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Scarring after Radiofrequency Ablation: *Implications for Subsequent Surgical Management*

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Introduction

- Radiofrequency ablation (RFA) is an appealing therapeutic option for patients with benign thyroid nodules wishing to avoid surgery
- In a 2022 consensus statement between 8 national and multinational thyroid associations, "RFA may be used as a first-line alternative to surgery for patients with benign thyroid nodules contributing to compressive and/or cosmetic symptoms"[1]
- Although no formal size restrictions exist, RFA is typically recommended for smaller nodules ≤3 cm[2-4]
- Under ultrasound guidance, RFA destroys targeted tissue through frictional and conductive heat from an alternating electric current that oscillates between 200 and 1200 kHz[5,6]
- Heat and injury can extend 1-5 mm from the electrode tip, depending on tip size and settings[7,8,9]

Objective & Methods

- The aim of this study was to describe three cases of noncancerous thyroid nodules treated with RFA who subsequently underwent surgery, which were significant for unexpected fibrosis and scarring not previously documented in the literature

Results

- 3 patients were referred to UNLV otolaryngology for benign thyroid nodules causing compressive symptoms
- All patients had prior radiofrequency ablation with outside providers

Patient	*Age, Gender*	*Medical History*	*Prior RFA treatment*	*Nodule dimensions and biopsy results*	*Surgery*	*Findings*	*Final Pathology*
Case 1	48, Female	Hashimoto's	Left side in 2020 and right side in 2022	Multiple bilateral nodules, right 2.2 cm biopsied Bethesda II	Total thyroidectomy	Adhesions more extensive on the right side, involving the right internal jugular vein	Chronic Lymphocytic/Hashimoto's Thyroiditis
Case 2	76, Female	Hashimoto's	Right side in 2022	Multiple bilateral nodules. right 2.0 cm Bethesda II; Isthmus 1.8 cm Bethesda III (Afirma GSC ROM 50%)	Total thyroidectomy	Adhesions more extensive on the right, particularly along the anterolateral surface during elevation from the sternothyroid muscle	Chronic Lymphocytic/Hashimoto's Thyroiditis
Case 3	51, Female	Hashimoto's	Left side in 2023	Multiple bilateral subcentimeter nodules, left 4.1 cm nodule Bethesda II	Left hemithyroidectomy	Diffuse adhesions more difficult than anticipated	3mm focus of papillary thyroid cancer and 45 mm Hurthle cell adenoma

Abbreviations: GSC, Genomic Sequencing Classifier; ROM, Risk of Malignancy

Discussion

- All 3 cases had a prior history of Hashimoto's and experienced nodule regrowth in 2-3 years after RFA prompting ENT referral and subsequent surgery
  - Unanticipated scarring and fibrosis encountered during surgery in all 3 cases
- Preoperative FNA was concordant with surgical pathology in most cases with the exception of case 3
  - In one patient, a preoperative Bethesda II 4 cm nodule was found to have 3mm focus of papillary thyroid cancer
  - A prior study found a malignant rate of 20% among previously FNA benign nodules refractory to RFA, raising concern for malignant potential in symptomatic, large, benign thyroid nodules showing regrowth or suboptimal reduction after RFA[10]
- No significant change in postoperative complications (vocal cord paresis, permanent hypocalcemia) consistent with prior studies[11]
  - Our series consisted of a limited sample by a single surgeon
- Further research regarding the operative implications of RFA should be conducted to help inform RFA limitations and shared decision making

References

1. Sinclair CF, Baek JH, Hands KE, et al. General Principles for the Safe Performance, Training, and Adoption of Ablation Techniques for Benign Thyroid Nodules: An American Thyroid Association Statement. Thyroid. 2023;33(10):1150-1170.
2. Papini E, Monpeyssen H, Frasoldati A, Hegedüs L. 2020 European Thyroid Association Clinical Practice Guideline for the Use of Image-Guided Ablation in Benign Thyroid Nodules. *Eur Thyroid J*. 2020;9(4):172-185. doi:10.1159/000508484
3. Kim JH, Baek JH, Lim HK, et al. 2017 Thyroid Radiofrequency Ablation Guideline: Korean Society of Thyroid Radiology. *Korean J Radiol*. 2018;19(4):632-655. doi:10.3348/KJR.2018.19.4.632
4. Garberoglio R, Aliberti C, Appetecchia M, et al. Radiofrequency ablation for thyroid nodules: which indications? The first Italian opinion statement. *J Ultrasound*. 2015;18(4):423-430. doi:10.1007/S40477-015-0169-Y
5. Shin JH, Baek JH, Ha EJ, Lee JH. Radiofrequency Ablation of Thyroid Nodules: Basic Principles and Clinical Application. *Int J Endocrinol*. 2012;2012. doi:10.1155/2012/919650
6. Goldberg SN. Radiofrequency tumor ablation: principles and techniques. *Eur J Ultrasound*. 2001;13(2):129-147. doi:10.1016/S0929-8266(01)00126-4
7. Sinclair CF, Baek JH, Hands KE, et al. General Principles for the Safe Performance, Training, and Adoption of Ablation Techniques for Benign Thyroid Nodules: An American Thyroid Association Statement. *Thyroid*. 2023;33(10):1150-1170.
8. Park HS, Baek JH, Choi YJ, Lee JH. Innovative Techniques for Image-Guided Ablation of Benign Thyroid Nodules: Combined Ethanol and Radiofrequency Ablation. *Korean J Radiol*. 2017;18(3):461-469.
9. Gharib H, Papini E, Garber JR, et al. American Association of Clinical Endocrinologists, American College of Endocrinology, and Associazione Medici Endocrinologi Medical Guidelines for Clinical PRactice for the Diagnosis and Management of Thyroid Nodules-2016 Update. *Endocr Pract*. 2016;22(5). doi:10.4158/EP161208.GL
10. Kim MK, Shin JH, Hahn SY, Kim H. Delayed Cancer Diagnosis in Thyroid Nodules Initially Treated as Benign With Radiofrequency Ablation: Ultrasound Characteristics and Predictors for Cancer. *Korean J Radiol*. 2023;24(9):903-911. doi:10.3348/KJR.2023.0386
11. Hussein M, Toraih E, Issa PP, et al. From ablation to operation: Unraveling the surgical outcomes and complications of thyroidectomy after radiofrequency ablation. *Surg (United States)*. 2024;175(1):146-152. doi:10.1016/j.surg.2023.09.025