

Reviewer #1:

Scientific Quality: Grade D (Fair)

Language Quality: Grade B (Minor language polishing)

Conclusion: Accept (General priority)

Specific Comments to Authors: This case shows microwave thermoablation can be a safe and effective alternative to surgery in patients with no conditions to undergo surgery or refuse it. However, there is no control case, so this is not solid evidence for clinical practice

Yes, we do not have control case. We are aware that the gold standard treatment is thyroidectomy and this technique is only used in selected cases, when surgery is not possible.

Reviewer #2:

Scientific Quality: Grade C (Good)

Language Quality: Grade B (Minor language polishing)

Conclusion: Major revision

Specific Comments to Authors: This article investigated a case with papillary thyroid carcinoma treated by microwave ablation. Major points : 1. The background in the manuscript is too brief to understand the motivation of the study. Previously, microwave ablation was mainly used for the treatment of recurrent thyroid cancer without surgical indications. Nonetheless, the current indications were extended to the ablation of benign thyroid nodules, thyroid microcarcinoma, regional metastatic lymph nodes, as well as enlarged glands in Graves' disease. The authors need to replenish the treatment indications about the Korean Society of Thyroid Radiology launched a consensus on the ablation treatment (AT) of thyroid nodules in 2012 and 2017. 2. Similarly, the discussion in the manuscript is too brief, and lack of main concerns. e.g., ① For lesions > 1 cm in diameter, the residual rate of the tumor is as high as 50% after AT. How did you confirm there was no tumor residue? ② Ablation will increase the risk of subsidiary-injury. How did you avoid it? ③ What are the best option for the ablation therapy?

We introduced the answers for these questions on the reviewed manuscript, as you can see below.

For a quicker visualization, I will enumerate:

1. It is not possible to present an anatomopathological result that confirms the absence of remaining tumor tissue, since the patient did not undergo surgery and did not die (post mortem examination). However, none of the imaging tests he performed, from contrast-enhanced ultrasound, neck CT and PE-CT, found aspects that would raise this suspicion, quite the opposite, they demonstrated the disappearance of the nodule and of the area of hypermetabolism where it was previously present.
2. Iatrogenic injury to neighboring structures was avoided using hydrodissection with lidocaine diluted in saline. This way, safety margin of at least 2 mm was obviously guaranteed in relation to vital structures, such as the carotid artery.

3. Laser ablation, radiofrequency ablation, and microwave ablation are similarly safe and effective, so the choice should be based on the specific competences and resources of the centers [8].

CASE REPORT - MICROWAVE ABLATION OF SOLITARY T1N0M0 PAPILLARY THYROID CARCINOMA

Dionisio et al. Microwave ablation of solitary t1n0m0 papillary thyroid carcinoma

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Author contributions: All authors contributed to manuscript writing and editing and had approved the final manuscript.

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Abstract

BACKGROUND

The gold standard treatment for papillary thyroid carcinoma is total thyroidectomy and indications for microwave thermal ablation for primary thyroid cancers have not yet been clearly established. However, some patients refuse surgery and others have no indication, for example patients under palliative care as in this case, or cannot undergo

surgery, based on their comorbidities. These indications are described in the most recent Korean, North American and European guidelines [4,6,8].

Laser ablation, radiofrequency ablation, and microwave ablation are similarly safe and effective, so the choice should be based on the specific competences and resources of the centers [8].

These indications are Percutaneous minimally-invasive techniques can be useful to stop disease progression and as an alternative to surgery in patients with contraindication or who refuse surgery. We present a case of a thyroid papillary carcinoma with 17 mm effectively treated with microwave thermal ablation and without recurrence after one year of follow up.

CASE SUMMARY

The authors present a case of a 71-years-old patient with a left lobe papillary thyroid carcinoma with 13x17x13 mm, with no indication for thyroid surgery given the context of another cancer in palliative treatment. Microwave thermoablation was performed on December 2021. Four months later he repeated CT scan, which showed that the tumor had disappeared. Six months after ablation he underwent a PET/CT-FDG scan, which didn't show any evidence of hypermetabolic tumor lesions.

CONCLUSION

This case shows microwave thermoablation can be a safe and effective alternative to surgery in patients with no conditions to undergo surgery or refuse it. By treating the tumor, with this minimally invasive technique, we are stopping its growth and avoiding disease progression.

Key Words: Papillary thyroid carcinoma; Thyroid Thermoablation; Microwave ablation; Prognosis; Case report.

Core Tip: The authors present a case of well succeeded treatment with microwave thermoablation of a 17 mm papillary thyroid carcinoma, in a patient with no indication for thyroid surgery, given the context of another neoplastic disease in palliative treatment. Four and twelve months later, a control neck CT scan was performed, which showed complete disappearance of the tumor.

INTRODUCTION

Surgery was historically the treatment of choice for most thyroid cancer. However, microwave thermal ablation has become a minimally invasive option for patients who have no indication or cannot undergo surgery, avoiding disease progression [1,3,13]. We present a case of a thyroid papillary carcinoma with 17 mm effectively treated with microwave thermal ablation, without major complications and without recurrence after one year of follow up.

CASE PRESENTATION

History of present illness

71 years old male patient with Lung Adenocarcinoma T4N0M0 initially treated with chemotherapy and radiotherapy. Because of disease progression patient restarted chemotherapy.

During follow up, the patient was referred for a PET/CT-FDG scan, which showed focal and intense uptake of 18F-FDG in the left lobe of the thyroid gland. An ultrasound-guided biopsy confirmed the presence of an 13x17x13 mm (corresponding to a volume of 1,4 mL) papillary carcinoma.

Imaging examinations

PET/CT-FDG scan showed focal and intense uptake of 18F-FDG in the left lobe of the thyroid gland (**figure 1a**). Ultrasonography revealed a hypoechogenic mass, with a diameter of 1.7 cm, on the left lobe of the thyroid (**figure 2a**). Nodule biopsy was performed under ultrasound control and cytological study revealed a papillary carcinoma. Neck CT showed a contrast-enhancing nodule in the left lobe of the thyroid and absence of locoregional lymph node metastasis (**figure 3a**).

FINAL DIAGNOSIS

Thyroid Papillary Carcinoma.

TREATMENT

Given the context of palliative treatment for lung cancer, the patient had no indication for thyroid surgery, so he was proposed for microwave thermal ablation of the thyroid tumor.

Before MWA, contrast-enhanced ultrasound (CEUS) was performed to evaluate the extent of the tumor and its enhancement mode (**figure 4a**). The relationship between the tumor and cervical critical structures was carefully evaluated to determine the best puncture site.

Topical 2% lidocaine was applied for local anesthesia and hydro dissection technique, which was employed at the designated ablation site before insertion of the ablation antenna.

It was then inserted a TATO 18-gauge microwave antenna. The output microwave power was 15 W for the ablation (**figure 5**).

We started from the most posterior part of the lower pole of the nodule, ablating to include the limit of the nodule and 2 mm of the surrounding thyroid tissue and the antenna was repositioned several times, successively in a more anterior and cranial direction of the lesion, always taking care to ensure that all tissue in the nodule and 2 mm around it were ablated. Iatrogenic injury to neighboring structures was avoided using hydrodissection with lidocaine diluted in saline. This way, safety margin of at least 2 mm was obviously guaranteed in relation to vital structures, such as the carotid artery.

The ablation time was 20 minutes.

After MWA, CEUS was performed to confirm whether the ablation was complete (**figure 4b**).

Vocal cord function was evaluated during and after the procedure.

After ablation, the patient remained under observation for 1 hour, with an ice patch at the puncture site.

At the end of this period, an ultrasound was performed to exclude acute complications of the procedure and the patient was discharged home.

OUTCOME AND FOLLOW-UP

Thermoablation of the malignant thyroid nodule was performed with technical success, meaning complete nodule ablation with safety margins.

The procedure was well tolerated by the patient and there were no acute complications.

The follow-up has been carried out with clinical and imaging surveillance, with thyroid ultrasound and CT to look for local or distant disease progression.

Ultrasound showed an avascularized hypoechoic area in the topography of the previous nodule, reflecting the ablation area (**figure 2b**).

CT scan 5 and 12 months after MWA thermal ablation shows tumor disappearance and absence of locoregional or distant disease progression (**figure 3b**).

PET/CT-FDG scan 6 months after thermal ablation had no evidence of hypermetabolic tumor lesions (**figure 1b**).

DISCUSSION

Thermal ablations proved to be an effective and safe treatment option in small low-risk PTCs supported by recent long-term follow-up data. However, there is no relevant data about treatment of thyroid papillary carcinomas with more than 1 centimeter and comparisons between MWA and surgical resection in the management of these tumors are rare.

This case illustrates a successful treatment of a thyroid papillary carcinoma with 17 mm, with a follow up of one year without recurrence.

No vital cervical structures were injured, namely vessels, nerves or vocal cords, and the patient's voice was unaffected. The remaining thyroid parenchyma remained intact, with normal thyroid function.

It is not possible to present an anatomopathological result that confirms the absence of remaining tumor tissue, since the patient did not undergo surgery and did not die (post mortem examination). However, none of the imaging tests he performed, from contrast-enhanced ultrasound, neck CT and PE-CT, found aspects that would raise this suspicion, quite the opposite, they demonstrated the disappearance of the nodule and of the area of hypermetabolism where it was previously present.

CONCLUSION

Literature on percutaneous treatment of thyroid carcinomas is limited.

This case illustrates an effective treatment of a thyroid papillary carcinoma with microwave thermal ablation, with no major complications or signs of recurrence after one year of follow-up.

Microwave ablation was comparable in the short term to surgery in terms of treatment safety and efficacy, that is, in this one-year follow-up period, no major iatrogenic complications of the procedure were identified and there were no signs of tumor recurrence.

The patient was spared the morbidity of an open surgical procedure potentially higher due to he was an immunosuppressed patient, because he was undergoing chemotherapy. Moreover, he did not have to be hospitalized and did not need hormone replacement therapy.

At the time of diagnosis of thyroid carcinoma, the patient had no indication for thyroidectomy and, in the impossibility of percutaneous treatment, the thyroid nodule would only be under surveillance.

However, at this moment, there are no signs of regional or distant recurrence of the lung neoplasm, so the attempt at a curative treatment for thyroid carcinoma proved to be an asset.

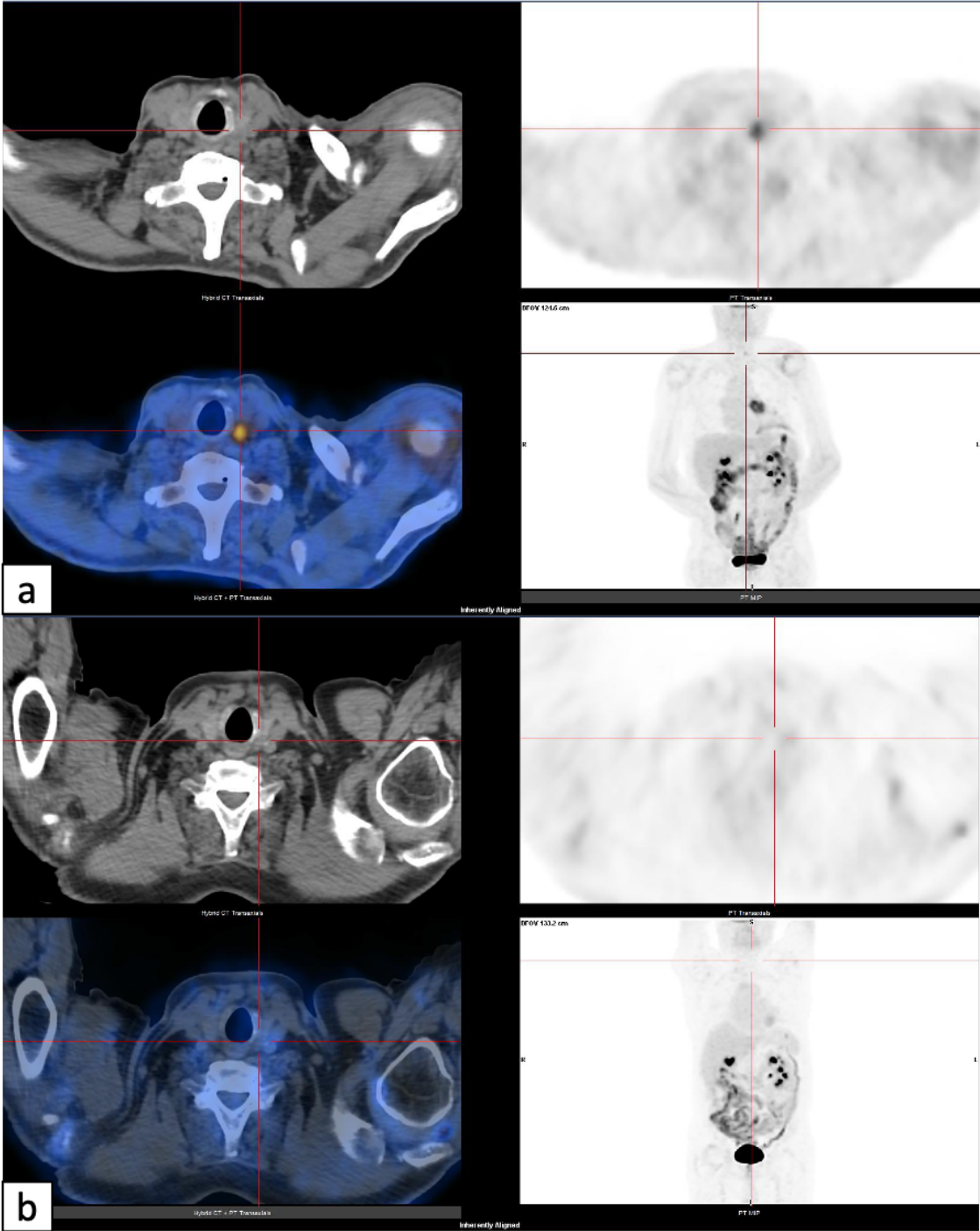
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Figure Legends

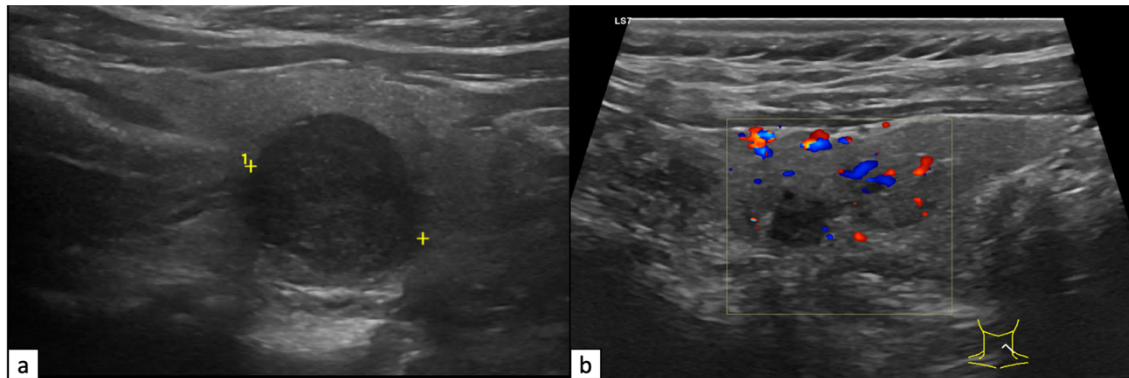
Figure 1 Positron emission tomography (PET). **a.** Before thermal ablation scan shows focal and intense uptake of 18F-FDG on left lobe of the thyroid gland (SUV max. 3,4). **b.** Six months post thermal ablation FDG-PET did not identify hypermetabolic tumor lesions.



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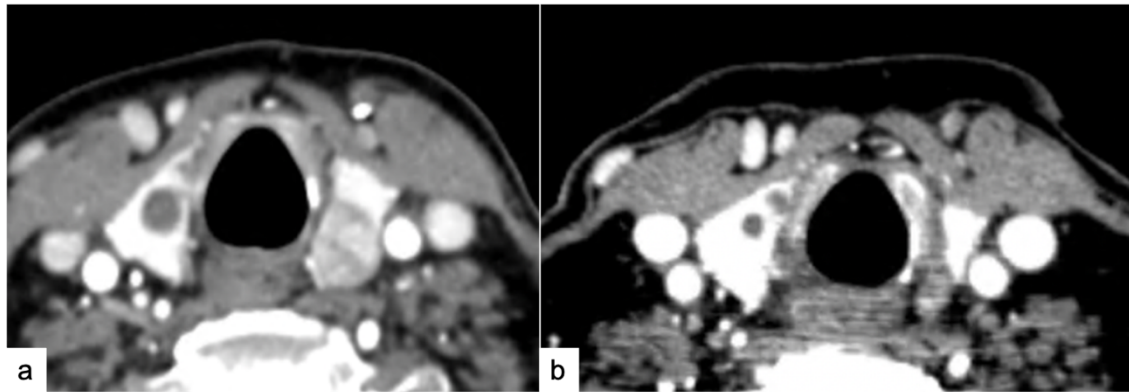
Figure 2 Thyroid Ultrasound. **a.** Ultrasonography done before thermal ablation revealed a hypoechogenic mass, with a diameter of 1.7 cm, on the left lobe of the thyroid. **b.**

Ultrasound performed 6 months after thermal ablation showed an hypoechoogenic avascularized area corresponding to the area submitted to ablation.



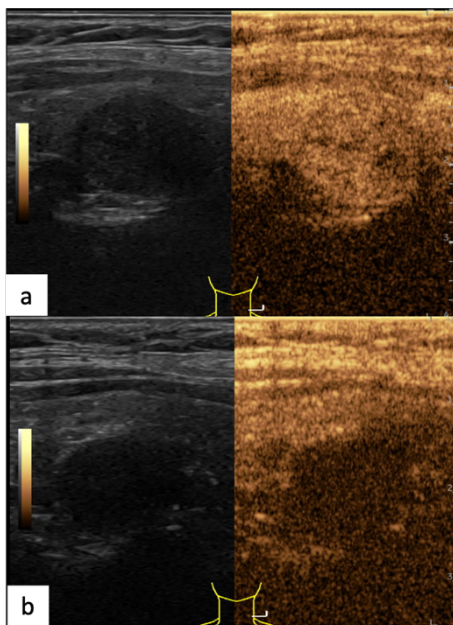
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Figure 3. Neck CT. a. Before thermal ablation shows a left lobe solitary papillary carcinoma and no suspicious cervical lymph nodes were seen. b. CT scan 4 months after MWA thermal ablation shows tumor disappearance and absence of locoregional or distant disease progression.



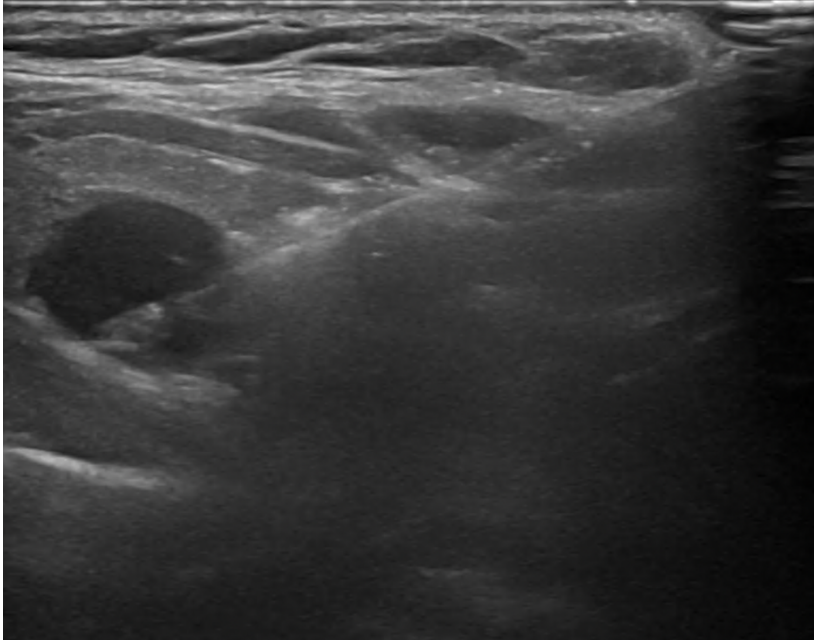
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Figure 4. Contrast enhanced ultrasound. a. Before procedure CEUS shows a solid nodule showing a fast wash-in, slow washout and homogeneous and high enhancement. B. Post-procedure CEUS confirms lack of contrast enhancement inside the ablated nodule.



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Figure 5. Ultrasound guided microwave thermal ablation.



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