Review of Thermal Ablation for Papillary Thyroid Cancer

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INTRODUCTION

While there is no clear consensus on the treatment approach for PTC, the initial treatment of choice is surgery. Surgery has a low rate of recurrence, but it is associated with intraoperative injury to the recurrent laryngeal nerve and parathyroid glands. Patients may elect active surveillance (AS) as it has been shown to have an acceptable tumor progression rate. However, AS provides anxiety and concern to patients and physicians alike due to the indwelling cancer.

Contrast-enhanced (CE) ultrasound (US) guided thermal ablation, including microwave ablation (MWA) and radiofrequency ablation (RFA) is a treatment modality that has been increasingly studied as it is minimally invasive and effective in treating early-stage (T1a/T1b) PTC.[1]

TECHNIQUE

1. Prior to ablation, a CE US is performed to evaluate tumor enhancement patterns. In the supine position, local anesthesia is administered in the designated ablation site.

2. To reduce injury to adjacent critical structures, a core needle is inserted along the along the thyroid capsule between the thyroid lobe beside the tumor and adjacent structures for hydrodissection, and a distance of at least 5 mm is maintained during ablation. Slow continuous saline infusion may be used to maintain this distance.

3. The power of ablation is usually maintained at 30-50W

4. Ablation is terminated once the hyperechoic ablation zone covered the entirety of the original tumor.

5. CE US is completed to assess ablation effects and determine if further ablation is needed.[2]

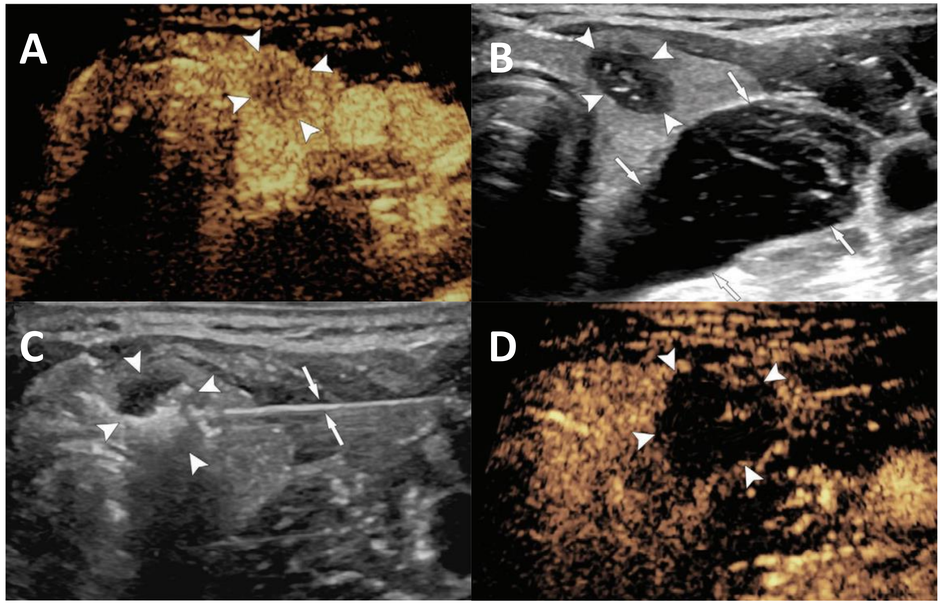

Figure 1: PTC in the right lobe treated with microwave ablation.[2]
(A) Pre-ablation CE US demonstrating hypoenhancemed tumor (arrowheads).
(B) Hydrodissection (arrow) used to protect the carotid artery and vagus nerve (arrowheads) during ablation.
(C) Hyperechoic tumor (arrowheads) during ablation. Ablation needle marked with arrows.
(D) Loss of hyperechoic pattern post-ablation representing a successful ablation procedure.

Follow-up Time	Maximum Diameter (mm)	*P* Value	Volume (mm^3)	*P* Value
Preablation (*n* = 847)	7.7 ± 3.5		245.7 ± 413.8	
Postablation				
1 month (*n* = 847)	9.2 ± 3.1	<.001*	342.8 ± 453.3	<.001*
3 months (*n* = 847)	7.8 ± 2.9	.08	240.8 ± 329.0	.31
6 months (*n* = 847)	6.1 ± 3.5	<.001	142.7 ± 210.8	<.001
9 months (*n* = 726)	4.8 ± 4.0	<.001	118.5 ± 205.9	<.001
12 months (*n* = 664)	2.9 ± 4.1	<.001	78.2 ± 181.7	<.001

Note.—Unless otherwise specified, data are mean ± standard deviation, with the range in parentheses. *P* value is for postablation (months 1, 3, 6, 9, and 12) versus preablation values, respectively.
* The value 1 month after ablation was greater than the preablation value.

Table 1: Diameter and volume of PTC tumors 1 year after ablation[2]

COMPLICATIONS

- Complications are relatively uncommon (~3%) following thermal ablation
- Patients with voice hoarseness generally improve within 6 months.
- Complication rates may be decreased through the use of high-frequency probe with higher spatial and temporal resolution to guide the ablative procedure and use of continuous saline hydrodissection.[2]

DISCUSSION

- Active surveillance is an alternative to immediate surgery for low-risk PTC (usually T1N0M0), though studies have shown this increases worry among both patients and physicians.
- CE US-guided thermal ablation allows for an intermediate between surveillance and surgery for low-risk PTC.
- Data favorably supports the use of thermal ablation in PTC in which >60% of patients experience tumor disappearance.
- Long-term studies reveal excellent short-term outcomes, including no locoregional recurrence, lymph node or distant metastasis, and reduction in patients undergoing surgery due to anxiety
- To increase safety and efficacy of thermal ablative therapies for low-risk PTC, it is imperative to evaluate tumors preoperatively using US and a thyroid-dedicated CT protocol

REFERENCES

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2. Cao X-J, Wang S-R, Che Y, et al. Efficacy and Safety of Thermal Ablation for Treatment of Solitary T1N0M0 Papillary Thyroid Carcinoma: A Multicenter Retrospective Study. *Radiology*. 2021;300(1):209-216. doi:10.1148/radiol.2021202735