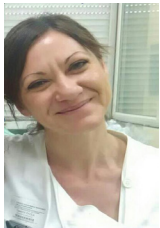


Comment on “Preliminary outcome of microwave ablation of hepatocellular carcinoma: breaking the 3-cm barrier?”

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Nowadays, surgical resection represents the gold standard for the treatment of hepatocellular carcinoma (HCC) in eligible patients, and liver transplantation is considered the best option for selected patients with HCC. However, in the last years the role of thermal ablation therapies is becoming more and more relevant. Their effectiveness and safety have widely been proven, and they play a key role in the treatment of HCC patients who are not eligible or poor candidates for surgery, or who refuse surgery.^[1-4] Moreover, they can also be used as a bridge to liver transplantation.

In the Barcelona Clinic Liver Cancer (BCLC) guidelines for treatment of HCC, tumors up to 3 cm in diameter are considered eligible for radiofrequency ablation (RFA) with curative intent in non-surgical candidates.^[5] Moreover, recent studies showed that RFA of very early HCC is as effective as surgical resection in terms of overall survival and recurrence-free survival rates.^[6,7] On the basis of these reports and their own experience, most skilled interventional oncologists and radiologists are advocating an update of the current guidelines, as it is time to consider RFA at least equivalent to surgical resection in the treatment of HCC up to 2 cm, in particular when the liver tumor is centrally located.

RFA represents the “historical”, best established and

experienced thermal ablation technique, but its efficacy is well known to decrease in presence of tumors larger than 2-3 cm. Last generation microwave ablation (MWA) systems offer some advantages compared with RFA, such as greater intratumoral temperature, deeper penetration of energy, propagation across the poorly conductive tissues, less sensitivity to the heat-sink effect, and larger ablation volume. These peculiarities could enable to treat larger tumors than RFA with adequate safety margin. So to date the question is: is it time to break the 3-cm barrier for thermal ablation?


To the best of our knowledge, no previous studies compared the efficacy of MWA in nodules up to 5 cm with respect to nodules up to 3 cm. Thamtorawat *et al.*^[8] recently published an interesting retrospective study including 129 patients with 173 HCCs up to 5 cm treated with MWA: 118 nodules were ≤ 3 cm in size, whereas 55 nodules were from 3.1 to 5 cm in size. The reported overall technical success rate of MWA was 96.5%. Local tumor progression occurred in 20/173 tumors (11.6%), and recurrences were successfully retreated by additional thermal ablation session. The mean follow-up period was 11.8 ± 9.8 months. The 1-year and 2-year overall survival rates for nodules ≤ 3 cm and for nodules from 3.1 to 5 cm were 91.3% and 81.7%, respectively. Eighteen patients out of 129 (13.9%) were bridged to liver transplantation.

Interestingly, there was no statistically significant difference in local progression rates between the two groups of HCC, with a 2-year local tumor control of 83.9% and 82.1%, respectively.

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As reported by the authors, the study has some limitations. First, it is a retrospective non-randomized study. Second, all the treatments were performed by using MWA. Therefore, a comparison with other thermal techniques is not possible. Finally, long-term outcome would also require longer follow-up times. However, as stated by the authors, this study was intended to be a pilot report on the treatment of larger HCC by using MWA.

Surgical resection and RFA can actually achieve the same good results in the treatment of very-early HCC (≤ 2 cm). Surgical resection remains the gold standard for the treatment of early (< 3 cm) HCC, although RFA represents an effective alternative in patients who are not eligible for surgery. Based on the BCLC guidelines, single nodules from 3 to 5 cm are classified as intermediate HCC, and transarterial chemoembolisation (TACE) is recommended as the best treatment option.^[5] Nevertheless, most experts consider surgery the very best option for the treatment of resectable large nodules with curative intent. However, most patients with intermediate HCC are not eligible for surgery because of inadequate liver function, anatomic limitations, multifocal disease, or medical comorbidities. This group of patients can benefit from TACE, or combined treatments including RFA plus TACE. RFA alone is frequently unable to obtain an adequate safety margin in nodules > 3 cm, particularly when the tumor is strictly close to large vessels, because thermal energy is partially shunted away by the cooler blood (the so-called heat-sink effect).^[9,10] Moreover, the treatment of large nodules require multiple overlapping insertions of the needle electrode, and it is known that the insertions following the first or second ones can be inaccurate owing to the steam generated during the procedure.^[11] As a consequence of these limitations, at present the use of RFA alone with curative intent is limited to nodules up to 3 cm.

Several studies demonstrated that last generation MWA systems enable to achieve larger ablation volumes than RFA, with comparable safety and survival rates.^[12-16] A randomized prospective comparison of MWA and RFA in the treatment of HCC did not demonstrate any difference in the rates of residual or untreated disease,^[17] and the capability of MWA to produce larger coagulation areas could result particularly useful in the treatment of tumors ≥ 3 cm. Reported mortality and major complication rates using the most recent MWA devices are similar to RFA.^[18] Complication rates reported by Thamtorawat *et al.*^[8] agree with the data reported by other authors, despite the larger size of the treated nodules. Moreover, although MWA appears less feasible than RFA in the treatment of high-risk located and subcapsular nodules, no difference in local tumor progression rate was found for subcapsular nodules in the study of Thamtorawat *et al.*^[8]

In conclusion, in our opinion this article could be considered the starting point for breaking the 3-cm barrier in the treatment of non surgical HCC. Our preliminary experience in the treatment of large nodules supports the efficacy of MWA for HCC up to 5 cm (unpublished data), and we hopefully expect further studies with longer follow-up aimed at extending the dimensional barrier of thermal ablation with curative intent.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Bruix J, Sherman M; Practice Guidelines Committee, American Association for the Study of Liver Disease. Management of hepatocellular carcinoma. *Hepatology* 2005;42:1208-36.
- Yao FY, Bass NM, Nikolai B, Davern TJ, Kerlan R, Wu V, Ascher NL, Roberts JP. Liver transplantation for hepatocellular carcinoma: analysis of survival according to the intention-to-treat principle and dropout from the waiting list. *Liver Transplant* 2002;8:873-83.
- Gervais DA, Goldberg SN, Brown DB, Soulen MC, Millward SF, Rajan DK. Society of Interventional Radiology position statement on percutaneous radiofrequency ablation for the treatment of liver tumors. *J Vasc Interv Radiol* 2009;20:S342-7.
- McCarley JR, Soulen MC. Percutaneous ablation of hepatic tumors. *Semin Intervent Radiol* 2010;27:255-60.
- Bruix J, Sherman N; American Association for the Study of Liver Diseases. Management of hepatocellular carcinoma: an update. *Hepatology* 2011;53:1020-2.
- Peng ZW, Lin XJ, Zhang YJ, Liang HH, Guo RP, Shi M, Chen MS. Radiofrequency ablation versus hepatic resection for the treatment of hepatocellular carcinoma 2 cm or smaller: a retrospective comparative study. *Radiology* 2012;262:1022-33.
- Tombesi P, Di Vece F, Sartori S. Resection vs. thermal ablation of small hepatocellular carcinoma: what's the first choice? *World J Radiol* 2013;5:1-4.
- Thamtorawat S, Hicks R, Yu J, Siripongsakun S, Lin WC, Raman S, McWilliams JP, Douek M, Bahrami S, Lu DSK. Preliminary outcome of microwave ablation of hepatocellular carcinoma: breaking the 3-cm barrier? *J Vasc Interv Radiol* 2016;27:623-30.
- Mulier S, Jamart J, Ruers T, Marchal G, Michel L. Local recurrence after hepatic radiofrequency coagulation: multivariate meta-analysis and review of contributing factors. *Ann Surg* 2005;242:158-71.
- Lu DS, Raman SS, Limanond P, Aziz D, Economou J, Busuttill R, Sayre J. Influence of large peritumoral vessels on outcome of radiofrequency ablation of liver tumors. *J Vasc Interv Radiol* 2003;14:1267-74.
- Di Vece F, Tombesi P, Ermili F, Maraldi C, Sartori S. Coagulation areas produced by cool-tip radiofrequency ablation and microwave ablation using a device to decrease back-heating effects: a prospective pilot study. *Cardiovasc Intervent Radiol* 2014;37:723-9.
- Lu MD, Xu HX, Yin XY, Chen JW, Kuang M, Xu ZF, Liu GJ, Zheng YL. Percutaneous microwave and radiofrequency ablation for hepatocellular carcinoma: a retrospective comparative study. *J Gastroenterol* 2005;40:1054-60.
- Simon CJ, Dupuy DE, Mayo-Smith WW. Microwave ablation principles and applications. *Radiographics* 2005;25 Suppl 1:S69-83.
- Boutros C, Somasundar P, Garrean S, Saied A, Espat NJ. Microwave coagulation therapy for hepatic tumors: review of the literature and critical analysis. *Surg Oncol* 2010;19:e22-32.
- Lubner MG, Brace CL, Ziemlewicz TJ, Hinshaw JL, Lee FT Jr. Microwave ablation of hepatic malignancy. *Semin Intervent Radiol* 2013;30:56-66.
- Qian GJ, Wang N, Shen YH, Zhao JQ, Kuang M, Liu GJ, Wu MC. Efficacy of microwave versus radiofrequency ablation for treatment of small hepatocellular carcinoma: experimental and clinical studies. *Eur Radiol* 2012;22:1983-90.
- Shibata T, Iimuro Y, Yamamoto Y, Ametani F, Itoh K, Konishi J. Small hepatocellular carcinoma: comparison of radio-frequency ablation and percutaneous microwave coagulation therapy. *Radiology* 2002;223:331-7.
- Livraghi T, Meloni S, Solbiati L, Zanus G; Collaborative Italian Group using AMICA System. Complications of microwave ablation for liver tumors: results of a multicenter study. *Cardiovasc Intervent Radiol* 2012;35:868-74.