

Microwave coagulation therapy: the future is quite rosy

Paola Tombesi, Francesca Di Vece, Sergio Sartori

Department of Medical, Section of Interventional Ultrasound, St. Anna Hospital, 44100 Ferrara, Italy

Address for correspondence:

Prof. Sergio Sartori, Department of Medical, Section of Interventional Ultrasound, St. Anna Hospital, Via A. Moro, 44100 Ferrara, Italy.
E-mail: srs@unife.it

Received: 29-10-2015, **Accepted:** 09-11-2015



Prof. Sergio Sartori was born on June 22, 1954, and graduated cum laude in 1979. He is specialist in Gastroenterology and in Clinical Pharmacology, is dealing with interventional ultrasonography from 1990, and from 2002 is Chief of the Section of Interventional Ultrasound, St. Anna Hospital, Ferrara, Italy. He is author of 246 scientific papers.

TO THE EDITOR

We read with great interest the review of Guan^[1] on microwave coagulation therapy (MCT) of hepatocellular carcinoma (HCC), and we strongly agree with his conclusion that MCT has a great promise for future use, especially with further technical improvements.


In this regard, one of the main limits of MCT [which discouraged its clinical application in many western countries in favor of radiofrequency ablation (RFA)] was the back heating effect, due to reflected waves along the coaxial line. Such a drawback imposed to use large antennas and to deliver energy for a short time, achieving small ablation areas and requiring multiple insertions even in the presence of small tumors.^[2,3] Internally-cooled MCT partially reduced this problem, allowing for the increase of the ablation time and the amount of power that could be safely delivered.^[4] The introduction into the distal portion of the antenna of a choke coil was proposed to reduce back heating effects. However, this remedy caused remarkable thickening of the antenna (9-10 gauge), making the

device not suitable for percutaneous applications.^[5] In the very last years, a miniaturized device for MW confinement has been developed (Mini Choke®), that enables to minimize back heating effects using slender MW antennas and allowing for percutaneous applications (AMICA MWA System, HS Hospital Service, Aprilia, Italy). In an experimental study, this system produced thermal lesions of 6.5 cm × 4.5 cm in *ex vivo* bovine liver by delivering 60 W for 10 min.^[6] A randomized prospective comparison of MCT and RFA reported significantly larger coagulation areas *in vivo* with MCT than with internally-cooled RFA, using a 16-gauge internally-cooled, minichoked MCT antenna with a power output of 60-70 W and ablation time of 10 min.^[7] Although energy delivery was underpowered with respect to the maximum power output of the system, MCT yielded ablation areas comparable to those previously reported by other authors who performed MCT using a power output of 100 W and a 14-gauge cooled shaft antenna without choke device.^[8] As the minichoked MWA system can also use a 14-gauge antenna with a power output of 100 W, it is hypothesizable that ablation areas even larger than those obtained in the above-mentioned *in vivo* comparison between MCT and RFA could be achieved using the maximum

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: service@oapublish.com

How to cite this article: Tombesi P, Di Vece F, Sartori S. Microwave coagulation therapy: the future is quite rosy. *Hepatoma Res* 2016;2:107-8.

Access this article online	
Website: http://hrjournal.net	Quick Response Code 
DOI: 10.4103/2394-5079.170543	

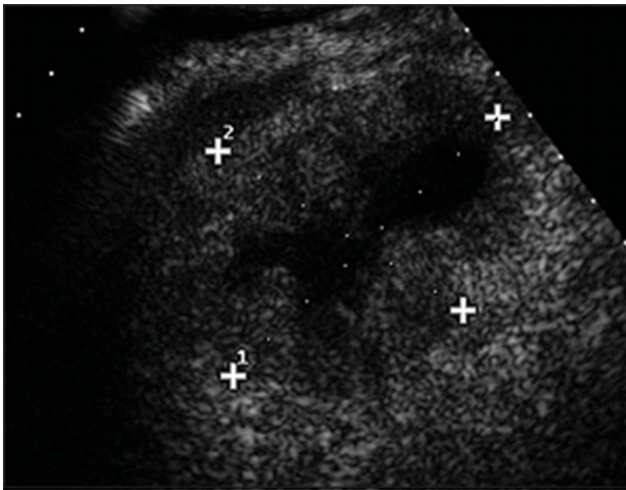


Figure 1: Right intercostal contrast-enhanced sonogram showing a 7 cm × 6 cm colorectal metastasis of the right liver lobe

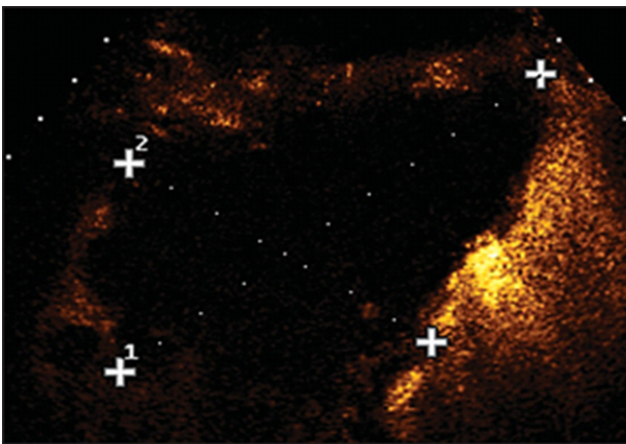


Figure 2: Right intercostal contrast-enhanced sonogram showing a 10 cm × 7 cm ablation area produced after two insertions of a 14-gauge internally-cooled, minichoked MW antenna using a power output of 90 W for a total ablation time of 20 min

power output. Indeed, we treated some HCCs and liver metastases measuring up to 7 cm × 6 cm, performing two insertions of a 14-gauge minichoked antenna and using a power output of 90 W for a total ablation time of 20 min, achieving coagulation areas measuring up to 10 cm × 7 cm [Figures 1 and 2].

Further randomized trials enrolling large series of patients are obviously needed to verify whether the superiority of MCT in obtaining larger ablation areas than RFA can

translate into better long-term outcome and longer survival of patients with primary and secondary liver tumors, but it is indubitable that the technical improvement of MCT systems is already ongoing. According to the conclusion of the interesting review of Guan,^[1] we believe that MCT is leaving its infancy and is running up to a quite rosy future.

Financial support and sponsorship

Nil.

Conflict of interest

There is no conflict of interest.

REFERENCES

1. Guan YS. Microwave coagulation therapy of hepatocellular carcinoma. *Hepatoma Res* 2015;1:159-64.
2. Seki T, Wakabayashi M, Nakagawa T, Imamura M, Tamai T, Nishimura A, Yamashiki N, Okamura A, Inoue K. Percutaneous microwave coagulation therapy for patients with small hepatocellular carcinoma: comparison with percutaneous ethanol injection therapy. *Cancer* 1999;85:1694-702.
3. Horigome H, Nomura T, Saso K, Itoh M. Standards for selecting percutaneous ethanol injection therapy or percutaneous microwave coagulation therapy for solitary small hepatocellular carcinoma: consideration of local recurrence. *Am J Gastroenterol* 1999;94:1914-7.
4. Wang Y, Sun Y, Feng L, Gao Y, Ni X, Liang P. Internally cooled antenna for microwave ablation: results in *ex vivo* and *in vivo* porcine livers. *Eur J Radiol* 2008;67:357-61.
5. Ahmed M, Brace CL, Lee FT Jr, Goldberg SN. Principles of and advances in percutaneous ablation. *Radiology* 2011;258:351-69.
6. Cavagnaro M, Amabile C, Bernardi P, Pisa S, Tosoratti N. A minimally invasive antenna for microwave ablation therapies: design, performances, and experimental assessment. *IEEE Trans Biomed Eng* 2011;58:949-59.
7. 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.
8. Qian GJ, Wang N, Shen Q, Sheng 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.