

# MWA Versus RFA in HCC: Superior? Equivalent? Will We Ever Know?

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Radiofrequency ablation (RFA) is the standard of care for hepatocellular carcinoma (HCC) ablation in treatment guidelines. Compared with RFA, microwave ablation (MWA) is supposed to reduce ablation time, increase ablation temperature, enlarge ablation zone and reduce the heat sink effect. Although MWA is more and more adopted under the assumption of a superiority over RFA, three recent randomized trials comparing both techniques failed to demonstrate any oncological benefit of MWA over RFA [1–3]. By contrast in a recent issue of CVIR, Bouda et al. interestingly reported a lower rate of local tumor progression (LTP) after MWA than after RFA, whatever the tumor size or vascular contact, in a retrospective study enrolling 149 patients (MWA [ $n = 79$ ], RFA [ $n = 70$ ]). How can we interpret these results in the light of the negative randomized trials? First, showing no difference does not mean that there is none, but rather that the difference might be smaller than expected! This is particularly true for two of the randomized trials which compared, respectively, 47 versus 49 [1] and 28 versus 28 [2] MWA versus RFA patients. Either low statistical power or (very) optimistic differences that were expected between treatment arms could explain the low number of patients enrolled in these trials and subsequently their negativities. Such comment does not really apply to the third one published in the *Lancet Gastroenterology and Hepatology* [3] randomizing 152 patients (MWA [ $n = 76$ ], RFA [ $n = 76$ ]) with  $\leq 4$  cm HCC. They report the opposite results regarding the risk of

LTP, even though the sample size is comparable with that of Bouda et al.'s study. One could argue about the retrospective nature of Bouda et al.'s study [4] and the use of historical controls (i.e., RFA patients enrolled at the beginning and MWA patients at the end of the study), but propensity score matching was performed to limit the inherent biases.

LTP may not only differ depending on the technology (RFA or MWA) but also depending on the imaging guidance modality used for needle placement. Indeed, inconspicuous or undetectable lesions may be challenging to ablate irrespectively of the ablation technology. The rate of such lesions is not mentioned in Bouda et al.'s study as in many others. Additionally, the imaging guidance modality itself may influence LTP rate. Ultrasound guidance has been shown to reduce the risk of LTP, owing to its real-time ability as compared to CT guidance [5]. This information, too, is not reported in the Bouda et al. study. Given their complex 3D shape, expandable RF electrodes they used were certainly more difficult to position within the tumor without damaging nearby structures than were MWA antenna.

Nevertheless, it is perhaps necessary to step back to better understand what we actually compare. Behind the putative comparison between RFA and MWA, in most studies one MWA system is compared to one RFA system. That is true for the largest randomized trial (Covidien clustered internally cooled electrode versus 2.45 Ghz Acculis system). In the paper by Bouda et al., the expandable Starbust Rita system was used for RFA, whereas two different 2.45 Ghz MWA systems were used (AMICA or Acculis) but not compared. The results of studies comparing MWA to RFA only apply to those systems they refer to and can in no way be generalized unless

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the equivalence between systems is demonstrated. MWA systems used in all previously mentioned studies provide different ablation volumes in different times [6] and thus cannot be considered as equivalent. It is very unlikely that MWA (in general) ever proves any oncological superiority over RFA. Are these technologies at least equivalent? Certainly, but again, it has not been proven yet! In that context, should we continue paying a higher price for MWA (a common feature among systems): that is also the question.

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#### **Compliance with Ethical Standards**

**Conflict of interest** Boris Guiu declares that he has no conflict of interest.

**Ethical Approval** This article does not contain any studies with human participants or animals performed by any of the authors.

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