Thermal ablation for papillary thyroid microcarcinoma ,clinical outcomes

- *Presenter:*
- *Dr. Hojat Ebrahiminik M.D*
- *Associated professor of Interventional Radiology*

- *TIRAD Imaging institute*

TECHNIQUES ON THE MARKET

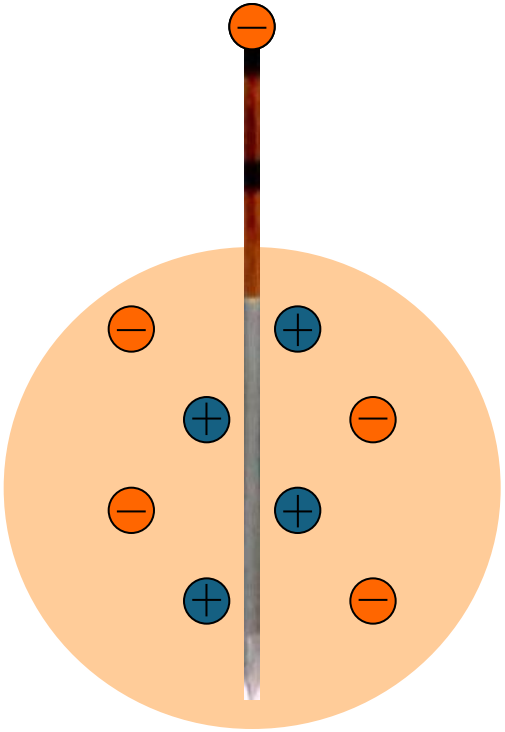
Different techniques can be classified according to energy type:

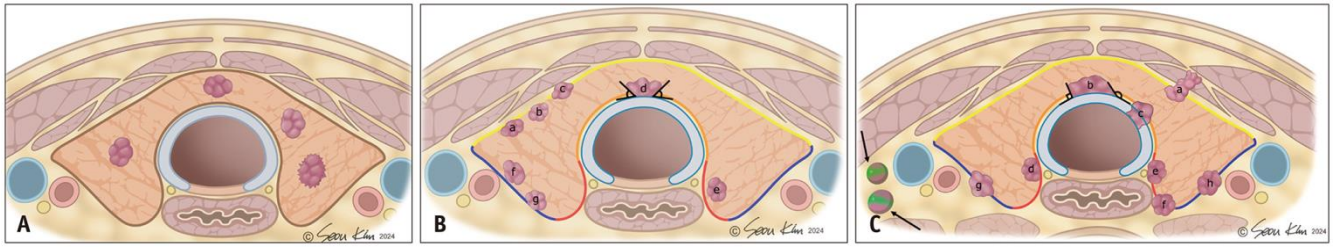
Electromagnetic - Thermal	**Radiofrequencies (RFA)** **Microwaves (MWA)** **Laser (LITT)**
Electromagnetic - Biological	**Irreversible Electroporation (IRE)**
Mechanical - Thermal	**High Intensity Focused Ultrasound (HIFU)**
Thermal	**Cryoablation (CWA)**
Chemical	**Percutaneous Ethanol Injection (PEI)**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

RF Ablation indication for neck mass

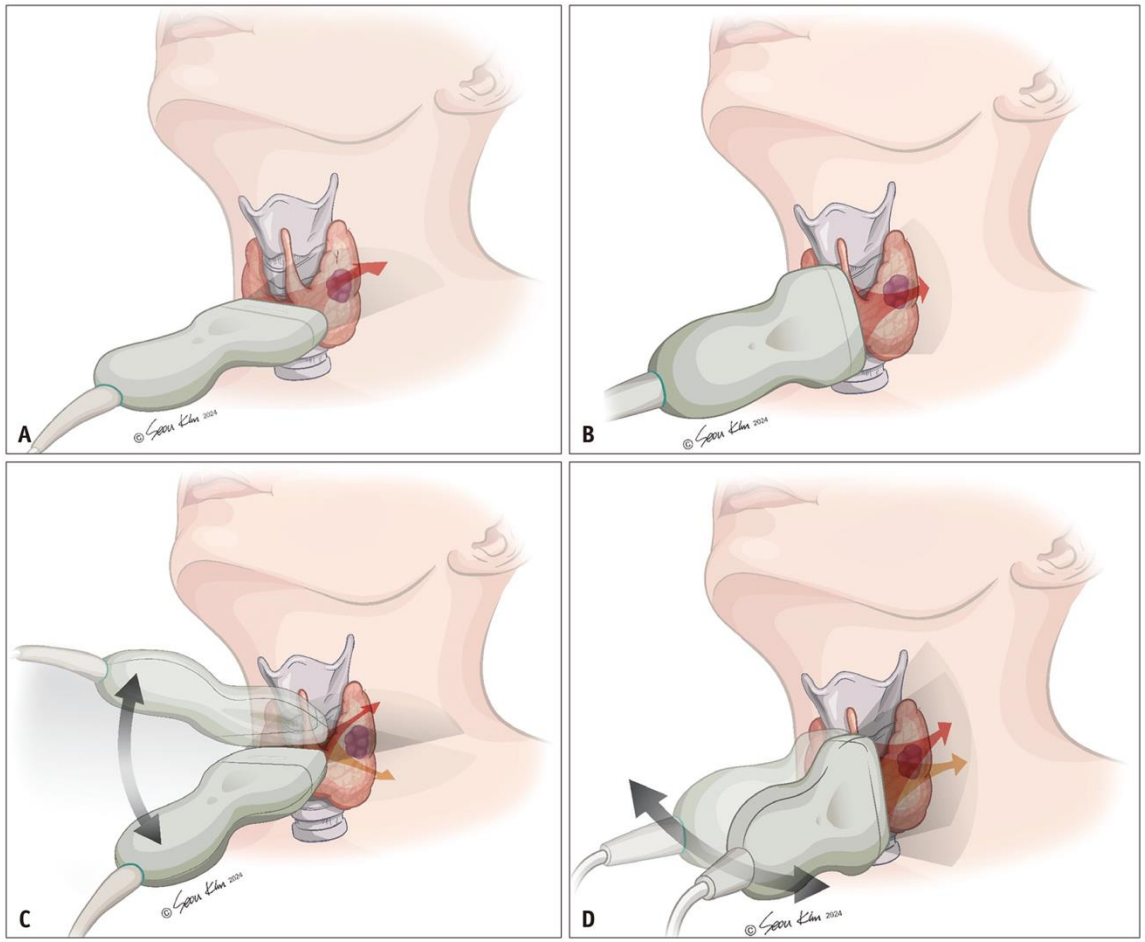
recurrent thyroid cancer	metastatic cervical lymph nodes	benign thyroid nodule
hot nodule (AFTN)	parathyroid adenoma	primary micro PTC

RFA Basic Understanding



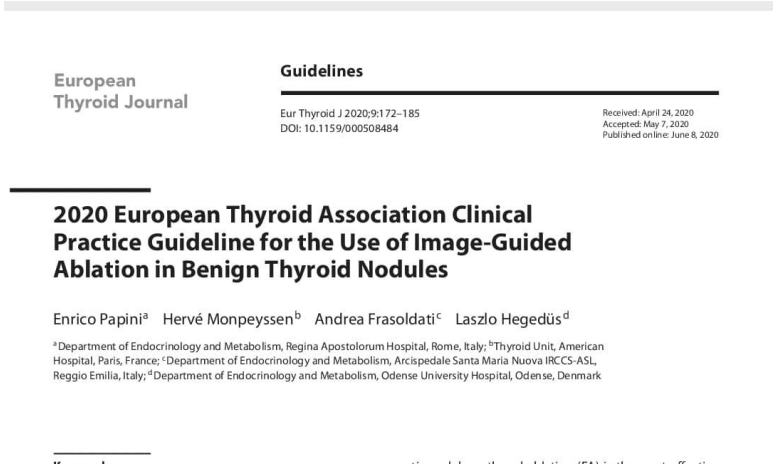


Korean J Radiol 2024 November;25(11):942-958. https://doi.org/10.3348/kjr.2024.0871



Korean J Radiol 2024 November;25(11):942-958. https://doi.org/10.3348/kjr.2024.0871

RF Ablation guidelines



European
Thyroid Journal

Guidelines

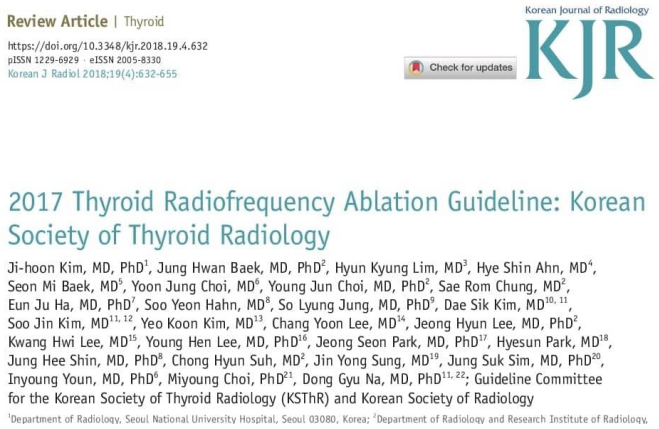
Eur Thyroid J 2020;9:172–185
DOI: 10.1159/000508484

Received: April 24, 2020
Accepted: May 7, 2020
Published online: June 8, 2020

2020 European Thyroid Association Clinical Practice Guideline for the Use of Image-Guided Ablation in Benign Thyroid Nodules

Enrico Papini[a] Hervé Monpeyssen[b] Andrea Frasoldati[c] Laszlo Hegedüs[d]

[a]Department of Endocrinology and Metabolism, Regina Apostolorum Hospital, Rome, Italy; [b]Thyroid Unit, American Hospital, Paris, France; [c]Department of Endocrinology and Metabolism, Arcispedale Santa Maria Nuova IRCCS-ASL, Reggio Emilia, Italy; [d]Department of Endocrinology and Metabolism, Odense University Hospital, Odense, Denmark



Review Article | Thyroid

https://doi.org/10.3348/kjr.2018.19.4.632
pISSN 1229-6929 · eISSN 2005-8330
Korean J Radiol 2018;19(4):632-655

Check for updates

Korean Journal of Radiology
KJR

2017 Thyroid Radiofrequency Ablation Guideline: Korean Society of Thyroid Radiology

Ji-hoon Kim, MD, PhD[1], Jung Hwan Baek, MD, PhD[2], Hyun Kyung Lim, MD[3], Hye Shin Ahn, MD[4], Seon Mi Baek, MD[5], Yoon Jung Choi, MD[6], Young Jun Choi, MD, PhD[2], Sae Rom Chung, MD[2], Eun Ju Ha, MD, PhD[7], Soo Yeon Hahn, MD[8], So Lyung Jung, MD, PhD[9], Dae Sik Kim, MD[10, 11], Soo Jin Kim, MD[11, 12], Yeo Koon Kim, MD[13], Chang Yoon Lee, MD[14], Jeong Hyun Lee, MD, PhD[2], Kwang Hwi Lee, MD[15], Young Hen Lee, MD, PhD[16], Jeong Seon Park, MD, PhD[17], Hyesun Park, MD[18], Jung Hee Shin, MD, PhD[8], Chong Hyun Suh, MD[2], Jin Yong Sung, MD[19], Jung Suk Sim, MD, PhD[20], Inyoung Youn, MD, PhD[6], Miyoung Choi, PhD[21], Dong Gyu Na, MD, PhD[11, 22]; Guideline Committee for the Korean Society of Thyroid Radiology (KSThR) and Korean Society of Radiology

[1]Department of Radiology, Seoul National University Hospital, Seoul 03080, Korea; [2]Department of Radiology and Research Institute of Radiology,

Clinical practice guidelines for radiofrequency ablation of benign thyroid nodules: a systematic review

Article in ULTRASONOGRAPHY · June 2020

DOI: 10.14366/usg.20015

European
Thyroid Journal

Guidelines

Eur Thyroid J 2021;10:185–197
DOI: 10.1159/000516469

Received: 03 23, 2021
Accepted: 04 10, 2021
Published online: May 25, 2021

European Thyroid Association and Cardiovascular and Interventional Radiological Society of Europe 2021 Clinical Practice Guideline for the Use of Minimally Invasive Treatments in Malignant Thyroid Lesions

ETA &CVIR recommendations 2021

Indications for use of MITs in PTMCs

Factors favoring thermal ablation	Factors favoring surgery
Demographics	*Demographics*
Old age	Young age
Relevant comorbidities	No comorbidities
No family history of aggressive forms	Familial form
Contralateral vocal cord palsy	–
Refusal of surgery	–
Cytology	*Cytology*
Papillary carcinoma classical variant	Worrisome cytology features
–	High-risk molecular pattern
US examination	*US examination*
Central location	Subcapsular location
Well defined margins	Posterior location
Absence of capsular contact	Paratracheal location
Solitary thyroid lesion	Multinodular goiter
No evidence of extrathyroidal spread	Extrathyroidal spread
Technical resources	*Technical resources*
Expertise in US-guided ablation procedures	High-volume thyroid surgery

MITs, minimally invasive treatments; PTMCs, papillary thyroid microcarcinomas; US, ultrasound.

Table 2. US based appropriateness criteria for AS in PTMC

Risk of tumor	Appropriateness for AS	US feature
Low-risk	Ideal	Confined to the thyroid
		No contact with the thyroid capsule and adjacent organs
		No suspicious feature of LN metastasis* or distant metastasis
	Appropriate	Anterior subcapsular tumors with a capsular abutment, capsular disruption or protrusion
		Paratracheal tumors with acute angle abutment to the trachea
		Posteromedial subcapsular tumors showing preserved thyroid parenchyma between tumor and TEG
		Posterolateral subcapsular tumors with capsular abutment
		Tumors with ill-defined margin
High-risk	Inappropriate (candidates for immediate surgery)	Anterior subcapsular tumors with replacement of strap muscle
		Paratracheal tumors with right- or wide-angle abutment to trachea
		Posteromedial tumors with loss of normal parenchyma between TEG and tumor, or obvious protrusion
		Posterolateral subcapsular tumors with obvious protrusion
		Presence of biopsy proven or clinical lymph node metastasis or distant metastasis

*Cortical hyperechogenicity, cystic change, echogenic foci (calcification) or abnormal vascularity on US.

US = ultrasound, AS = active surveillance, PTMC = papillary thyroid microcarcinoma, LN = lymph node, TEG = tracheoesophageal groove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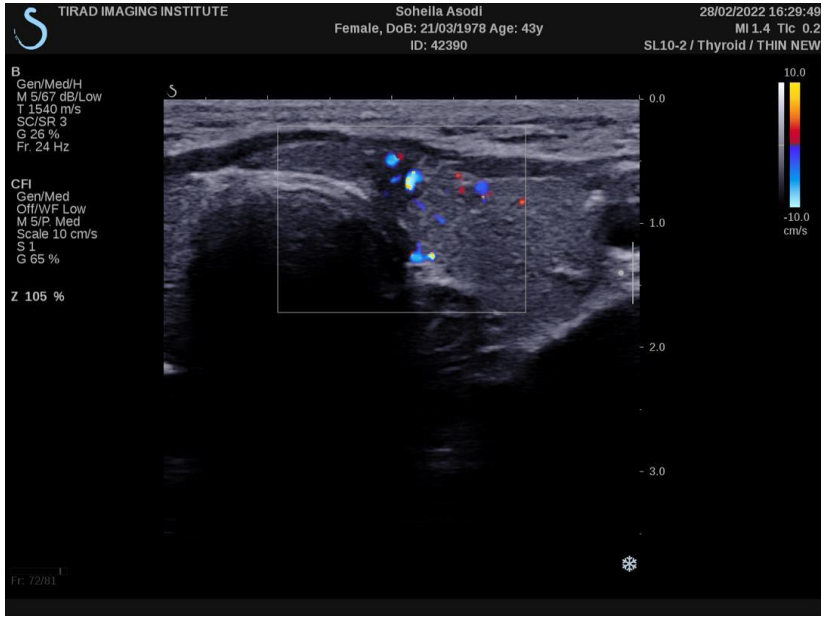
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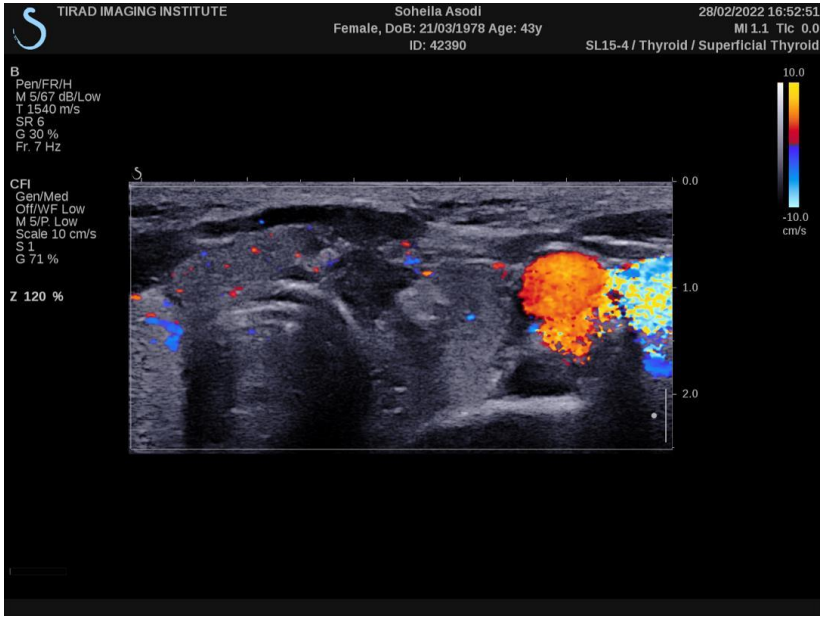
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Fr. 7 Hz
CFI
Gen/Med
Off/WF Low
M 5/P. Low
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S 1
G 71 %
Z 120 %
10.0
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cm/s
0.0
1.0
2.0


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Fr. 22 Hz
CFI
Gen/Med
Off/WF Low
M 5/P. Low
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S 1
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Z 120 %
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0.0
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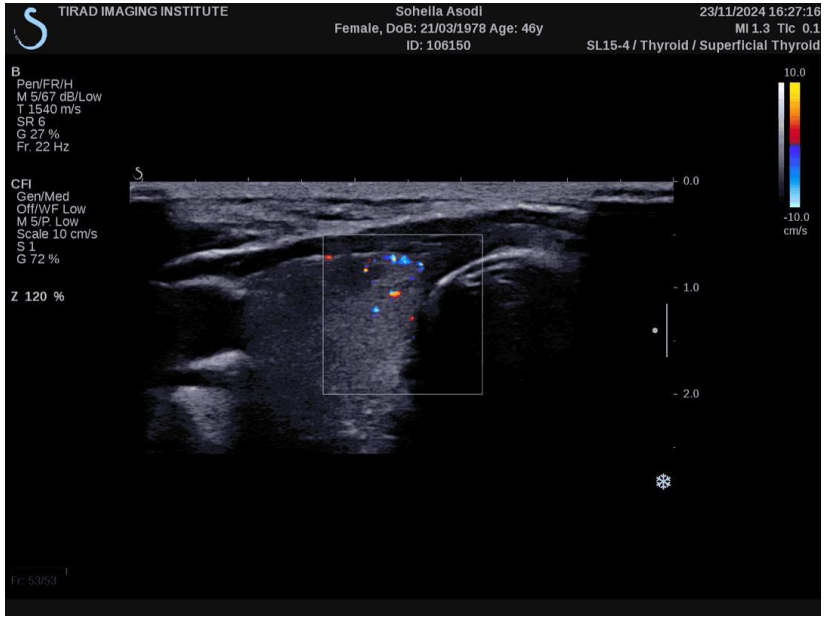
cm/s
1.0
2.0
Fr: 16/16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Fr. 22 Hz
CFI
Gen/Med
Off/WF Low
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Scale 10 cm/s
S 1
G 72 %
Z 120 %
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cm/s
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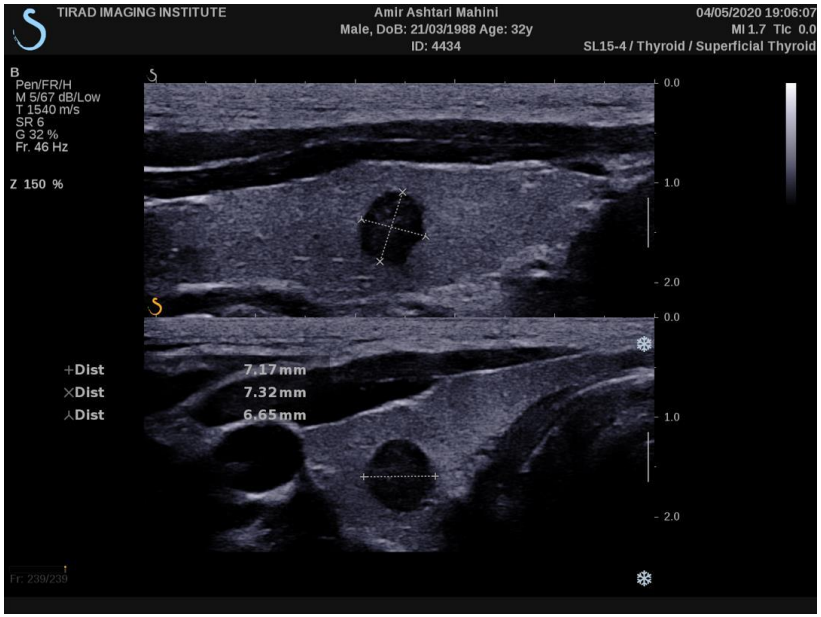
Primary micro PTC

Micro PTC



1 year follow up after RFA

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Microwave Ablation for Papillary Thyroid Microcarcinoma with and without US-detected Capsule Invasion: A Multicenter Prospective Cohort Study

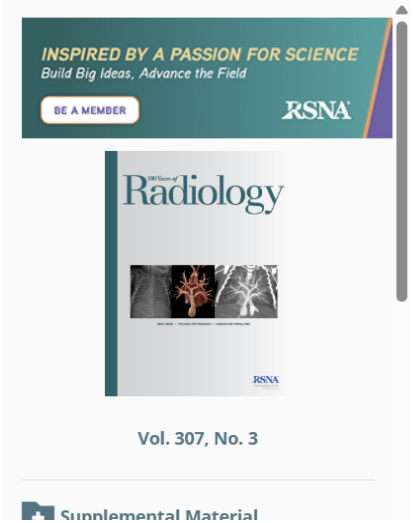
Lin Zheng*, Jian-ping Dou*, Zhi-yu Han, Fang-yi Liu, Jie Yu, Zhi-gang Cheng, Xiao-ling Yu, Hui Wang, Zhi-bin Cong, Shu-rong Wang, Ming-an Yu, Zhi-feng Xu, Ying Che, Bai Nan, Cun Liu, Ying Hao, Xue Wang, Ying Liu, Ying Zhou, Ping Liang

* L.Z. and J.P.D. contributed equally to this work.

Author Affiliations

Published Online: Mar 7 2023 | https://doi.org/10.1148/radiol.220661

Figures References Related Details



Vol. 307, No. 3

Supplemental Material

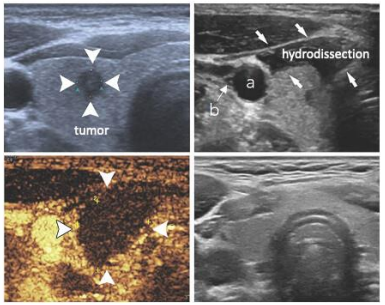
Conclusion

Microwave ablation was feasible in the treatment of papillary thyroid microcarcinoma with US-detected capsular invasion and showed comparable short-term efficacy with or without the presence of capsular invasion.

Clinical trial registration no. NCT04197960

RSNA

Microwave Ablation for Papillary Thyroid Microcarcinoma with and without US-detected Capsule Invasion: A Multicenter Prospective Cohort Study



No enhancement on CEUS No tumor on 1-year follow-up

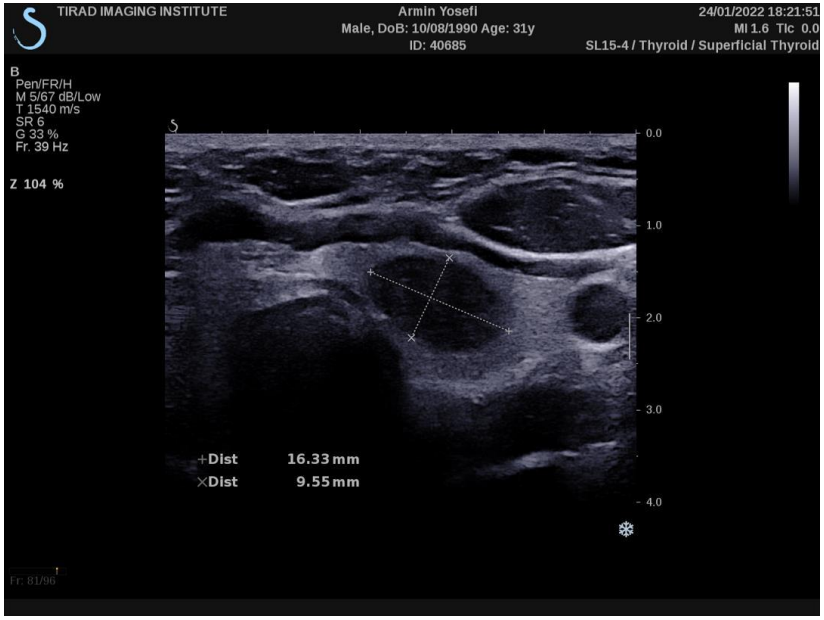
- Prospective study of 461 participants with papillary thyroid microcarcinoma who underwent ablation were divided into those with (n = 83) and those without (n = 378) capsule invasion (mean follow-up, 20 and 21 months ± 4, respectively).
- No differences in volume reduction rate (P = .58) or disease progression (2% vs 1%, P = .82), respectively.
- Comparable technical success rates were achieved (99% vs 100%), with one versus 11 complications (1% vs 3%, P = .38).

Zheng L and Dou JP et al. Published Online: March 7, 2023
https://doi.org/10.1148/radiol.220661

Radiology

Zheng L. Published Online: March 07, 2023
https://doi.org/10.1148/radiol.220661

Radiology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Z 104 %
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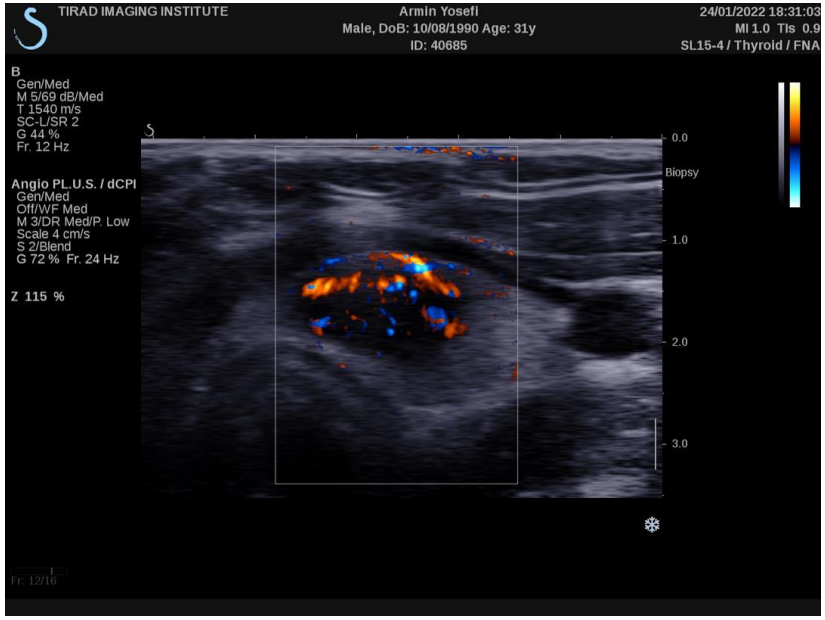
Fr: 81/96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Gen/Med
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M 3/DR Med/P. Low
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S 2/Blend
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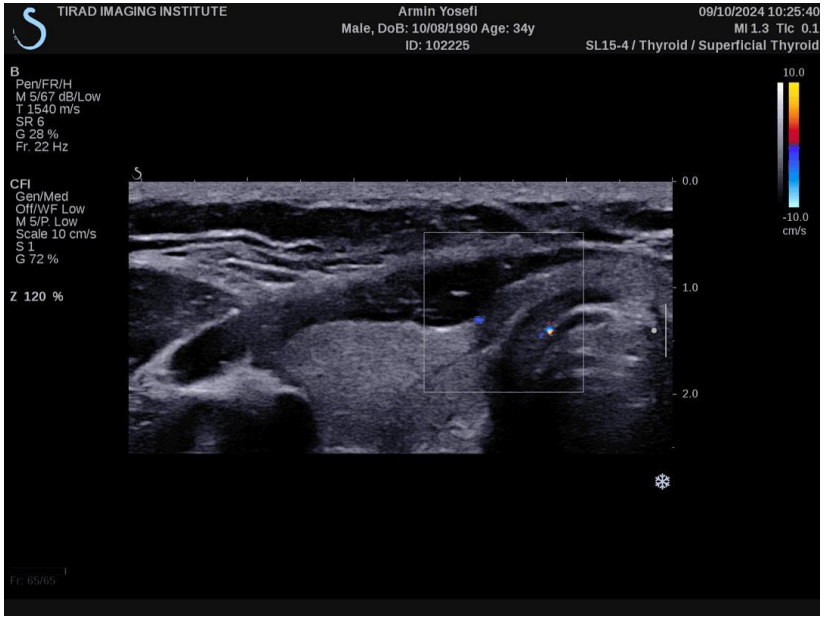
Z 115 %
Biopsy
Fr: 12/16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SR 6
G 28 %
Fr. 22 Hz
CFI
Gen/Med
Off/WF Low
M 5/P. Low
Scale 10 cm/s
S 1
G 72 %
Z 120 %
10.0
-10.0
cm/s
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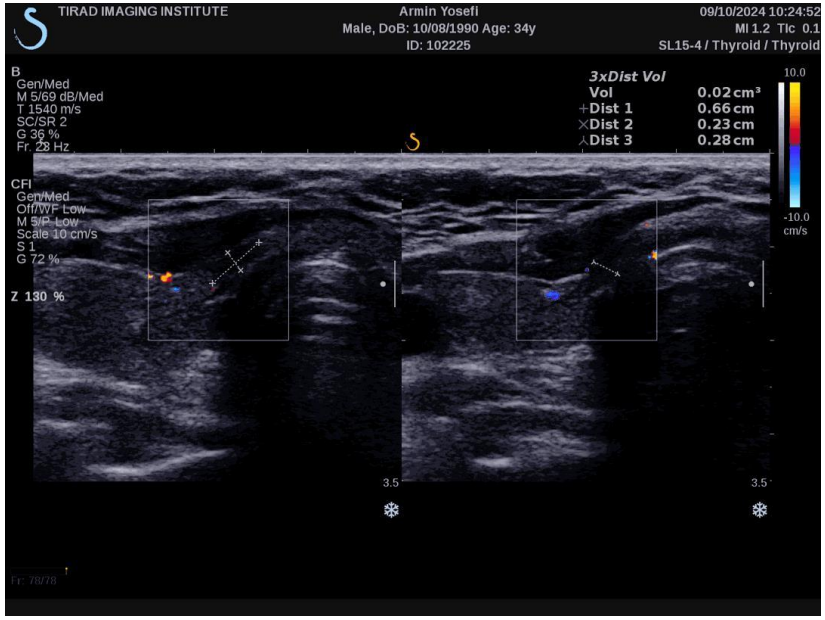
1.0
2.0
Fr: 65/65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B
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M 5/69 dB/Med
T 1540 m/s
SC/SR 2
G 36 %
Fr. 28 Hz
CFI
Gen/Med
Off/WF Low
M 5/P. Low
Scale 10 cm/s
S 1
G 72 %
Z 130 %
3xDist Vol
Vol 0.02 cm³
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Dist 2 0.23 cm
Dist 3 0.28 cm
10.0
-10.0
cm/s
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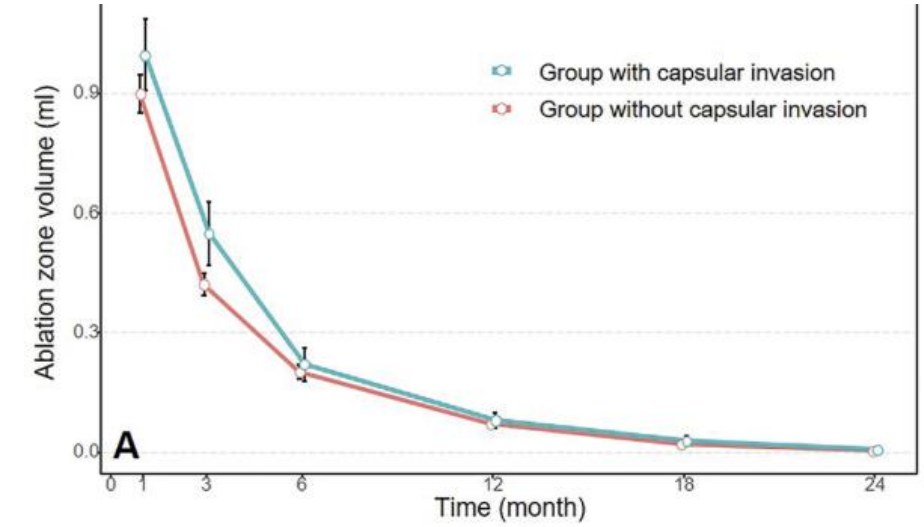
Fr: 78/78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0.0
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0.6
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Group with capsular invasion
Group without capsular invasion
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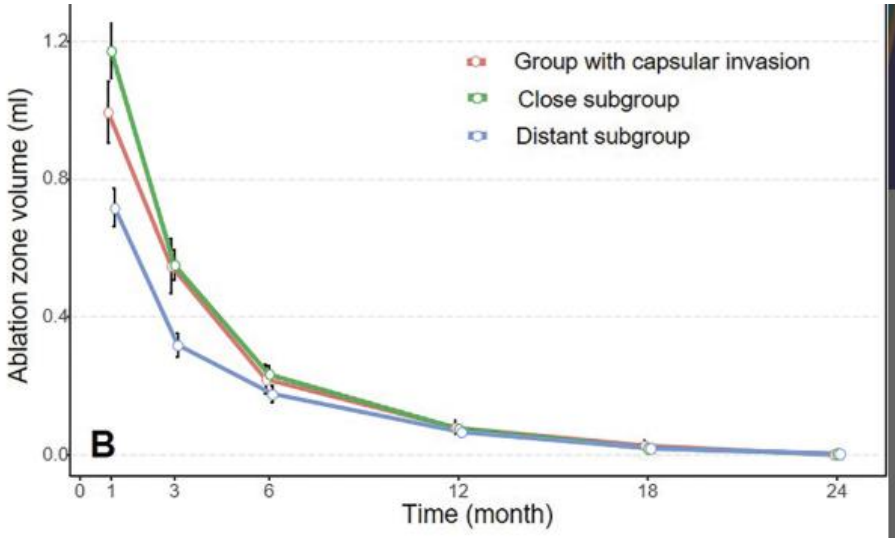
0
1
3
6
12
18
24
Time (month)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0.4
0.8
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Close subgroup
Distant subgroup
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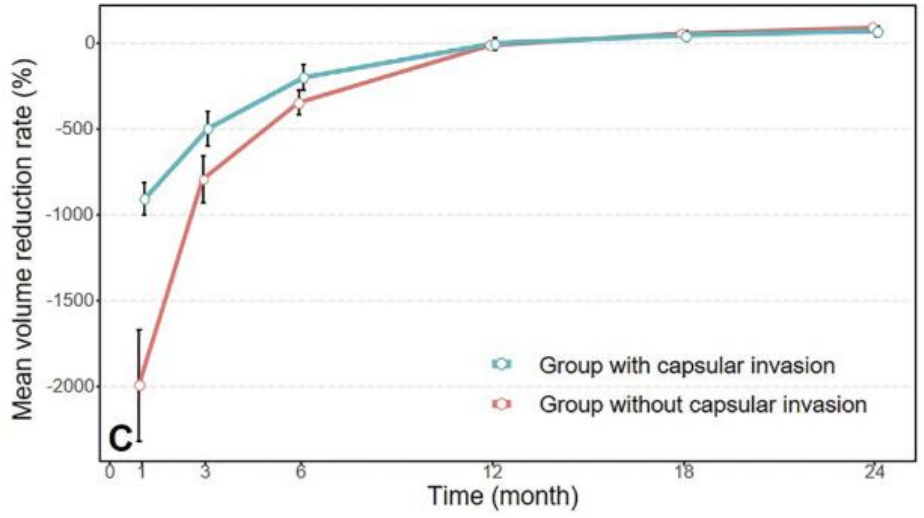
1
3
6
12
18
24
Time (month)


Mean volume reduction rate (%)
0
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-1000
-1500
-2000
Group with capsular invasion
Group without capsular invasion
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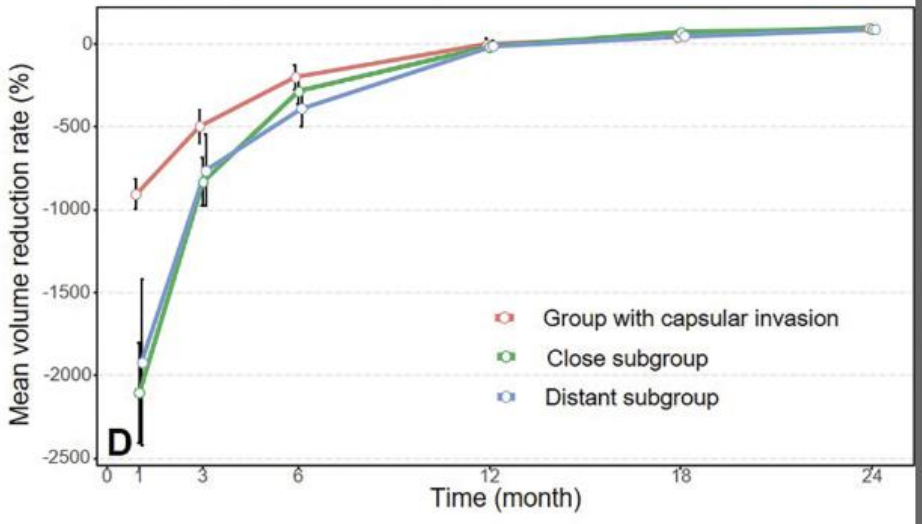
0
1
3
6
12
18
24
Time (month)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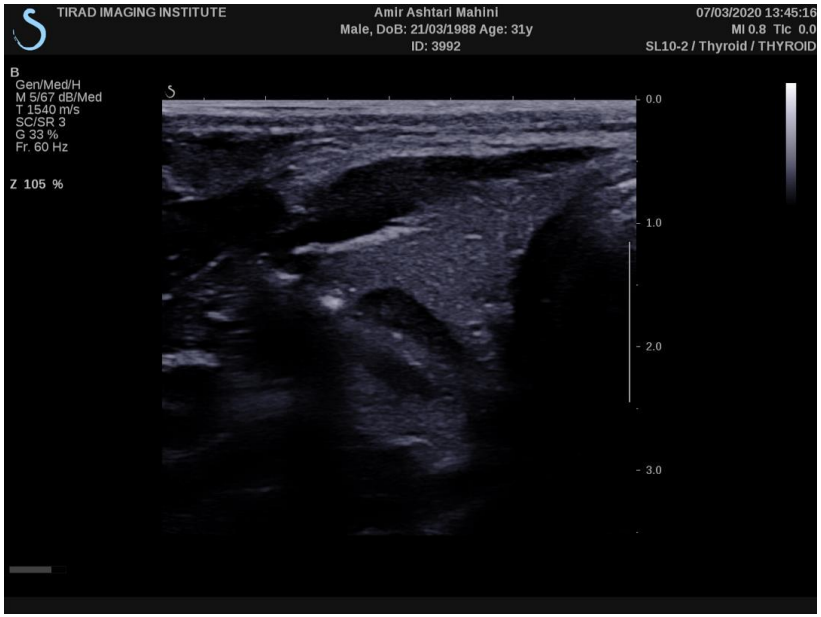
-1000
-1500
-2000
-2500
Group with capsular invasion
Close subgroup
Distant subgroup
D
0
1
3
6
12
18
24
Time (month)

Table 3. Meta-analysis of RFA in Patients With mPTC

Characteristic	No.		Follow-up, mean (SD), mo	Pooled proportion (95% CI)	Heterogeneity test		Publication bias (Egger test)	
	Studies	Patients			I^2, %	*P* value	*z* Score	*P* value
Complete disappearance								
After 12 mo	9	929	12	0.66 (0.52-0.81)	96.8	<.001	−0.39	.69
At end of follow-up	12	1386	34 (21)	0.79 (0.65-0.94)	99.7	<.001	−1.87	.06
Volume reduction rate after 12 mo	7	1025	12	0.92 (0.85-0.99)	99.8	<.001	−5.17	<.001
Mean volume reduction, mm^3	6	937	30 (18)	95 (83-107)	87.7	<.001	0.26	.79
Tumor progression rate	15	1770	33 (11)	0.01 (0.00-0.01)	4.9	.38	2.22	.03
Total complications	15	1770	33 (11)	0.02 (0.01-0.03)	60.9	<.001	4.21	<.001
Major complications	15	1770	33 (11)	0.00 (0.00-0.01)	0.00	.99	4.21	<.001

Abbreviations: mPTC, papillary microcarcinoma of the thyroid; RFA, radiofrequency ablation.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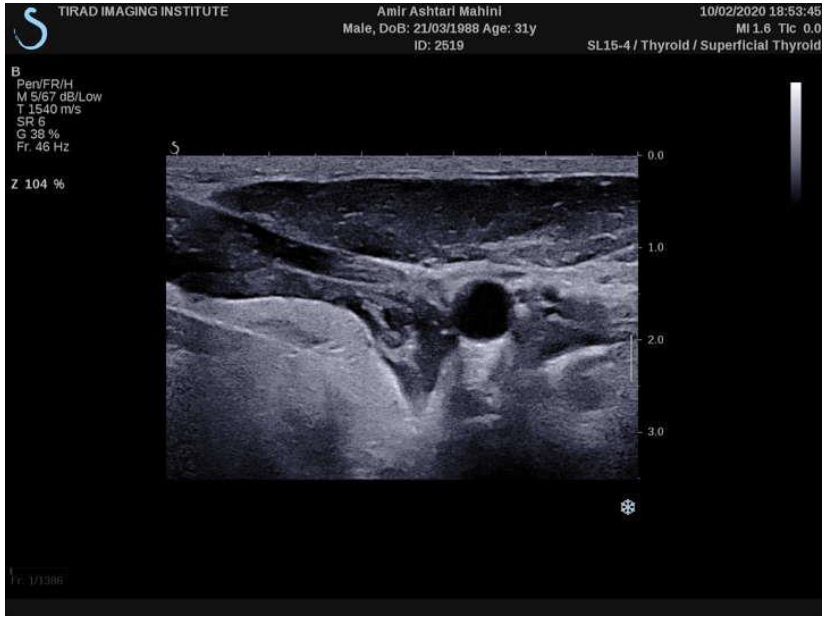
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SR 6
G 38 %
Fr. 46 Hz
Z 104 %
0.0
1.0
2.0
3.0

Complication:

- Minor

Hematoma (compression 30m -2h)

Vomiting

Skin burn

Transient thyrotoxicosis,

Lidocaine toxicity,

Hypertension

Pain

- Major

Nerve injuries (recurrent laryngeal

nerve, cervical sympathetic ganglion

brachial plexus and spinal accessory nerve)

nodule rupture (conservative)

Permanent hypothyroidism.

Nerve injury

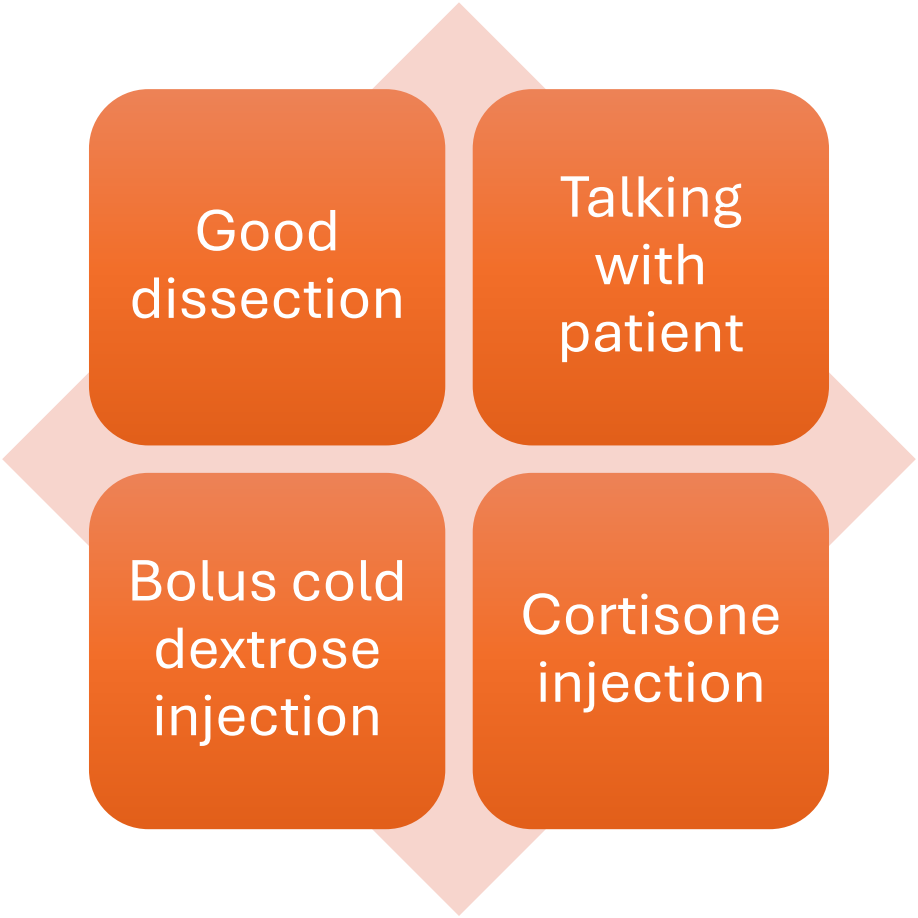


Table 3. Meta-analysis of RFA in Patients With mPTC

Characteristic	No. Studies	No. Patients	Follow-up, mean (SD), mo	Pooled proportion (95% CI)	Heterogeneity test I^2, %	Heterogeneity test *P* value	Publication bias (Egger test) *z* Score	Publication bias (Egger test) *P* value
Complete disappearance								
After 12 mo	9	929	12	0.66 (0.52-0.81)	96.8	<.001	−0.39	.69
At end of follow-up	12	1386	34 (21)	0.79 (0.65-0.94)	99.7	<.001	−1.87	.06
Volume reduction rate after 12 mo	7	1025	12	0.92 (0.85-0.99)	99.8	<.001	−5.17	<.001
Mean volume reduction, mm^3	6	937	30 (18)	95 (83-107)	87.7	<.001	0.26	.79
Tumor progression rate	15	1770	33 (11)	0.01 (0.00-0.01)	4.9	.38	2.22	.03
Total complications	15	1770	33 (11)	0.02 (0.01-0.03)	60.9	<.001	4.21	<.001
Major complications	15	1770	33 (11)	0.00 (0.00-0.01)	0.00	.99	4.21	<.001

Abbreviations: mPTC, papillary microcarcinoma of the thyroid; RFA, radiofrequency ablation.

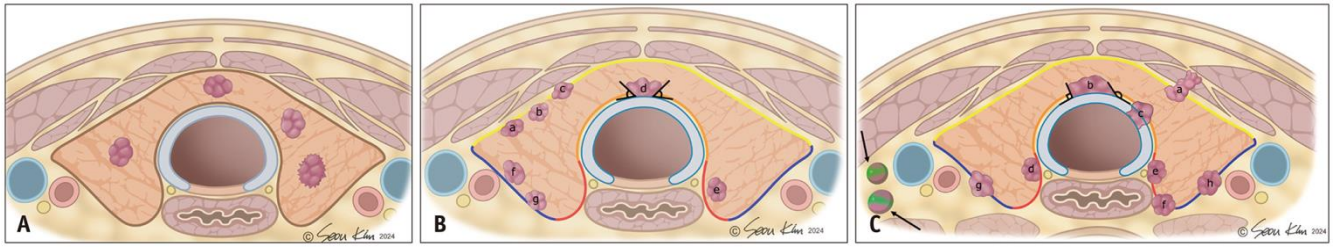
Table 4. Different Studied mPTC Treatment Options With Advantages and Disadvantages

Characteristic	Surgery[a]	RFA	Active surveillance
Complete disappearance of mPTC, %	100	80	0
Progression of disease, %[b]	3[55]	Unknown	7[52]
Overall complications (eg, infection, bleeding, transient voice problems, or hypoparathyroidism), %	3-8[56,57]	2	0
Advantages	Complete removal of mPTC Relatively short follow-up time after surgery No cancer in situ	Minimally invasive procedure 80% Complete disappearance after ablation No thyroid hormone replacement therapy needed	In most cases no surgery needed No thyroid hormone replacement therapy needed
Disadvantages	Risk of complications; permanent voice change in 1%-3% of patients Potential need for thyroid hormone replacement therapy after surgery (20%-30% for lobectomy[58])	Long-term oncologic results are vastly unknown, especially in populations with restrictive diagnostic protocols	Long-term results are vastly unknown, especially in populations with restrictive diagnostic protocols Lifelong (?) follow-up Anxiety owing to cancer in situ

Abbreviations: mPTC, papillary thyroid microcarcinoma; RFA, radiofrequency ablation.

[a] Lobectomy.

[b] Surgery: recurrence of disease more than 5 years after initial treatment (in other thyroid lobe or nodal metastasis); RFA: recurrence of disease more than 5 years after initial treatment (in ablation area, other thyroid lobe, or nodal metastasis); active surveillance: progression of disease more than 5 years after start of active surveillance (tumor growth, new mPTC in other lobe, or nodal metastasis).



Korean J Radiol 2024 November;25(11):942-958. https://doi.org/10.3348/kjr.2024.0871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