Editorial Commentary

Which is the best approach for liver resections of postero-superior liver segments?

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We read with great interest the article written by Nota *et al.* (1) comparing the perioperative results of robotic (RLR) versus open (OLR) minor liver resections of postero-superior (PS) segments with a propensity score based analysis. Data from four international institutions, from both Western and Eastern centres, were compared. The authors demonstrated that minor RLRs of the PS segments, when performed in selected patients in referral centres, are safe, feasible and also characterized by a shorter length of hospital stay compared to the OLRs. Although this analysis provides valuable data, we would like to highlight some aspects that have been underestimated by the authors.

First, we would like to draw attention to the comparison between RLR and OLR itself. Several studies have shown that pure laparoscopic liver resections (LLR) significantly reduce hospital stay (2-6), intraoperative bleeding (2,4,6,7), and perioperative complications (2,5,6) compared to OLRs. Hence, LLRs rather than OLRs should be the right comparator to evaluate the benefits of RLRs since RLR is in fact a laparoscopic surgery assisted by the robot. The robotic approach has some theoretical advantages over laparoscopy in dealing with PS segments, due to the improved angle of view and articulate instruments, these are valuable advantages, especially when multiple and orthogonal transection lines are required. Nonetheless, the only available study comparing RLRs and LLRs to date reports substantially overlapping results in terms of postoperative hospital stay and complications (8).

The second aspect that we would like to highlight is that the authors stated that LLRs of the PS segments are difficult to perform (9) and are a predictor for conversion (10,11). Although some studies reported conversion rates of 10–14.5% (2-4) with LLRs, data from high-volume centres showed significantly inferior conversion rates (2.9–7.3%) (5-7) that are even lower than those reported by Nota *et al.* with RLRs (6% and 8 % in the post- and pre-matched population, respectively) (1). Furthermore, to reinforce the value of RLRs with respect to LLRs, the authors highlighted data from literature reporting that LLRs of PS segments take significantly longer and have higher blood losses than LLRs of antero-lateral segments (12). This is certainly true, and is supported by several studies (13,14), but in fact, no study has analysed so far whether the position of the lesions in the PS segments is a risk factor for conversion during RLR, with respect to the antero-lateral segments. Nevertheless, it is likely that resections in the PS segments are more complex than ones in antero-lateral segments, regardless of the technique (robotic or laparoscopic). We agree that both LLRs and RLRs are preferred to OLRs, when possible, but it is not yet clear which of the two minimally invasive approaches is better.

Third, an important aspect which has not been addressed by the authors is the selection of patients for RLRs. In fact, only one third of the study patients underwent a RLR and it is not known whether this was due to the learning curve or to specific selection criteria. Indeed, patients with major

surgical complexity could have been addressed to OLR. The reported rate of R1 resections in the OLR group (23%), is higher than those reported from other studies (0–13.6%) and could be indicative of this hypothesis being true (2,4,5,7). Although the authors used the propensity score to correct a potential selection bias, several indicators of the surgical complexity, such as the presence of vascular invasions of hepatic veins or the tumour size, were not considered in the propensity score. An important parameter to consider is that only minor resections (namely including <3 segments) were included. However, minor liver resections involving PS segments show a widely variable degree of complexity. For example, an anatomical resection of segment VII and VIII, or a wedge resection of a lesion located in the posterior part of segment VII near the inferior vena cava, are more complex than a wedge resection of a small, superficial lesion located in segment IVa. Using a difficulty score to evaluate the complexity of liver resections in the PS segments would probably have been more accurate when matching RLR and OLR (15). Furthermore, it should be noted that despite a large number of OLRs [145] being available for 1:1 matching with 51 RLRs, only 31 matches were obtained. This suggests that the two populations of patients undergoing RLR and OLR only partially overlap, subsequently the findings of Nota *et al.* are applicable only to this subgroup of patients. Therefore, it is necessary to clarify which are, at present, the indications and contraindications of a minimally invasive approach to PS segments (multiple nodules? major hepatectomies? proximity of lesions to major vessels? size of the lesion?). A further potential confounding factor could be the operator itself, as the surgeon and their experience considerably influence both intra-operative and post-operative results. Therefore, it would have been useful to know if the surgeons performing RLRs were the same as those carrying out OLRs.

Finally, it is not clear whether an enhanced recovery after surgery (ERAS) protocol was applied and if so to which group. This missing information is relevant, as fast-track protocols, if properly applied, significantly reduce the post-operative hospital stay, time to functional recovery, and overall complication rates both in open and minimally-invasive surgery (16). Several studies from the Western world have reported, after OLR of PS segments, a mean postoperative hospital stay of 5-6 days (3,5,7), lower than reported in the present study (8 days) in the OLR group and close to that achieved in the RLR group (4 days). This would demonstrate that the correct application of ERAS protocols in open techniques leads to a significant reduction in post-operative hospital stay, independent of the surgical approach.

In conclusion, minimally-invasive techniques (laparoscopic and robotic) can be safely employed to carry out liver resections in the PS segments in selected patients, providing benefits in terms of postoperative hospital stay and complications, as also shown by a recent meta-analysis (17). Future research needs to clarify which indications give better results with the robotic or laparoscopic approach than with conventional surgery. Furthermore, the hypothetical superiority of the robotic over the laparoscopic approach is yet to be demonstrated.

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References

1. Nota CL, Woo Y, Raoof M, et al. Robotic Versus Open Minor Liver Resections of the Posterosuperior Segments:

A Multinational, Propensity Score-Matched Study. Ann Surg Oncol 2019;26:583-90.
2. Morikawa T, Ishida M, Takadate T, et al. Laparoscopic partial liver resection improves the short-term outcomes compared to open surgery for liver tumors in the posterosuperior segments. Surg Today 2019;49:214-23.
3. Okuno M, Goumard C, Mizuno T, et al. Operative and short-term oncologic outcomes of laparoscopic versus open liver resection for colorectal liver metastases located in the posterosuperior liver: a propensity score matching analysis. Surg Endosc 2018;32:1776-86.
4. Guro H, Cho JY, Han HS, et al. Laparoscopic liver resection of hepatocellular carcinoma located in segments 7 or 8. Surg Endosc 2018;32:872-8.
5. Scuderi V, Barkhatov L, Montalti R, et al. Outcome after laparoscopic and open resections of posterosuperior segments of the liver. Br J Surg 2017;104:751-9.
6. Xiao L, Xiang LJ, Li JW, et al. Laparoscopic versus open liver resection for hepatocellular carcinoma in posterosuperior segments. Surg Endosc 2015;29:2994-3001.
7. D'Hondt M, Tamby E, Boscart I, et al. Laparoscopic versus open parenchymal preserving liver resections in the posterosuperior segments: a case-matched study. Surg Endosc 2018;32:1478-85.
8. Montalti R, Scuderi V, Patriti A, et al. Robotic versus laparoscopic resections of posterosuperior segments of the liver: a propensity score-matched comparison. Surg Endosc 2016;30:1004-13.
9. Cho JY, Han HS, Yoon YS, et al. Feasibility of laparoscopic liver resection for tumors located in the posterosuperior segments of the liver, with a special reference to overcoming current limitations on tumor location. Surgery 2008;144:32-8.
10. Halls MC, Cipriani F, Berardi G, et al. Conversion for Unfavorable Intraoperative Events Results in Significantly Worse Outcomes During Laparoscopic Liver Resection: Lessons Learned From a Multicenter Review of 2861 Cases. Ann Surg 2018;268:1051-7.
11. Troisi RI, Montalti R, Van Limmen JG, et al. Risk factors and management of conversions to an open approach in laparoscopic liver resection: analysis of 265 consecutive cases. HPB (Oxford) 2014;16:75-82.
12. Ishizawa T, Gumbs AA, Kokudo N, et al. Laparoscopic segmentectomy of the liver: from segment I to VIII. Ann Surg 2012;256:959-64.
13. Levi Sandri GB, Ettorre GM, Aldrighetti L, et al. Laparoscopic liver resection of hepatocellular carcinoma located in unfavorable segments: a propensity score-matched analysis from the I Go MILS (Italian Group of Minimally Invasive Liver Surgery) Registry. Surg Endosc 2019;33:1451-8.
14. Zheng B, Zhao R, Li X, et al. Comparison of laparoscopic liver resection for lesions located in anterolateral and posterosuperior segments: a meta-analysis. Surg Endosc 2017;31:4641-8.
15. Halls MC, Berardi G, Cipriani F, et al. Development and validation of a difficulty score to predict intraoperative complications during laparoscopic liver resection. Br J Surg 2018;105:1182-91.
16. Li L, Chen J, Liu Z, et al. Enhanced recovery program versus traditional care after hepatectomy: A meta-analysis. Medicine (Baltimore) 2017;96:e8052.
17. Yin Z, Jin H, Ma T, et al. Laparoscopic hepatectomy versus open hepatectomy in the management of posterosuperior segments of the Liver: A systematic review and meta-analysis. Int J Surg 2018;60:101-10.

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