Letter to the Editor

# Laparoscopic liver resection for malignancies confined to Couinaud's segment VII in the robotic surgery era


**Maurizio Zizzo[1,2], Lara Ugoletti[3], Carolina Castro Ruiz[3], Magda Zanelli[4], Loredana De Marco[4], Claudio Pedrazzoli[1], Valerio Annessi[3]**

[1]Surgical Oncology Unit, Azienda Unità Sanitaria Locale-IRCCS di Reggio Emilia, Arcispedale Santa Maria Nuova di Reggio Emilia, Reggio Emilia, Italy; [2]Clinical and Experimental Medicine PhD Program, University of Modena and Reggio Emilia, Modena, Italy; [3]General Surgery Unit, Azienda Unità Sanitaria Locale-IRCCS di Reggio Emilia, Ospedale Civile di Guastalla, Reggio Emilia, Italy; [4]Pathology Unit, Azienda Unità Sanitaria Locale-IRCCS di Reggio Emilia, Arcispedale Santa Maria Nuova di Reggio Emilia, Reggio Emilia, Italy

*Correspondence to:* Maurizio Zizzo. Surgical Oncology Unit, Azienda Unità Sanitaria Locale-IRCCS di Reggio Emilia, Arcispedale Santa Maria Nuova di Reggio Emilia, Viale Risorgimento, 80, 42123 Reggio Emilia, Italy. Email: zizzomaurizio@gmail.com.


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We read with pleasure papers by Cai *et al.* and Jia *et al.* published in *HepatoBiliary Surgery and Nutrition*, 2018, Volume 7, Issue 2 and 4, respectively (1,2). Both papers introduced comprehensive up-to-date literature reviews on indications and patient selection, surgical instruments, techniques, and outcomes of laparoscopic liver resections (LLRs) (1,2). Papers mentioned final statements by 2008 Louisville Statement and 2014 Morioka Consensus Conference (1,2). They stressed LLR non-inferiority to open procedures, in both minor and major liver resections as far as oncological and intraoperative/perioperative outcomes are concerned: reduced blood loss, lower postoperative morbidity and shorter length of hospitalization (1,2). Such results were corroborated by recent meta-analyses (3,4). Furthermore, some previous limitations for LLR look like they have been recently overcome (1-5). For example, tumor size, patient's old age and high BMI are no longer limitations for LLR, as Southampton Consensus guidelines suggested (5). Likewise, cirrhosis has been suggested as a further indication of LLR in highly selected patients with hepatocellular carcinoma and where it was performed by experienced surgeons (1-5).

Hepatocellular carcinoma, secondary liver tumors and other rare liver malignancies were identified as possible indications of LLRs (1-5). Biopsies or minor liver resections as small wedge resections, resections of left lateral section (II–III) or anterior hepatic segments (IVb, V, VI) can be carried out through laparoscopic approach (1-5). Prominent healthcare centers offer hemihepatectomies, trisectionectomies and resections of posterosuperior segments (IVa, VII, VIII) and caudate (I), which are considered major liver resections (1,2,5). Major liver resections are seldom performed, even at leading centers, because of considerable technical complexities, risk of massive bleeding and positive tumor margins (1,2,5). Segment VII and VIII tumors can be hardly reached by currently available laparoscopic instruments (1).

Despite recently improved surgical hepatectomy techniques, resection of liver neoplasms confined to segment VII represents one of the most challenging procedures (6). Segment VII is located behind the plane defined by vena cava and right hepatic vein (RHV) *in situ* and is biologically adherent to right diaphragm in the area without peritoneum (bare area) (6). Therefore, resection of segment VII lesions usually requires full mobilization of right liver from diaphragm, right adrenal gland and vena cava, by dividing thick short hepatic veins (inferior RHV) (6).

Recently, Lim *et al.* introduced one of the richest published series on resections of hepatic malignancies confined to segment VII (6). They highlighted how minor hepatectomy (wedge resection or VII segmentectomy) led to more favorable operative outcomes (shorter operative time and lower intraoperative blood loss) in comparison to major hepatectomy (right lateral sectionectomy or right hepatectomy) (6). Furthermore, 1-year relapse rate after local hepatectomy (28%) was shorter than 1-year relapse rate following extensive hepatectomy (46%), although tumor-related factors between the two groups were quite different (6). However, just a small number among the described cases was performed thorough a minimally invasive technique (8/200) (6).

Guerra and his robotic surgery team commented on Lim's experience by emphasizing the benefits of robotic liver surgery (7). Several technical challenges which are intrinsic to conventional laparoscopic techniques were partially met by robotic systems, as they don't just allow three-dimensional imaging but also increased surgical dexterity, thus leading to an excellent control of accurate dissections (7). Furthermore, a robot-integrated ultrasonography, which currently offers maneuverability in all robotic degrees of freedom, allows better localization of lesions to be removed and clearer visualization of neighboring vascular and biliary structures (7). Both operative field and ultrasound images are simultaneously displayed in real time over the surgeon's glasses, thus allowing a clear anatomic and vascular understanding and leading to more non-stop dissections (7). Possible intraoperative complications, such as severe bleeding or intestinal lesions, a lower rate of conversion to laparotomy are managed more easily (7). Eventually, fluorescence imaging mounted on robotic surgery system can also help identify liver neoplasms and segmental boundaries during hepatectomy (7,8).

International guidelines on hepatic robotic surgery have been recently issued (8). Based on current evidence, recommendations 4–6 are of some interest (8).

Recommendation 4 stated that robotic hepatectomy has similar effectiveness for liver malignancies compared to laparoscopic hepatectomy, with no significant difference in radical resection rate, overall survival rate and recurrence rate between robotic hepatectomy and laparoscopic hepatectomy. Level of evidence: very low.

Recommendation 5 and 6 stated that for minor and major hepatectomies, robotic hepatectomy as safe and feasible as laparoscopic hepatectomy and open hepatectomy. Minor and major robotic hepatectomies have longer operative time than minor and major laparoscopic hepatectomies. Intraoperative blood loss, overall postoperative complication rate and overall cost of robotic minor/major hepatectomy are comparable to that of laparoscopic minor/major hepatectomy. Level of evidence: very low.

Most reports prove robotic hepatectomy's safety, feasibility and effectiveness, although they are mainly case reports and case series stemming from high-volume centers (8). Case-control studies with large samples are relatively scarce and high-quality randomized controlled trials are strongly required (8). According to current studies' outcomes, robotic hepatectomy, open liver surgery and laparoscopic liver surgery are similarly effective (8). Several papers reported on operative time, intraoperative blood loss, conversion rate, incidence of postoperative complications and overall cost-benefit ratio, while disagreement on application of procedures still remains (8).

Following acquisition of our learning curve in laparoscopic liver surgery through minor or anterior hepatic resections, approximately 1 year ago we started performing LLRs of posterosuperior segments using a technique similar to the one introduced by Fiorentini *et al.* (9).

Until now 6 cases have been collected, 5 cases of colorectal metastases located in segment VII and 1 case in segment VIII. As concerned short-term and oncological outcomes, our results showed similarity to those reported by literature (3,4).

In conclusion, we believe that development of hepatic robotic surgery can lead to improved future outcomes in comparison to the present ones. However, we must keep in mind the reduced availability of da Vinci Surgical Systems (as in Italy), high costs of robotic systems, and non-negligible learning curve to be respected. Therefore, in addition to proper suggestions by present guidelines, we must still focus on development of learning curves, techniques and instruments in laparoscopic liver surgery, also in posterosuperior liver lesions. In accordance to Fung *et al.*, primacy of robotic surgery in comparison to conventional laparoscopy remains an open question for posterosuperior lesions (10).

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## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

## References


1. Cai X. Laparoscopic liver resection: the current status and the future. Hepatobiliary Surg Nutr 2018;7:98-104.
2. Jia C, Li H, Wen N, et al. Laparoscopic liver resection: a review of current indications and surgical techniques. Hepatobiliary Surg Nutr 2018;7:277-88.
3. Ciria R, Gomez-Luque I, Ocaña S, et al. A Systematic Review and Meta-Analysis Comparing the Short- and Long-Term Outcomes for Laparoscopic and Open Liver Resections for Hepatocellular Carcinoma: Updated Results from the European Guidelines Meeting on Laparoscopic Liver Surgery, Southampton, UK, 2017. Ann Surg Oncol 2019;26:252-63.
4. Ciria R, Ocaña S, Gomez-Luque I, et al. A systematic review and meta-analysis comparing the short- and long-term outcomes for laparoscopic and open liver resections for liver metastases from colorectal cancer. Surg Endosc 2019. [Epub ahead of print].
5. Abu Hilal M, Aldrighetti L, Dagher I, et al. The Southampton Consensus Guidelines for Laparoscopic Liver Surgery: From Indication to Implementation. Ann Surg 2018;268:11-8.
6. Lim C, Ishizawa T, Miyata A, et al. Surgical Indications and Procedures for Resection of Hepatic Malignancies Confined to Segment VII. Ann Surg 2016;263:529-37.
7. Guerra F, Bonapasta SA, Annecchiarico M, et al. Liver Malignancies in Segment VII: The Role of Robot-assisted Surgery. Ann Surg 2017;265:E80.
8. Liu R, Wakabayashi G, Kim HJ, et al. International consensus statement on robotic hepatectomy surgery in 2018. World J Gastroenterol 2019;25:1432-44.
9. Fiorentini G, Ratti F, Cipriani F, et al. Theory of Relativity for Posterosuperior Segments of the Liver. Ann Surg Oncol 2019;26:1149-57.
10. Fung AK, Lee KF. Robotic resection for posterosuperior liver lesions: is it really superior to laparoscopic resection? HepatoBiliary Surg Nutr 2019;8:264-6.


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