

Radiofrequency Ablation Is a Thyroid Function–Preserving Treatment for Patients with Bilateral Benign Thyroid Nodules

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ABSTRACT

Purpose: To evaluate the efficacy and safety of radiofrequency (RF) ablation for treatment of bilateral thyroid nodules as well as preservation of thyroid function.

Materials and Methods: Between January 2007 and October 2012, 18 patients (16 women and 2 men; mean age, 49.9 y; median age, 44 y; age range, 27–81 y) with bilateral thyroid nodules treated by RF ablation were included in this study. The inclusion criteria included bilateral thyroid nodules, pressure symptoms or cosmetic problems, cytologic confirmation of benignancy without atypical cells, and patient refusal of surgery. We used an RF generator (Cool-tip RF system [Covidien, Boulder, Colorado] or SSP-2000, Taewoong Medical Co, Ltd [Gyeonggi-do, Republic of Korea]) and an 18-gauge internally cooled electrode with 1-cm active tips (Cool-tip [Covidien] or Well-Point RF electrode [Taewoong Medical Co, Ltd]). RF ablation was conducted using the moving shot technique and a trans-isthmus approach. RF ablation was performed in separate sessions for nodules in each lobe. Follow-up ultrasound examinations were performed at 1–6 months, 6–12 months, and during the last month of follow-up. The diameter and volume of the nodule and clinical problems including cosmetic and symptom scores were evaluated before and after the procedure.

Results: The mean initial nodule size was 4.1 cm \pm 1.9, although there was a significant decrease by the time of the last follow-up examination (range, 1–48 mo; mean, 18.1 mo \pm 12.8; $P < .001$, 2.5 cm \pm 1.4). The initial nodule volume was 24.4 mL \pm 32.2 and was decreased at the last follow-up (6.3 mL \pm 19.0, $P < .001$), with a mean volume reduction of 75.9% \pm 19.0. The symptom ($P < .001$) and cosmetic ($P < .001$) scores were decreased. Serum hormone levels did not differ significantly before treatment and at the last follow-up ($P > .05$).

Conclusions: RF ablation improves cosmetic problems and symptoms and preserves thyroid function in patients with bilateral thyroid nodules.

ABBREVIATION

TPO = thyroid peroxidase

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None of the authors have identified a conflict of interest.

Videos 1 and 2 are available online at www.jvir.org.

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J Vasc Interv Radiol 2014; XX:■■■■

<http://dx.doi.org/10.1016/j.jvir.2014.09.015>

Thyroid nodules are a common problem and are found in 10%–41% of the general population by ultrasound (US) (1). Although most thyroid nodules are benign and do not require treatment, some patients with benign nodules may require treatment for nodule-related symptoms and cosmetic problems (2). Surgery and radioiodine therapy have been used for patients with symptomatic thyroid nodules, although both surgery and radioiodine therapy can cause complications, such as voice change or hypothyroidism. For patients with bilateral thyroid nodules, permanent hypothyroidism is inevitable after total thyroidectomy. In cases of unilateral lobectomy, subclinical or clinical hypothyroidism also can develop

(3). Nonsurgical treatment is an option to avoid hypothyroidism in patients who are averse to surgery. Nonsurgical therapy options, including US-guided procedures, are presently being investigated (4). Radiofrequency (RF) ablation has been proposed for thyroid lesions (5–10), and clinical trials have shown that it is effective in reducing nodule volume and reducing nodule-related symptomatic and cosmetic problems. Some studies have reported transient hyperthyroidism or permanent hypothyroidism in a few patients after RF ablation (5–7). However, the reason for permanent hypothyroidism was unclear owing to the elevated levels of antibodies to thyroid peroxidase (TPO) before ablation. Although thyroid function seems to be influenced only rarely by RF ablation, it is unclear whether RF ablation affects thyroid function in patients with bilateral, benign thyroid nodules. The purpose of this study is to evaluate the efficacy and safety of RF ablation for treatment of bilateral thyroid nodules as well as preservation of thyroid function.

MATERIALS AND METHODS

Patients

This retrospective study was approved by our institutional review board, and informed procedural consent was obtained from all patients before each procedure. Between January 2007 and October 2012, 692 patients received RF ablation for benign thyroid nodules at Asan Medical Center. Among these patients, 30 were treated for bilateral benign thyroid nodules. Of these patients, 12 who did not have baseline laboratory data ($n = 4$), follow-up laboratory data ($n = 4$), US follow-up ($n = 1$), measurement of the diameter of the nodule on US ($n = 1$), or records of cosmetic and symptom scores ($n = 2$) were excluded from the study. The study included 18 patients (36 nodules) with bilateral thyroid nodules (16 women and 2 men; mean age, 49.9 y; median age, 44 y; range, 27–81 y). All of the enrolled patients fulfilled the

following criteria: (i) bilateral thyroid nodules, (ii) nodule-related symptoms or cosmetic problems, (iii) at least two cytologic confirmations of benignancy without atypical cells, and (iv) refusal to undergo surgery (Fig 1).

Preparation and Participation

Before RF ablation, clinical evaluation for symptoms and cosmetic problems, US imaging, and laboratory data were obtained for all patients. US and US-guided fine-needle aspiration were performed by two radiologists (J.H.B. and J.H.L.) using a linear probe (5–14 MHz) with a US system (EUB-7500; Hitachi Medical Systems, Tokyo, Japan, or iU22; Philips Healthcare, Bothell, Washington). The three diameters of each nodule (ie, the largest diameter and two other perpendicular diameters) were measured by US, and the nodule volumes were calculated using the following equation: volume = $\pi abc/6$ (where a is the largest diameter, and b and c are the other two perpendicular diameters). In cases of multiple nodules in each lobe, the single dominant nodule was measured and treated. At the time of their enrollment, patients rated their symptoms on a 10-cm visual analog scale (range, 0–10) (2,8,9). The nodule size was represented by its largest diameter. Physicians recorded the cosmetic score (1, no palpable mass; 2, no cosmetic problem but a palpable mass; 3, a cosmetic problem on swallowing only; and 4, a readily detected cosmetic problem) (2,8,9). The baseline laboratory data included serum thyrotropin, free thyroxine, and triiodothyronine. The serum levels of antibodies against TPO and thyroglobulin were evaluated in all patients.

RF ablation was performed by two staff radiologists (J.H.B. and J.H.L.) using previously described techniques (2,5,8–13). We used an RF generator (Cool-tip RF system; Covidien, Boulder, Colorado, or SSP-2000, Taewoong Medical Co, Ltd, Gyeonggi-do, Republic of Korea) and an 18-gauge internally cooled electrode with 1-cm active tips (Cool-tip; Covidien, or Well-Point RF

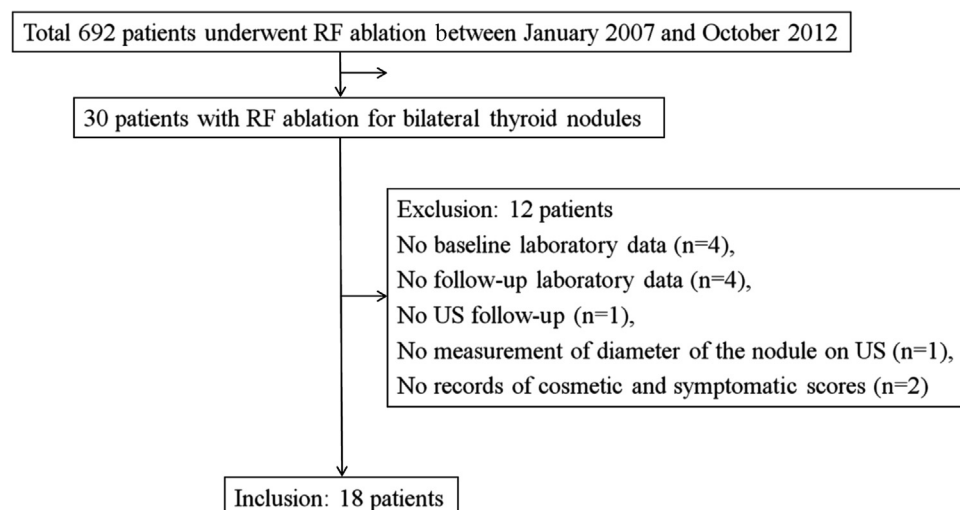


Figure 1. Flow chart of patient enrollment.

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