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Lecture Title : RFA versus MWA for Benign Thyroid Nodules: Pros and Cons

The promising thermal ablation techniques commonly used in thyroid tissue are radiofrequency ablation (RFA) and microwave ablation (MWA). The basic principle of both methods is to cause thermal damage by heating the tissue at a cytotoxic level. For an optimal ablation, it is necessary to adequately ablate the tumour by keeping the tissue temperature in the range of 50–100°C, as well as to prevent carbonization that may develop throughout the electrode tip owing to overheating. Tissue temperature and heating time are the main parameters that determine the nature of thermal damage.

MWA has larger ablation volume and a faster rate of temperature rise than RFA due to its use of higher frequency waves. This makes MWA more advantageous in the treatment of larger nodules by causing a reduction in treatment time. The predictable, homogeneously ablation zone could reduce the risk of injury to high risk structures around the nodule. However, since the central temperature in the tissue is usually above 150 °C due to the rapid temperature rise in nodules treated with MWA method, carbonization can easily occur in the lesion and may block heat transmission, and it is difficult to dissolve the carbonized tissue in the treated nodules. Whereas, in the RFA method, the central temperature in the tissue is not more than 110 °C, and therefore, the carbonization phenomenon is rarely seen. This results in a lower VRR in nodules treated with MWA. As a consequence, a proper power output reduction to minimize carbonization can precipitate the resorption of ablated nodules.

Another disadvantage of the MWA method is the back-heating effect caused by the waves reflected along the coaxial line. Especially when using a 16-gauge needle, there is a 2-cm back-heating. In large nodules, the antenna can be partially retracted if there is sufficient space behind. In small nodules, after fixing the antenna at a certain point and completing the burning process, the system can be turned off and localized to another place without back heating. The “back-heating effect” is a limitation for microwave ablation. A “modified moving shot method” should be used in order not to burn the capsule and skin, as well as prevent insufficient ablation of the part in front of the antenna due to back heating. Today, this situation can be overcome by reducing the back heating effect by using thinner (18 G) needles and the moving shot method can be used in the MWA method.

The complexity of neck anatomy and the presence of multiple contiguous critical structures (such as recurrent laryngeal nerves, great vessels, and the trachea) necessitate the operator to have a good understanding of the mechanism of each thermal ablation method, along with expertise in cervical ultrasound anatomy, in order to prevent potentially serious complications. Various complications (e.g., extrathyroidal/intrathyroidal hematoma, transient/permanent voice change, skin burn, wound infection/abscess, etc.) associated with RFA and MWA have been reported clinical studies. There was no significant difference between the complication rates with RFA or MWA