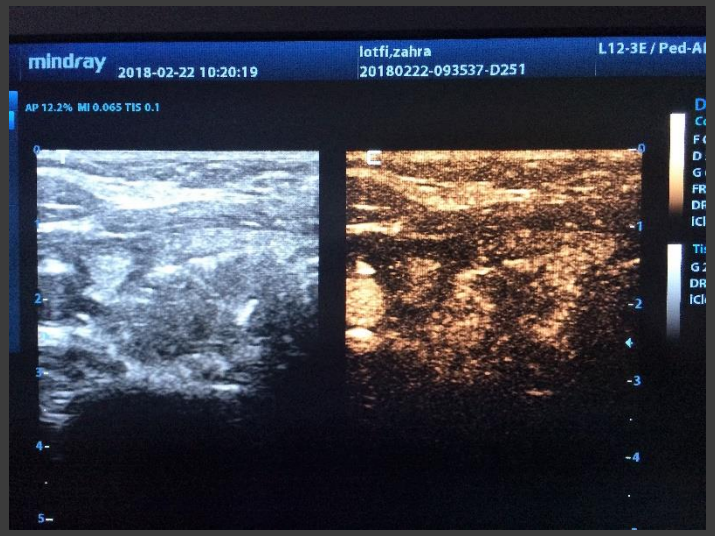
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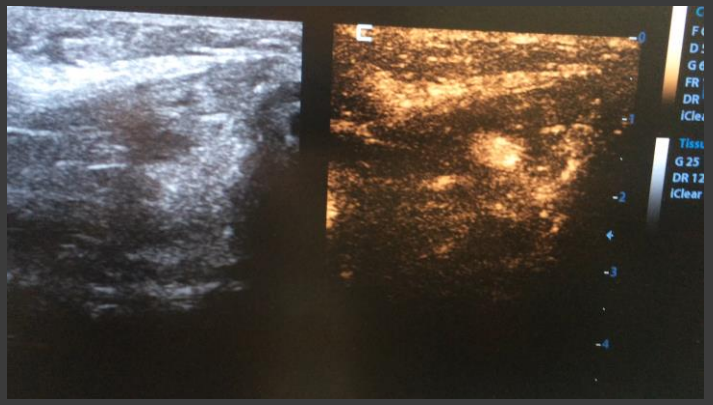

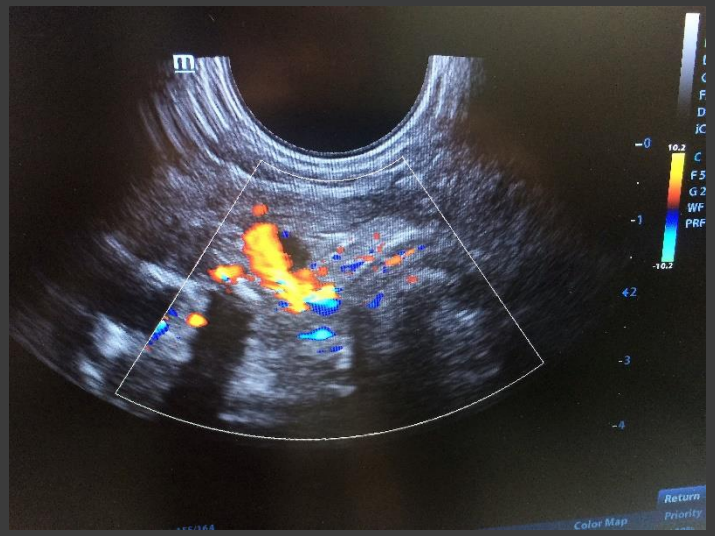
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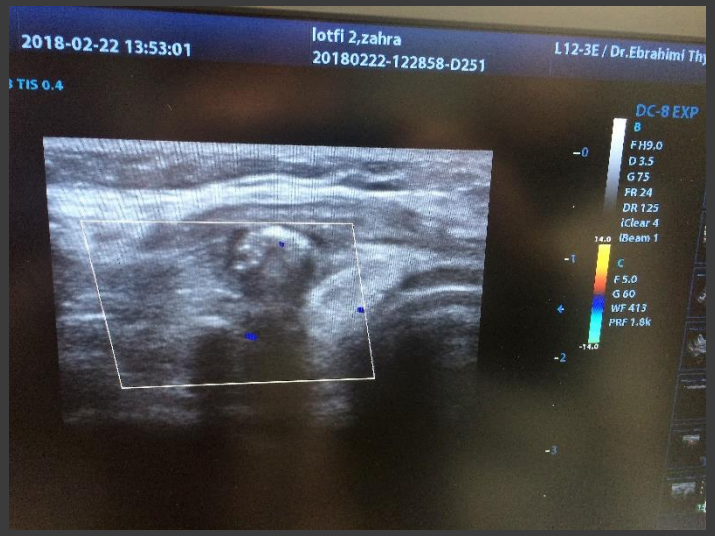
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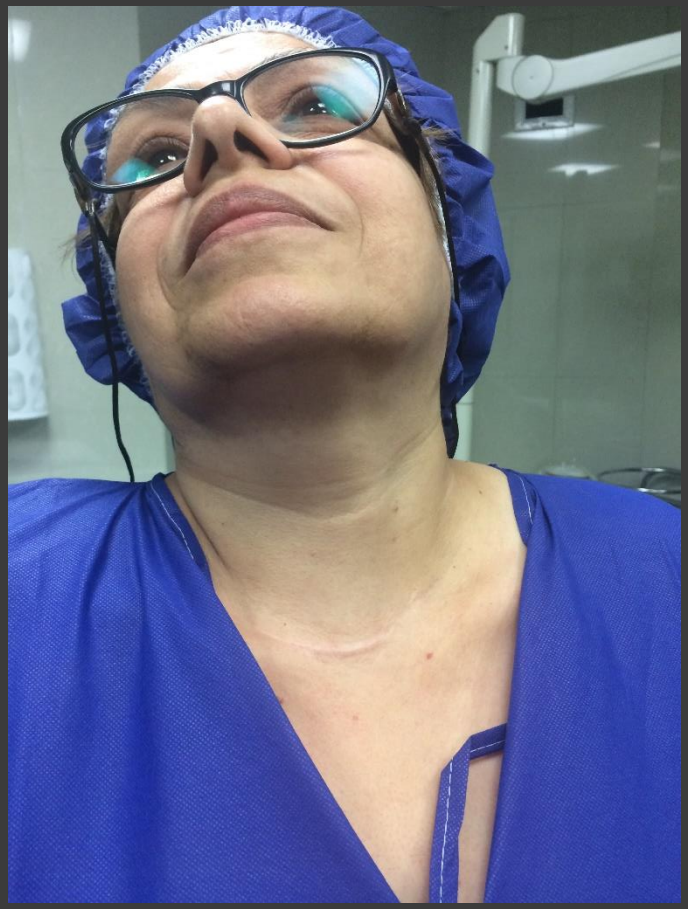
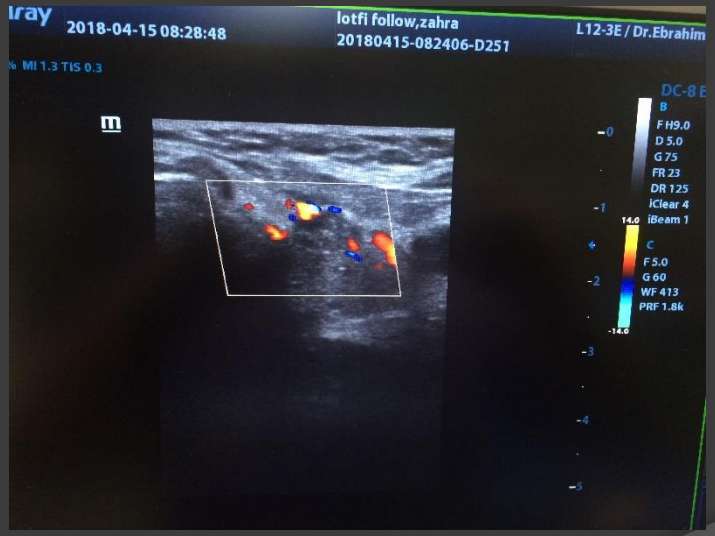
WF 413
PRF 1.8k

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DR 125
iClear 4
iBeam 1
C
F 5.0
G 60
WF 413
PRF 1.8k

ran- IRAN Tel: 66469324 - 66469237

Pt.'Name: Zahra, Lotfi
Age:61Y Sex:Female

Date In: 1397/01/26
April 15 2018

Referred by: Dr. Ebrahimi Nik

Date Out: 1397/01/29

No:DP-18-03256

Surgical Pathology Report

Clinical Data: H/O Right lobectomy of thyroid gland and recently detected node of left lobe. The FNA of which diagnosed as "suspicious for papillary carcinoma (No: C-96-1468, Sina Path-Lab Rasht)

Gross Description:

Specimen is received in formalin and consists of two filiform pieces of soft pale tan tissue 0.8-0.9cm in lengths.
It is submitted in toto in 1 block.

/S

Microscopic Diagnosis:

Image-guided core needle biopsy of thyroid nodule, left lobe:

- Thyroid tissue with presence of focal coagulative necrosis (?post ablation).
- No evidence of neoplastic process in present sample seen.

E/h

آزمایشگاه پاتوبیولوژی دانش پاتولوژی

M.E.JAFARI, M.D.

Follicular neoplasm

- FNA high false positive
- CNB more sensitive
- Increased conservative in selected patient
- RFA <2 cm ??

What is appropriate technique for RFA of benign thyroid nodules?

- For pain control of RFA of benign thyroid nodules, local anesthesia, rather than general anesthesia or deep sedation, is recommended.

- For RFA of benign thyroid nodules, trans isthmic approach method and moving-shot technique are recommended as standard Procedure (lateral approach in China and Italia) Interval 1-3 months.

What is appropriate technique for RFA of recurrent thyroid cancers?

- For RFA of recurrent thyroid cancers, perilesional lidocaine injection, Hydrodissection (dex .5) technique, and moving shot technique are recommended as standard techniques.

What is appropriate clinical, laboratory, and non functioning benign thyroid nodules and recurrent cancer after imaging evaluation for RFA?

Table 8. Post-Procedural Checklist after RFA

Benign Thyroid Nodule	Recurrent Thyroid Cancer
US Features of ablated zone to detect under-ablated portion with vascularity on color-Doppler US	US Features of ablated zone to detect under-ablated portion with vascularity on color-Doppler US
Nodule volume	Tumor volume
Symptom score	-
Cosmetic score	-
Laboratory tests Thyroid function test*	Laboratory tests Thyroid function test
Serum TSH	Serum TSH
Serum T3	Serum T3
Serum fT4	Serum fT4
	Serum Tg, anti-Tg antibody
CT or MRI* ^{99m}TC pertechnetate or ^{123}I thyroid scan†	CT or MRI*

*Selectively indicated, †Indicated for AFTN.

What is appropriate composition of benign thyroid nodules for RFA?

- RFA is recommended as first-line treatment method for solid and predominantly solid nodules, although it is also effective treatment method to manage nonfunctioning thyroid nodules, regardless of degree of solidity

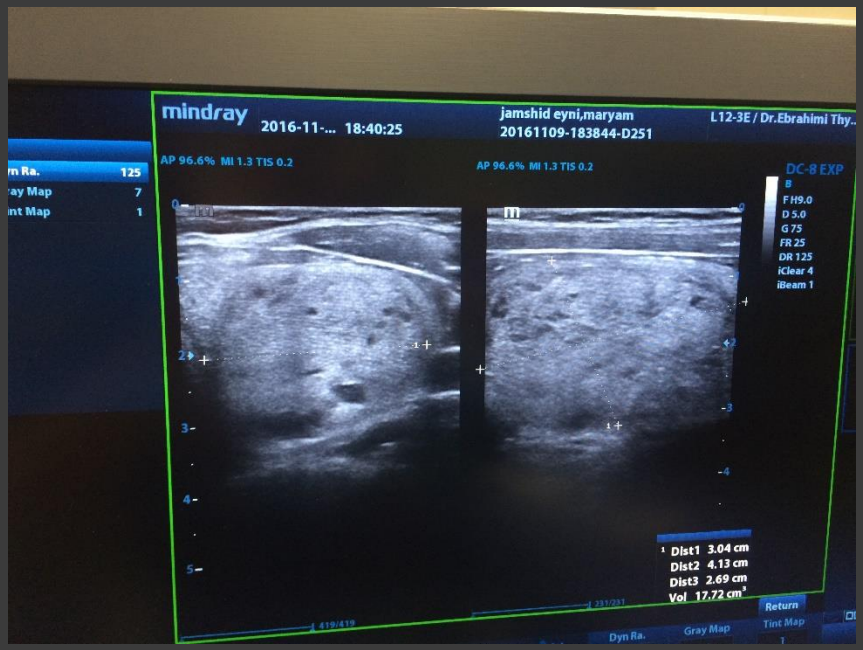
- EA is recommended as first-line treatment method for cystic and predominantly cystic nodules. RFA can be recommended as next step in cases with incomplete resolved symptom or recurrence following EA

Is single treatment enough for patients with non-functioning thyroid nodules?

- According to size and location of nodule, additional treatment may be required. Additional treatment may be considered

  if nodule shows marginal regrowth or if cosmetic or symptomatic problems are incompletely resolved ,VRR > 50

  Nodule > 20 ml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L12-3E / Dr.Ebrahimi Thy..
AP 96.6% MI 1.3 TIS 0.2
AP 96.6% MI 1.3 TIS 0.2
DC-8 EXP
Dist1 3.04 cm
Dist2 4.13 cm
Dist3 2.69 cm
Vol 17.72 cm³
Return
Dyn Ra.
Gray Map
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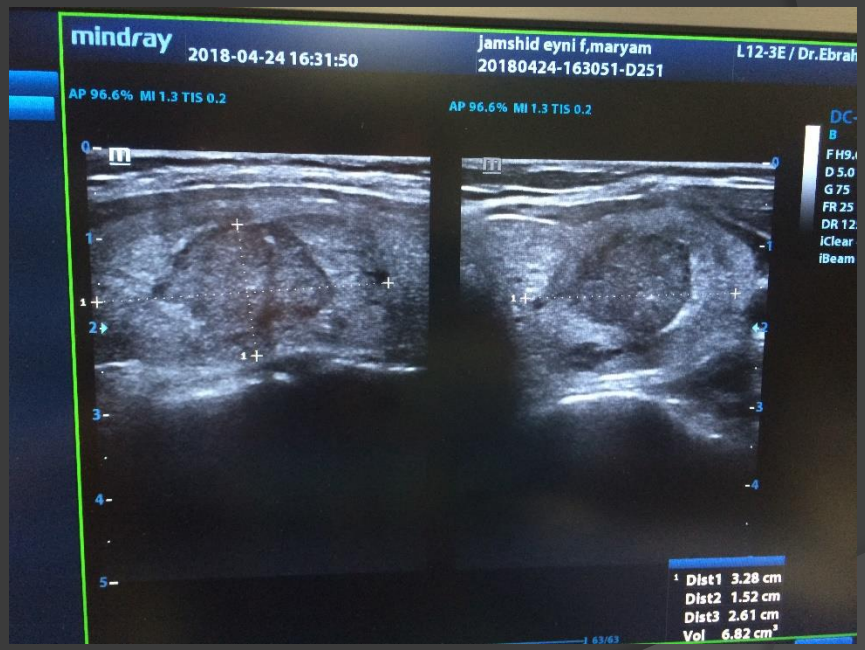
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AP 96.6% MI 1.3 TIS 0.2
AP 96.6% MI 1.3 TIS 0.2
Dist1 3.28 cm
Dist2 1.52 cm
Dist3 2.61 cm
Vol 6.82 cm³

Is RFA safe and tolerable procedure?

- RFA is safe and well-tolerated and is associated with low incidence of complications when performed by experienced operators.

Complication:

- Major

Nerve injuries (recurrent laryngeal nerve, cervical sympathetic ganglion brachial plexus and spinal accessory nerve)

nodule rupture (conservative)

Permanent hypothyroidism.

Complication:

- Minor

Hematoma (compression 30m –2h)

Vomiting

Skin burn

Transient thyrotoxicosis,

Lidocaine toxicity,

Hypertension

Pain

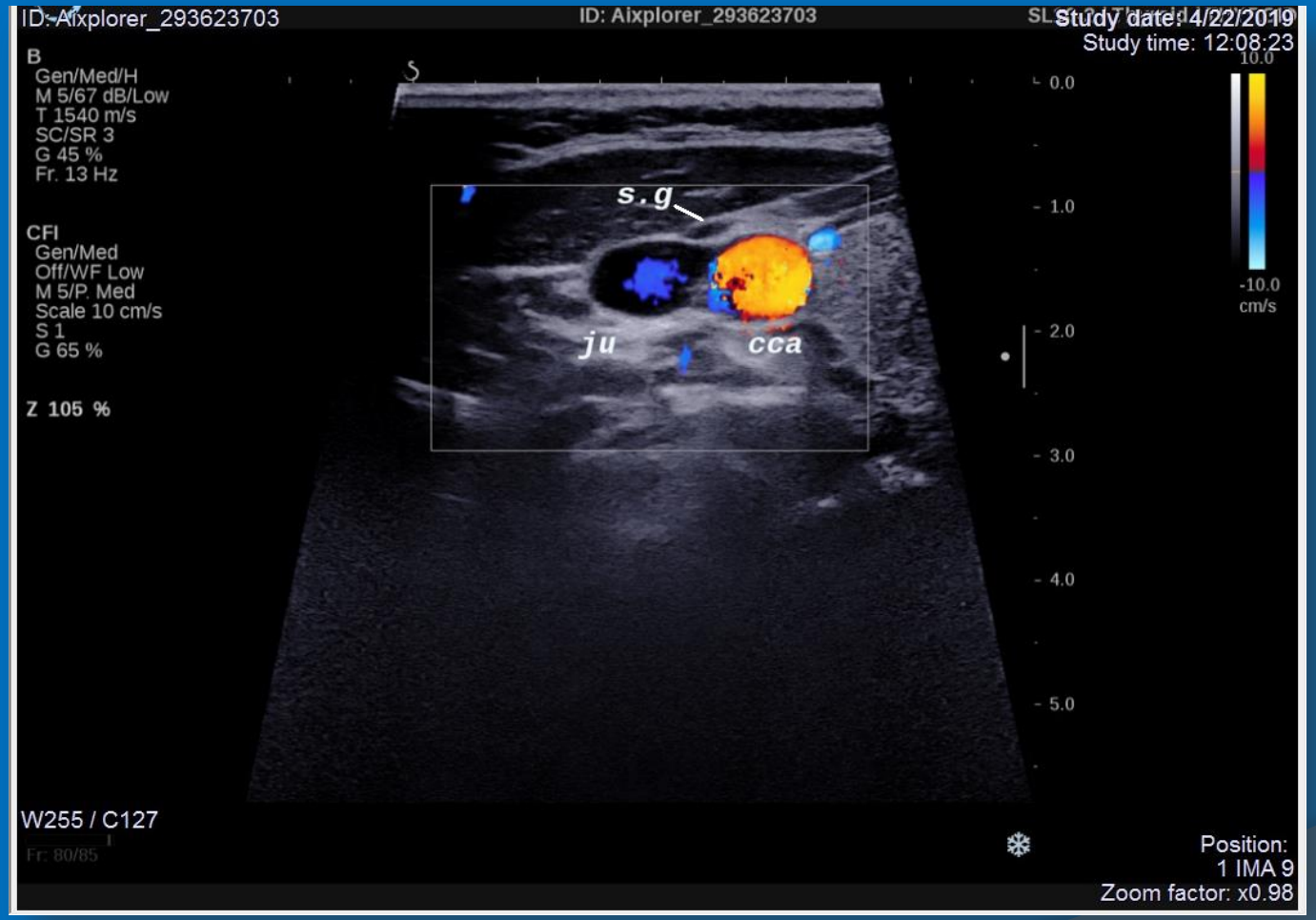
- pregnant women or patients with electrical devices, such as a cardiac pacemaker .
- The 2017 guideline recommends that a new device, i.e., a bipolar electrode, can be a safer option for these patients

Table 12. Summary of Recommendations and Evidences

Key Questions	Recommendations	Evidence Level	Delphi Score	Grading of Recommendations	References
1. What are indications for RFA for benign thyroid nodules?	1-1. RFA is indicated for patients with benign thyroid nodules complaining of symptomatic or cosmetic problems	Moderate	9	Strong	4, 9, 10, 12, 18
	1-2. Thyroid nodules should be confirmed as benign on at least two US-guided FNA or CNB before RFA	Moderate	8	Strong	27, 43-45
	1-3. Single benign diagnosis on FNA or CNB is sufficient when nodule has US features highly specific for benignity (isoechoic spongiform nodule or partially cystic nodules with intracystic comet tail artifact)	High	8	Strong	27, 43-45
	1-4. Single benign diagnosis on FNA or CNB is sufficient for confirmation of a benign nodule in AFTN	Low	8	Weak	49
	1-5. RFA can be indicated for AFTN, either toxic or pre-toxic	Moderate	8	Weak	4, 7, 53-59
2. What are indications for RFA for recurrent thyroid cancers?	2. RFA can be performed for curative or palliative purposes in recurrent thyroid cancers at thyroidectomy bed and cervical lymph nodes for patients at high surgical risk or who refuse surgery	Moderate	9	Strong	64, 66, 68-74
5. What is appropriate laboratory and imaging evaluation for patients with symptomatic benign thyroid nodule or recurrent thyroid cancer before RFA?	3. Before RFA of symptomatic benign thyroid nodule or recurrent thyroid cancer, pre-procedural checklists should be evaluated (Table 6)	Moderate	8	Weak	5, 64, 97, 98, 101, 102
6. What is appropriate recommendation for patients taking anticoagulants or anti-platelet drugs before RFA?	4. Before RFA, patients with bleeding tendency, such as those taking anticoagulation medications or those with disorders affecting coagulation cascade, should be thoroughly evaluated, and any problems should be corrected	Low	10	Weak	106
7. What is appropriate technique for RFA of benign thyroid nodules?	5-1. For pain control of RFA of benign thyroid nodules, local anesthesia, rather than general anesthesia or deep sedation, is recommended. Perithyroidal lidocaine injection is recommended for local anesthesia technique	Moderate	8	Strong	107
	5-2. For RFA of benign thyroid nodules, trans-isthmic approach method and moving-shot technique are recommended as standard procedure	Moderate	8.5	Strong	99, 107, 110
8. What is appropriate technique for RFA of recurrent thyroid cancers?	6. For RFA of recurrent thyroid cancers, perilesional lidocaine injection, hydrodissection technique, and moving-shot technique are recommended as standard techniques	Low	8	Weak	73

Table 12. Summary of Recommendations and Evidences (continued)

Key Questions	Recommendations	Evidence Level	Delphi Score	Grading of Recommendations	References
9. What is appropriate clinical, laboratory, and imaging evaluation for nonfunctioning benign thyroid nodules after RFA?	7. After RFA for nonfunctioning benign thyroid nodules, clinical, laboratory, and imaging checklists should be evaluated (Table 8)	Moderate	8	Weak	5, 9, 54, 99, 107, 110, 116, 117
10. What is appropriate clinical, laboratory, and imaging evaluation for AFTN after RFA?	8. After RFA for AFTN, clinical, laboratory, and imaging checklists should be evaluated (Table 8)	Moderate	8	Weak	53-56, 101, 102, 107, 110, 111
13. What is appropriate composition of benign thyroid nodules for RFA?	9-1. RFA is recommended as first-line treatment method for solid and predominantly solid nodules, although it is also effective treatment method to manage non-functioning thyroid nodules, regardless of degree of solidity	Moderate	8	Strong	5, 6, 9, 11, 57-59, 99, 101, 107, 110, 116, 117, 125, 127-129, 132
	9-2. EA is recommended as first-line treatment method for cystic and predominantly cystic nodules. RFA can be recommended as next step in cases with incomplete resolved symptom or recurrence following EA	High	9	Strong	10, 11, 18, 70, 107, 128, 136
14. Is single treatment enough for patients with non-functioning thyroid nodules?	10. According to size and location of nodule, additional treatment may be required. Additional treatment may be considered if nodule shows marginal regrowth or if cosmetic or symptomatic problems are incompletely resolved	Moderate	8	Strong	5, 110, 116, 120, 132
18. Is RFA safe and tolerable procedure?	11. RFA is safe and well-tolerated and is associated with low incidence of complications when performed by experienced operators	High	9	Strong	3, 12, 93, 102, 144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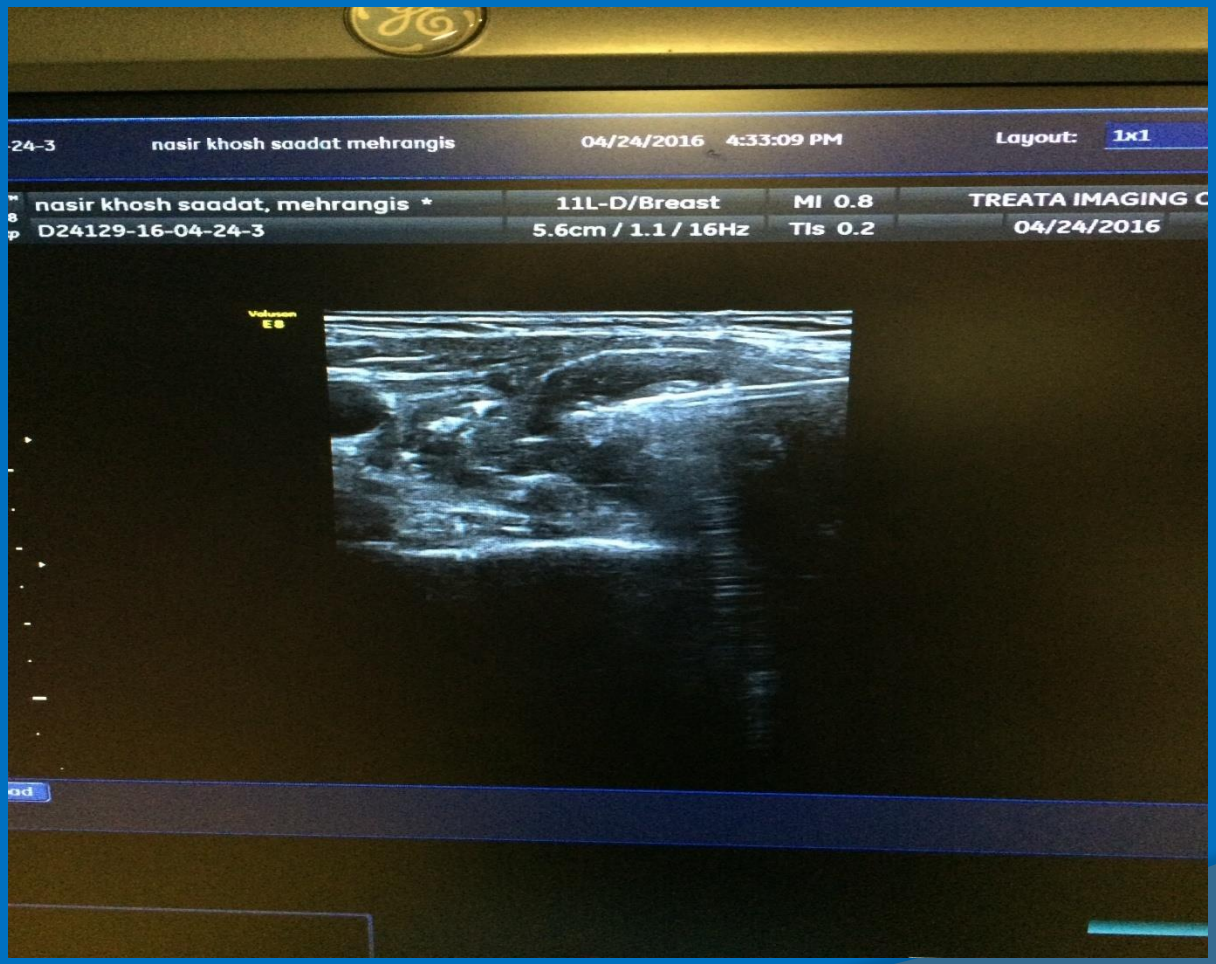
Study time: 12:08:23
B
Gen/Med/H
M 5/67 dB/Low
T 1540 m/s
SC/SR 3
G 45 %
Fr. 13 Hz
CFI
Gen/Med
Off/WF Low
M 5/P. Med
Scale 10 cm/s
S 1
G 65 %
Z 105 %
s.g
ju
cca
10.0
0.0
1.0
2.0
3.0
4.0
5.0
-10.0
cm/s
W255 / C127
Fr: 80/85
Position:
1 IMA 9
Zoom factor: x0.98

Thyroid cystic mass

Aspiration

RF Ablation Of Mural nodule and cystic wall




New Exam:
Clipboard:
nasir khosh saadat, mehrangis *
D24129-16-04-24-3
11L-D/Breast
5.6cm / 1.1 / 16Hz
MI 0.8
TIs 0.2
TREATA IMAGING CENTER
04/24/2016
5:26:48 PM
Breast
MOVIE
Img_7446.mov
Page 1/1
Exam History
Scan Assistant
No Exam History available
Change


Before
After
www.dr-ebrahiminik.com

Complications (multicenter study)

20 patients, 28 nodules,.

- The major
  - voice changes
  - brachial plexus injury
  - tumor rupture
  - permanent hypothyroidism
- The minor
  - complications were hematoma (n = 1)
  - skin burn
  - vomiting (n = 1)