

TATO

Thermal Ablation Treatments for Oncology

CHALLENGING LESION WHITE PAPER

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PUSHING BOUNDARIES

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How can TATO help me in ablation?

During the past 20 years, the objectives of ablation research endpoints have been to increase ablation volumes while reducing the procedural times and increasing the reproducibility. This means higher wattage, cooling optimization and larger calibre antennas. Large volumes of coagulative necrosis, however, are not the only achievement that matters in daily clinical practice.

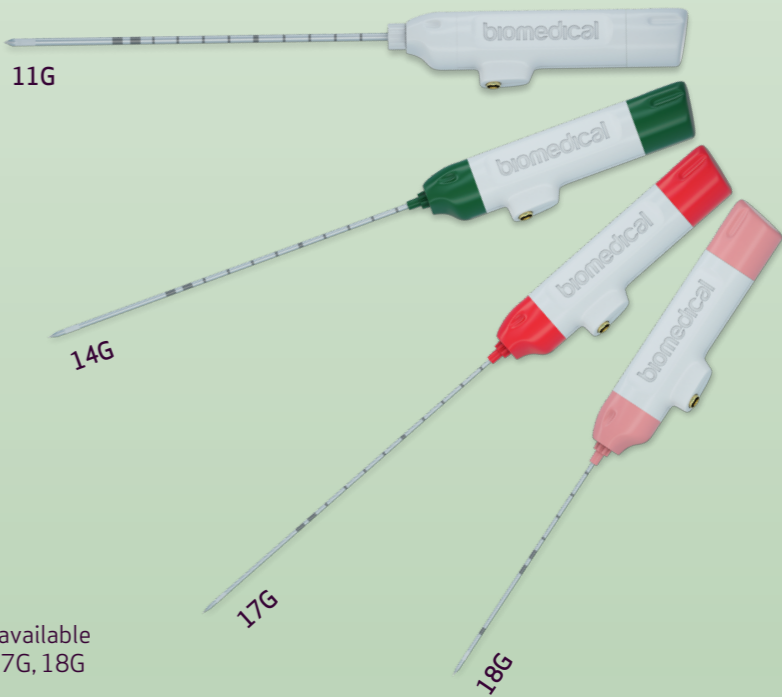
While ablation can be considered a minimally invasive treatment, some risks exist and the principle of beneficence against the principle of non-maleficence should be evaluated in order to optimize the treatment, balancing safety and efficacy. By planning an ablation treatment, it is fundamental to take into consideration the presence of factors affecting treatment safety or efficacy.

Liver ablation

TREATING PATIENTS AT HIGH RISK OF BLEEDING

Among the potential complications affecting safety, bleeding is the most important to be prevented. Unlike surgeons, Interventional Radiologists do not have direct control of haemostasis. For this reason, ablation is considered as a high bleeding-risk procedure¹.

When abnormalities in the coagulation are present, the risk of the occurrence of perihepatic free fluid after intervention or complications of any kind during follow-up is increased². The availability of thinner antennas may be useful in patients at risk, such as those with cirrhosis, abnormal platelets, or elevated values of INR.



Picture 1. TATO Antennae are available in different gauge: 11G, 14G, 17G, 18G

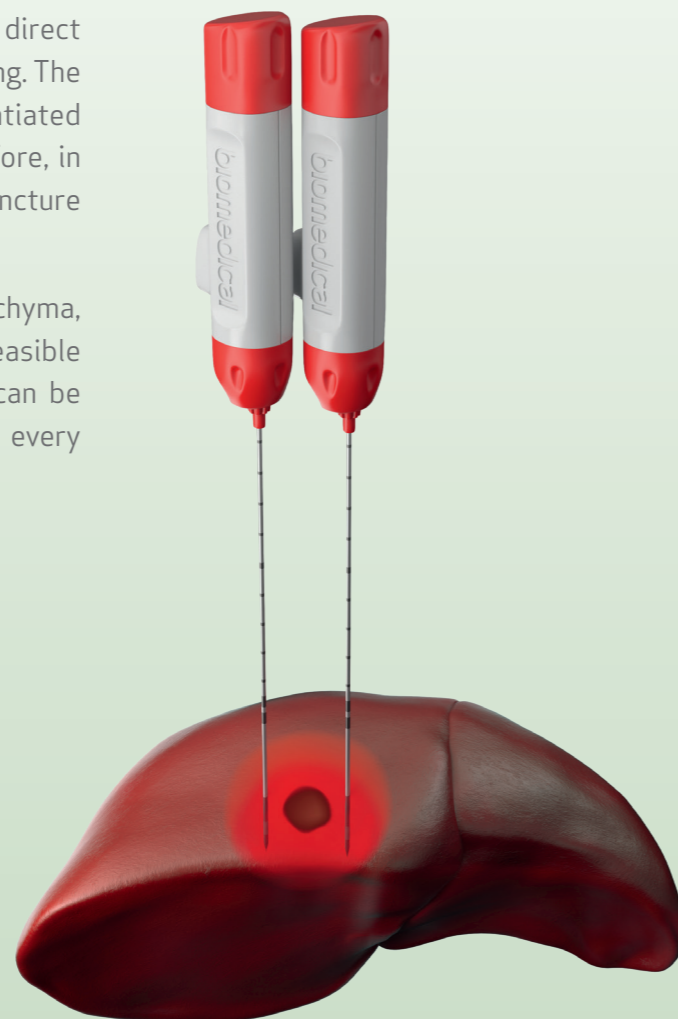
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TREATING NODULES AT HIGH RISK OF BLEEDING AND/OR SEEDING

Nodules in subcapsular location treated with a direct puncture are at higher risk of bleeding and seeding. The latter especially if the nodule is not well differentiated or presents an invasive tumoral pattern³. Therefore, in the treatment of subcapsular nodules, direct puncture should be avoided.

In the impossibility of interposing healthy parenchyma, “no touch” technique has been demonstrated as feasible and useful⁴. Multi-antenna microwave devices can be useful in nodules with subcapsular location and every time the physician prefers a no-touch technique.

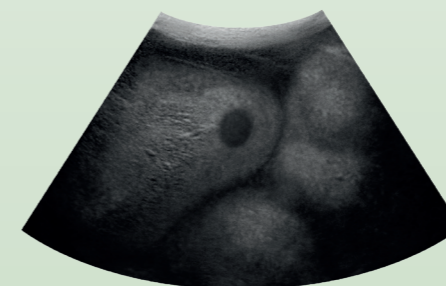


Picture 2. Multiple TATO antennae (up to 4) may be used simultaneously, spaced 2 cm apart, with a “no touch” technique

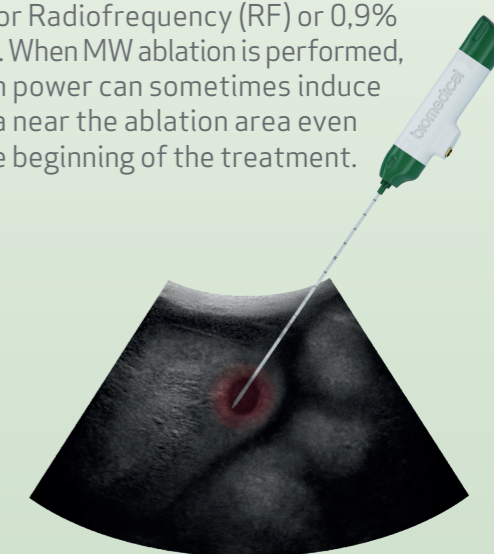
TREATING NODULES LOCATED NEAR CRITICAL STRUCTURES

Undesirable thermal damage can also affect safety and a “controlled ablation”, not growing too fast and too much in length is desirable. Structures that can be damaged are represented by:

- Muscles. Pain may follow ablation for several days or weeks.
- Main biliary tree. It is possible to perform the cooling of main biliary ducts, even if this procedure is not easy and practical⁵.
- Surrounding viscera, such as the colon or the gallbladder. In such locations, it is advisable to use artificial ascites Dextrose 5% for Radiofrequency (RF) or 0,9% NaCl for Microwave (MW)⁶ but it is not always effective. When MW ablation is performed, significant tissue retraction can occur. The use of high power can sometimes induce an important tissue retraction, attracting the viscera near the ablation area even if it has not been classified as a structure at risk at the beginning of the treatment.



Picture 3. Lesion (CAP L) view under US before hydro dissection



Picture 4. After hydro dissection, TATO allows to perform a “controlled ablation” exploiting the advantages of MW energy application in difficultly located liver nodules

In all those situations, a “controlled ablation” is desirable. While RF ablation is a mild, more controlled, and slowly growing technique, controlled MW ablation should be preferred due to its physical properties. Microwave tissue heating relies on the interaction of an electromagnetic field with water molecules in the tissue, while radiofrequency tissue heating is produced by an electric current going through the needles and the patient⁷. RF heating is limited in areas of low electrical conductivity (where there are no ions to be flipped), such as in the lung or in the bone. On the contrary, MW are capable of propagating more effectively, heating tissues with low electrical conductivity, (high impedance) or low thermal conductivity. Unlike RF, MW heating expands beyond charred or desiccated tissues⁸. MW are also less sensitive to the phenomenon of heat sink effect, that consists in the presence of flowing blood causing a cooling effect, thereby reducing the ablation volume⁹.

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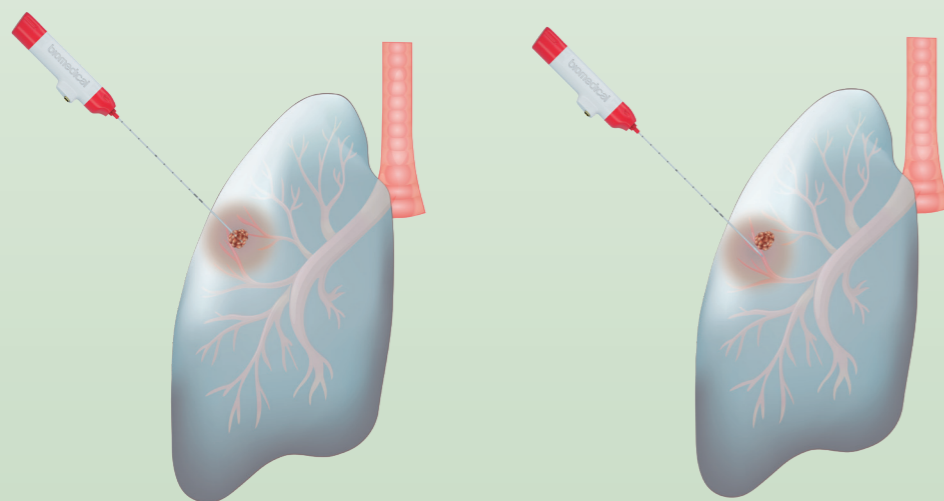
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Beyond the liver

LUNG ABLATION

Pneumothorax is the most frequent complication of ablation of primary and secondary lung tumors¹⁰. It has been demonstrated, in lung biopsy series, that the rate of pneumothorax is related to the calibre of the needle used to puncture the lung¹¹. Due to the ability of MW to propagate effectively and heat tissues with low electrical conductivity, high impedance or low thermal conductivity such as the lung, the combination of thin antennae and MW energy delivery could provide better results in lung ablation¹² (Picture 5).

This is especially true in case of small lung nodules such as metastases, which are often difficult to puncture as they might move” in lung parenchyma when touched by the antenna (Picture 6). The antenna can be placed on the side of the nodule and MW energy can effectively propagate and ablate the nodule and the tissue..



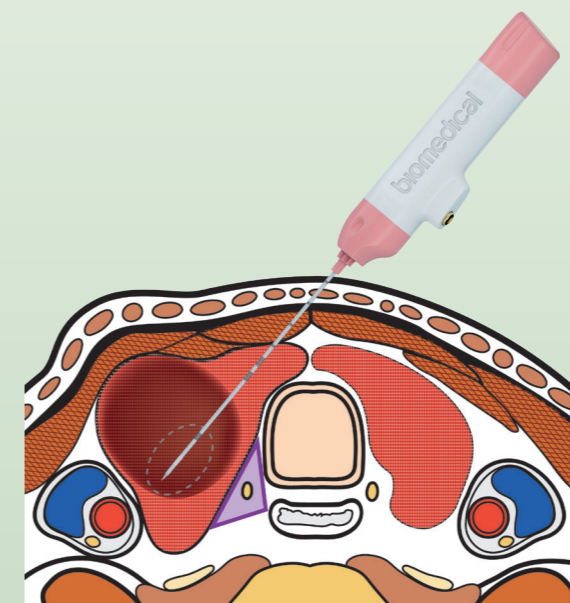
Picture 5. TATO can effectively deliver MW energy in lung tissue with thin antennae

Picture 6. Small “difficult to cross” lesions can be treated even when antenna is aside

THYROID ABLATION

Ablation of benign thyroid nodules or recurrences of malignant thyroid neoplasms requires the availability of thin and short devices, and the possibility to carefully monitor the treatment¹³. These treatments are usually performed under ultrasound (US) guidance: devices with optimal echogenicity and a slow-growing controlled treatment induced hyper echogenicity are mandatory for a safe treatment. MW could overcome limitations of RF in treating highly vascularized benign or malignant nodules, due to its physical properties¹⁴.

- 18G x 8 cm length TATO antenna is specifically designed for thyroid ablation. It is highly visible under US and the thermal induced hyper echogenicity grows slowly and in a controlled way



Picture 7. Thyroid anatomy: avoiding the “danger triangle” around the laryngeal recurrent nerve is crucial.

Currently there are many ablation devices with inherent differences. It is important to know these differences, in order to match the patient/nodule with the correct ablation technique and to balance power and control. TATO may offer advantages in combining MW energy delivered in a controlled fashion and less invasive approach.

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