Thermal ablation for papillary thyroid microcarcinoma: Some clarity amid controversies

ARTICLE INFO

Keywords
Papillary thyroid microcarcinoma
Thermal ablation
Thyroid
Ultrasound

ABSTRACT

The increasing incidence of papillary thyroid microcarcinoma (PTMC) has become a global challenge. Because of its indolent nature, active surveillance (AS) has been proposed as a treatment option in selected PTMC patients to prevent surgery-related complications. However, only a few patients with PTMC receive the AS approach because of the serious psychological burden following the “cancer” diagnosis and the uncertainty of the timing for metastatic dissemination. Ultrasound (US)-guided thermal ablation can bridge the gap in the treatment options of PTMC patients who wish for a minimally invasive management approach. However, it has acquired only marginal attention from the thyroid guideline societies because of concerns regarding incomplete elimination. The recently published guidelines from the European Thyroid Association-Cardiovascular and Interventional Radiological Society of Europe and the American Head Neck Society Endocrine Section-initiated global consensus provide the most definitive evidence and essential foundational experience to address the long-term controversy over US-guided thermal ablation for low-risk PTMC patient management and facilitate the responsible global dissemination of minimally invasive strategies.

Thermal ablation has been introduced as a potential alternative to surgery for benign thyroid nodules in the Korean guidelines for thyroid ablation with RFA in 2009 and its subsequent revised versions in 2012 and 2017. Further, various international societies of China, Austria, Europe, and the United States have established their own recommendations. However, the proposed thyroid guideline societies have dedicated only marginal attention to the application of thermal ablation for primary PTMC management. Despite the reported excellent short-term clinical therapeutic outcomes of PTMC treated with percutaneous thermal ablation, extensive debate and discussion are required. Indeed, the main issue lies in the controversy regarding the incomplete elimination using these ablation techniques because of the frequent multicentric nature of PTMC along with the potential risk of local cervical lymph node metastasis.

With the growing field of minimally invasive techniques, more long-term data with a large sample size have emerged and substantiated the oncologic effectiveness of US-guided thermal ablation for primary PTMC. The available information and technical resources are rapidly evolving in this area. Thus, in 2021, the European Thyroid Association (ETA) and the

Papillary thyroid cancer (PTC) constitutes 80%–85% of all thyroid cancer cases. Most of them are not aggressive tumors, as the disease-specific mortality rate is 0.5%–0.7% per 100,000 person-years. The widespread access to and the use of thyroid ultrasound (US) and fine-needle aspiration biopsy (FNAB) has led to a marked increase in papillary thyroid microcarcinoma (PTMC) detection worldwide. However, the reported mortality from thyroid carcinoma remains relatively low and stable in many affluent counties, including South Korea, Italy, France, Australia, and Nordic countries. Thus, the frequent indolent nature of PTMC particularly makes the management of these small tumors crucial, as complications associated with thyroidectomy exert substantial impacts on the patient quality of life. Moreover, the growing awareness of the extensive impacts of the rising surgical procedures has led to the modifications of the national and international guidelines for thyroid tumor management. Hence, active surveillance (AS) is proposed as an alternative to surgery for low-risk PTMC patients to balance the low probability of tumor progression and prevent surgery-related complications.

However, this situation has raised several clinical concerns. For example, AS can be a serious psychological burden for many patients diagnosed with “cancer”, and a stabilized condition may not be acceptable in some PTMC cases. More importantly, precise prediction of the indolence of tumors and accurate determination of the metastatic dissemination timing, such as early occurrence when the primary tumors are relatively small or late occurrence when they are large, is still impossible. Given this situation, very few patients outside Japan have been reported to receive the AS approach.

In addition to immediate surgery and AS, US-guided thermal ablative procedures, including radiofrequency ablation (RFA), laser ablation (LA) and microwave ablation (MWA), can eliminate the need for general anesthesia, incision, or removal of the thyroid gland. This may bridge the gap in the treatment options of PTMC patients who wish for a minimally invasive management approach. Papini et al. directed the first trial of US-guided LA for PTMC in 2011. Further, in 2014, our group presented the first clinical outcomes of MWA in low-risk PTMC cases. Our group has demonstrated that thermal ablation is an effective, rapid, and safe procedure for the management of PTMC patients. Since then, US-guided thermal ablation treatments have been documented in several other centers.

Thermal ablation has been introduced as a potential alternative to surgery for benign thyroid nodules in the Korean guidelines for thyroid ablation with RFA in 2009 and its subsequent revised versions in 2012 and 2017. Further, various international societies of China, Austria, Europe, and the United States have established their own recommendations. However, the proposed thyroid guideline societies have dedicated only marginal attention to the application of thermal ablation for primary PTMC management. Despite the reported excellent short-term clinical therapeutic outcomes of PTMC treated with percutaneous thermal ablation, extensive debate and discussion are required. Indeed, the main issue lies in the controversy regarding the incomplete elimination using these ablation techniques because of the frequent multicentric nature of PTMC along with the potential risk of local cervical lymph node metastasis.

With the growing field of minimally invasive techniques, more long-term data with a large sample size have emerged and substantiated the oncologic effectiveness of US-guided thermal ablation for primary PTMC. The available information and technical resources are rapidly evolving in this area. Thus, in 2021, the European Thyroid Association (ETA) and the

https://doi.org/10.1016/j.jimed.2022.07.002
Received 22 January 2022; Received in revised form 3 June 2022; Accepted 23 July 2022
Available online 8 August 2022

2096-3602/© 2022 Shanghai Journal of Interventional Radiology Press. Publishing services by Elsevier B.V. on behalf of KeAi Communications Co. Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Cardiovascular and Interventional Radiological Society of Europe (CIRSE) assembled a joint working group to develop the guidelines for minimally invasive treatments of malignant thyroid tumors. Based on an evidence-based approach, they have recommended that US-guided thermal ablation can be considered as an alternative option to AS (strength of recommendation 1, strong agreement [11/11, 100%]) for low-risk PTMC patients who are not eligible or wish for surgery. The scope of the present guideline can undoubtedly offer a clinical practice guide to both patients and clinicians regarding the appropriate use of thermal ablation for PTMC. Noticeably, the American Head and Neck Society Endocrine Surgery Section (AHNSESS) has recently initiated a global collaborative consensus guideline for US-guided ablation technologies, especially for PTMC management. Since ablation procedures are currently being performed by surgeons, endocrinologists, and radiologists, this guideline should serve as a resource to reduce variations in clinical practice and facilitate responsible global dissemination of the minimally invasive strategies.

In summary, the recently published ETA-CIRSE guidelines and the AHNSSESS-initiated global collaborative consensus provide the most definitive evidence and essential foundational experience thus far to address the long-term controversy over whether US-guided thermal ablation should be incorporated into our routine clinical framework for low-risk PTMC patient management. The answer is yes. However, some questions still deserve consideration before disseminating and securing the global availability of these ablation technologies. In contrast, the majority of available therapeutic data on the efficacy and safety of thermal ablation came from Asia, particularly China and South Korea. Therefore, it is still uncertain whether these technologies would work equally well in populations of various races and places. Most clinical trials have been conducted using a single-center retrospective study design. Thus, high-level clinical evidence derived from large population-based multi-ethnic randomized controlled trials is needed to evaluate further the therapeutic efficacy and safety of these ablation techniques. In contrast, given the paucity of clinical data regarding head-to-head comparisons among thermal ablation, surgery, and AS within the same population, and the academic concern that the size and number of thyroid nodules may affect the prognosis is also not addressed, thermal ablation should not completely modify but complement thyroidectomy and AS in selected low-risk PTMC patients.

Declaration of competing interest

The authors declare no conflict of interest.

References

1. Abdullah MI, Junit SM, Ng KL, et al. Papillary thyroid cancer: genetic alterations and molecular biomarker investigations. Int J Med Sci. 2019;16:450–460.
2. Mauri G, Hegedüs L, Bandula S, et al. 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. Eur Thyroid J. 2021;10:185–197.
3. Li M, Dal Maso L, Vaccarella S. Global trends in thyroid cancer incidence and the impact of overdiagnosis. Lancet Diabetes Endocrinol. 2020;8:468–470.
4. Morris LG, Silora AG, Tosteson TD, et al. The increasing incidence of thyroid cancer: the influence of access to care. Thyroid. 2013;23:985–989.
5. Ahn HS, Kim JH, Welch HG. Korea's thyroid-cancer‘epidemic’—screening and overdiagnosis. N Engl J Med. 2014;371:1765–1767.
6. Vaccarella S, Franceschi S, Bray F, et al. Worldwide thyroid cancer epidemic? The increasing impact of overdiagnosis. N Engl J Med. 2016;375:614–617.
7. Wang TS, Sosa JA. Thyroid surgery for differentiated thyroid cancer - recent advances and future directions. Nat Rev Endocrinol. 2018;14:670–683.
8. Takami H, Ito Y, Okamoto T, et al. Therapeutic strategy for differentiated thyroid carcinoma in Japan based on a newly established guideline managed by Japanese Society of Thyroid Surgeons and Japanese Association of Endocrine Surgeons. World J Surg. 2011;35:111–121.
9. Haugen BR, Alexander EE, Bible KC, et al. American thyroid association management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer: The American thyroid association guidelines task force on thyroid nodules and differentiated thyroid cancer. Thyroid. 2016;26:1–133.
10. Jeon MJ, Lee VM, Sung TY, et al. Quality of life in patients with papillary thyroid microcarcinoma managed by active surveillance or lobectomy: a cross-sectional study. Thyroid. 2019;29:956–962.
11. Turajlic S, Swanton C. Metastasis as an evolutionary process. Science. 2016;352:169–175.
12. Nikiforova YE, Nikiforova MN. Molecular genetics and diagnosis of thyroid cancer. Nat Rev Endocrinol. 2011;7:569–580.
13. Papini E, Guglielmi R, Garibaldi H, et al. Ultrasound-guided laser ablation of incidental papillary thyroid microcarcinoma: a potential therapeutic approach in patients at surgical risk. Thyroid. 2011;21:917–920.
14. Yue W, Wang S, Yu S, et al. Ultrasound-guided percutaneous microwave ablation of solitary T1N0M0 papillary thyroid microcarcinoma: initial experience. Int J Hyperther. 2014;30:150–157.
15. Choi Y, Jung SL. Efficacy and safety of thermal ablation techniques for the treatment of primary papillary thyroid microcarcinoma: a systematic review and meta-analysis. Thyroid. 2020;30:720–731.
16. Teng DK, Li HQ, Sui GQ, et al. Preliminary report of microwave ablation for the primary papillary thyroid microcarcinoma: a large-cohort of 185 patients feasibility study. Endocrine. 2019;54:109–117.
17. Kim JH, Baek JH, Lim HK, et al. 2017 Thyroid radiofrequency ablation guideline: Korean Society of Thyroid Radiology. Korean J Radiol. 2018;19:632–655.
18. Dobni H, Zeichmann W, Hermann M, et al. Radiofrequency ablation of thyroid nodules: “good clinical practice recommendations” for Austria: an interdisciplinary statement from the following professional associations: Austrian thyroid association (OSDG), Austrian society for nuclear medicine and molecular imaging (OQNMIB), Austrian society for endocrinology and metabolism (OGES), surgical endocrinology working group (ACE) of the Austrian surgical society (OEÖCHG). Wien Med Wochenschr. 2020;170:6–14.
19. Papini E, Monpeysson H, Frasoldati A, et al. 2020 European Thyroid Association clinical practice guideline for the use of image-guided ablation in benign thyroid nodules. Eur Thyroid J. 2020;9:172–185.
20. Gao M, Ge M, Ji Q, et al. 2016 Chinese expert consensus and guidelines for the diagnosis and treatment of papillary thyroid microcarcinoma. Cancer Biol Med. 2017;14:203–211.
21. Iida F, Sugenoya A, Muramatsu A. Clinical and pathologic properties of small differentiated carcinomas of the thyroid gland. World J Surg. 1991;15:511–515.
22. Yue WW, Qi L, Wang DD, et al. US-guided microwave ablation of low-risk papillary thyroid microcarcinoma: longer-term results of a prospective study. J Clin Endocrinol Metab. 2020;105:dgaa128.
23. Mauri G, Hegedüs L, Bandula S, et al. 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. Eur Thyroid J. 2021;10:185–197.
24. Orloff LA, Noel JE, Stack Jr BC, et al. Radiofrequency ablation and related ultrasound-guided ablation technologies for treatment of benign and malignant thyroid disease: an international multidisciplinary consensus statement of the American head and neck society endocrine surgery section with the Asia pacific society of thyroid surgery, associazione medici endocrinologi, British association of endocrine and thyroid surgeons, European thyroid association, Italian society of endocrine surgery units, Korean society of thyroid radiology, Latin American thyroid society, and thyroid nodules therapies association. Head Neck. 2022;44:633–660.

Wenwen Yue* Department of Medical Ultrasound, Shanghai Tenth People's Hospital, Ultrasound Research and Education Institute, School of Medicine, Tongji University, Shanghai Engineering Research Center of Ultrasound Diagnosis and Treatment, Shanghai, 200072, PR China

Wenyi Sun Department of Medical Ultrasound, Shanghai Tenth People's Hospital, Ultrasound Research and Education Institute, School of Medicine, Tongji University, Shanghai Engineering Research Center of Ultrasound Diagnosis and Treatment, Shanghai, 200072, PR China

Huixiong Xu Department of Ultrasound, Zhongshan Hospital, Fudan University, Shanghai, 200032, PR China

*Corresponding author.

E-mail address: yuwe0902@163.com (W. Yue).