References

[1] Mohkam K, Dumont PN, Manichon AF, Jouvet JC, Boussel L, Merle P, et al. No-touch multibipolar radiofrequency ablation vs. surgical resection for solitary hepatocellular carcinoma ranging from 2 to 5cm. J Hepatol 2018;68:1172–1180.

[2] Teratani T, Yoshida H, Shiina S, Obi S, Sato S, Tateishi R, et al. Radiofrequency ablation for hepatocellular carcinoma in so-called high-risk locations. Hepatology (Baltimore, MD) 2006;43:1101–1108.

[3] Lee S, Kang TW, Cha DI, Song KD, Lee MW, Rhim H, et al. Radiofrequency ablation vs. surgery for perivascular hepatocellular carcinoma: propensity score analyses of long-term outcomes. J Hepatol 2018;69:70–78.

[4] Nguyen KT, Gamblin TC, Geller DA. World review of laparoscopic liver resection-2,804 patients. Ann Surg 2009;250:831–841.

[5] Han HS, Shehta A, Ahn S, Yoon YS, Cho JY, Choi Y. Laparoscopic versus open liver resection for hepatocellular carcinoma: case-matched study with propensity score matching. J Hepatol 2015;63:643–650.

[6] Shindoh J, Makuuchi M, Matsuyama Y, Mise Y, Arita J, Sakamoto Y, et al. Complete removal of the tumor-bearing portal territory decreases local tumor recurrence and improves disease-specific survival of patients with hepatocellular carcinoma. J Hepatol 2016;64:594–600.

[7] Eguchi S, Kanematsu T, Arii S, Okazaki M, Okita K, Omata M, et al. Comparison of the outcomes between an anatomical subsegmentectomy and a non-anatomical minor hepatectomy for single hepatocellular carcinomas based on a Japanese nationwide survey. Surgery 2008;143:469–475.

Yuxin Zhang
Youliang Pei
Xiaoping Chen
Wanguang Zhang*

Hepatic Surgery Center, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China

*Corresponding author. Address: Hepatic Surgery Center, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China; Tel. +86 13886195965.

E-mail address: wgzhang@tjh.tjmu.edu.cn

Reply to: "Treatment for solitary hepatocellular carcinoma ranging from 2 and 5 cm: Is the curative effect of no-touch multibipolar radiofrequency ablation comparable to that of surgical resection?"

To the Editor:

We thank Dr. Zhang and colleagues for their interest in our recently published article in the *Journal of Hepatology*.[1] The authors raised several questions regarding our findings and conclusions. We would like to address the following points.

First, Zhang *et al.* raise the importance of tumor location on results, and they claim that ablation is not appropriate for lesions adjacent to large vessels or close to extrahepatic organs. However, it has been demonstrated that no-touch multibipolar radiofrequency ablation (NTM-RFA) is much less affected by the proximity of large vessels and the so-called heat-sink effect, which makes it suitable even for hepatocellular carcinomas (HCCs) adjacent to large vessels.[2,3] Moreover, NTM-RFA is performed according to the no-touch principle[4] and could therefore be safely used for subcapsular lesions contrary to the standard monopolar RFA technique, which is associated with the risk of tumor seeding and peritoneal spread.[5] Besides, superficial lesions adjacent to extrahepatic vital organs could be safely treated by modern ablation techniques thanks to the use of artificial ascites.[6]

We disagree with the statement by Zhang *et al.* that "surgical resection does not need to consider the tumor location". In a context of underlying liver disease, it is important to consider parenchyma sparing procedures. While a superficial lesion could be safely treated by monosegmentectomy, a lesion of the same size located more deeply may require a major hepatectomy, which is associated with a higher risk of posthepatectomy liver failure. Therefore, we believe that using subcapsular (*vs.* deep) location of the lesion as an adjustment factor in the propensity score is scientifically valid.

Zhang *et al.* claim that the most mainstream treatment of HCC of 2–5 cm is represented by anatomical resection. We agree with this statement, and in our series, 84% of patients in the resection group underwent an anatomical resection. However, one should remember that many patients with HCC are at high risk of posthepatectomy liver failure, especially in the presence of portal hypertension.[7] This is why a non-anatomical resection with wider margins of 2 cm is also considered as a valid strategy, especially for superficial tumors located at the border of 2 or more adjacent segments.[8]

While it is true that the laparoscopic approach is associated with a lower morbidity and provides equivalent oncological results compared to the open approach, there is currently no evidence to support the statement made by the authors that laparoscopic resection offers a similar morbidity rate than percutaneous radiofrequency ablation, which must still be considered as a less invasive technique than laparoscopic hepatectomy.[9]

Finally, Zhang *et al.* state that our conclusion regarding the comparable outcome after surgical resection and NTM-RFA is not appropriate. However, Zhang *et al.* should recall that we clearly mentioned in our conclusion that NTM-RFA was associated with a higher rate of systematized recurrence compared to surgical resection, and our full statement was that both treatments achieved comparable long-term outcomes due to a great access to rescue therapies, such as repeat local ablation, resection, and even liver transplantation. Indeed, the vast majority of patients with intrahepatic recurrence in our series were successfully treated by a repeat curative treatment, and 1 out of 5 patients was eventually transplanted (16% after surgical resec-

Keywords: Hepatocellular carcinoma; Radiofrequency; Ablation; Hepatectomy; Local neoplasm recurrence.

Received 25 November 2018; accepted 27 November 2018

tion, 20% after NTM-RFA). The modern curative management of HCC in a given patient should no longer solely rely on a single modality of treatment. Instead, the majority of patients nowadays benefit from a therapeutic sequence including a series of various effective modalities including resection, ablation, transplantation, and even stereotactic body radiation therapy or irreversible electroporation.[7] Thus, the best treatment at a given point is not necessarily the one that theoretically provides the lowest rate of local recurrence, but the one that may provide the best overall long-term outcome, and several factors other than local recurrence should be taken into account, including preservation of liver parenchyma, the risk of post-procedure liver decompensation, the possibility to maintain access to repeat treatments and salvage liver transplantation. With these thoughts in mind, we definitely believe that NTM-RFA represents an acceptable first-line modality of entry in the therapeutic process for solitary HCC of 2–5 cm, especially in patients at high risk of post-hepatectomy liver failure.

Financial support
The authors received no financial support for performing the study or writing the manuscript.

Conflict of interest
The authors have no conflict of interest to disclose.

Please refer to the accompanying ICMJE disclosure forms for further details.

Authors' contributions
KM and JYM wrote the manuscript.

Supplementary data
Supplementary data to this article can be found online at https://doi.org/10.1016/j.jhep.2018.11.028.

References
[1] Mohkam K, Dumont P-N, Manichon A-F, Jouvet J-C, Boussel L, Merle P, et al. No-touch multibipolar radiofrequency ablation vs. surgical resection for solitary hepatocellular carcinoma ranging from 2 to 5 cm. J Hepatol 2018;68:1172–1180.
[2] Hocquelet A, Aubé C, Rode A, Cartier V, Sutter O, Manichon A-F, et al. Comparison of no-touch multi-bipolar vs. monopolar radiofrequency ablation for small HCC. J Hepatol 2017;66:67–74.
[3] Hocquelet A, Loriaud A, Papadopoulos P, Trillaud H. Optimal multibipolar parameters should overcome heat-sink effect. Int J Hyperthermia 2016;32:940–941.
[4] Seror O, N'Kontchou G, Van Nhieu JT, Rabahi Y, Nahon P, Laurent A, et al. Histopathologic comparison of monopolar versus no-touch multipolar radiofrequency ablation to treat hepatocellular carcinoma within Milan criteria. J Vasc Interv Radiol 2014;25:599–607.
[5] Jaskolka JD, Asch MR, Kachura JR, Ho CS, Ossip M, Wong F, et al. Needle tract seeding after radiofrequency ablation of hepatic tumors. J Vasc Interv Radiol 2005;16:485–491.
[6] Kondo Y, Yoshida H, Shiina S, Tateishi R, Teratani T, Omata M. Artificial ascites technique for percutaneous radiofrequency ablation of liver cancer adjacent to the gastrointestinal tract. Br J Surg 2006;93:1277–1282.
[7] European Association for the Study of the Liver. EASL clinical practice guidelines: management of hepatocellular carcinoma. J Hepatol 2018;69:182–236.
[8] Shi M, Guo R-P, Lin X-J, Zhang Y-Q, Chen M-S, Zhang C-Q, et al. Partial hepatectomy with wide versus narrow resection margin for solitary hepatocellular carcinoma: a prospective randomized trial. Ann Surg 2007;245:36–43.
[9] Song J, Wang Y, Ma K, Zheng S, Bie P, Xia F, et al. Laparoscopic hepatectomy versus radiofrequency ablation for minimally invasive treatment of single, small hepatocellular carcinomas. Surg Endosc 2016;30:4249–4257.

Kayvan Mohkam[1,2,*]
Jean-Yves Mabrut[1]
[1]*Department of General Surgery and Liver Transplantation, Hôpital de la Croix-Rousse, Hospices Civils de Lyon, Université Claude Bernard Lyon 1, Lyon, France*
[2]*INSERM Unit 1052, Clinical Research Center of Lyon, France*
*Corresponding author. Address: Department of General Surgery and Liver Transplantation, Hôpital de la Croix-Rousse, Hospices Civils de Lyon, 103, Grande Rue de la Croix-Rousse, 69317 Cedex 04 Lyon, France; Tel.: +33 472 071 100, fax: +33 472 072 927.
E-mail address: kayvan.mohkam@chu-lyon.fr