

## **Luncheon Symposium 1 (KISTIA/STARmed)**

### **Technical advances in Thyroid RFA: Benign to Malignancy**

Our thyroid team has been utilizing Radiofrequency Ablation (RFA) for both benign and malignant thyroid lesions since 2002. The Korean Society of Thyroid Radiology (KSThR) has played a significant role in establishing guidelines for thyroid RFA, publishing recommendations in 2009, 2012, and 2018. These guidelines outline standard techniques such as Peri-thyroidal lidocaine injection for pain control, the Trans-isthmic Approach Method, and the Moving Shot Technique, as well as advanced techniques including the hydrodissection technique, vascular ablation technique, and bolus injection of cold 5%DW. Over time, RF devices have evolved alongside technical advancements in thyroid RFA.

Our approach involves utilizing 1% lidocaine for local anesthesia, inserting an RF electrode under ultrasound (US) guidance along the short axis of the nodule using the Trans-isthmic Approach Method, and employing the Moving Shot Technique for treatment. The Trans-isthmic Approach Method offers advantages over the long-axis approach (caudo-cranial or cranio-caudal direction), providing sufficient normal thyroid parenchyma coverage to prevent electrode displacement during swallowing or talking. Additionally, it enables clear visualization of the relations between the target nodule, electrode tip, and recurrent laryngeal nerve, minimizing the risk of thermal injury. The Moving Shot Technique, unique to thyroid RFA, addresses the challenge posed by the thyroid gland's small size compared to the liver, where RF electrodes are typically fixed during ablation. By dividing the targeting thyroid nodule into multiple conceptual ablation units, we perform RF ablation unit by unit, moving the electrode tip to prevent damage to surrounding structures.

To prevent marginal regrowth, recent techniques combine vascular ablation with hydrodissection, targeting marginal vessels around benign thyroid nodules. These techniques, including artery-first ablation and marginal venous ablation, are monitored using power Doppler US or advanced doppler imaging (i.e., microvascular flow imaging (MVFI: MV-flow™, Samsung). Combining ethanol and radiofrequency ablation has shown promise in enhancing treatment efficacy for benign nodules. During RFA procedures, monitoring for voice changes is crucial, with bolus injection of cold 5%DW recommended around the recurrent laryngeal nerve to manage heat-induced voice problems.

Two types of electrodes, straight internally cooled and multi-tined expandable, are used for thyroid RFA, with the straight internally cooled electrode being the mainstay due to its safety and versatility.

Our thyroid RFA team has used straight type internally cooled electrode, which is short shaft length (7 cm) to permit easy control, thin (18 or 19-gauge) to minimize injury to the normal thyroid gland, and can be used with active tips of various sizes (0.38 cm, 0.5 cm, 0.7 cm, and 1 cm). Small active tips (19-gauge 0.38 or 0.5cm) is useful to treat small early detected recurrent thyroid cancers. Moreover, bipolar electrode is safe for pregnant women and patients with heart problem. Adjustable electrode is a new electrode to change the size of electrode tip (from 0.5cm ~ 1.5cm). This electrode has several advantages such as Precise Targeting of nodule, optimal energy delivery, minimizing complications and minimizing patient discomfort.

In summary, RFA represents a safe and effective alternative to surgery for thyroid nodules and malignant tumors. Maximizing efficacy involves complete ablation of the entire tumor margin to prevent regrowth. Considering a broad spectrum of complications, preventative techniques, and management strategies is essential for optimizing outcomes. In this symposium, we will discuss standard and advanced techniques, as well as device developments, for treating benign and malignant thyroid lesions.