Editorial Commentary



# Laparoscopic parenchymal-sparing hepatectomy

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In their recent meta-analysis, Kalil *et al.* suggested that laparoscopic parenchymal-sparing hepatectomy (PSH) is associated with acceptable short-term outcomes and oncological efficiency, but they acknowledged that the quality of the available data is poor (1). During open surgery, it has long been recognised that PSH, if feasible, is superior to major hepatectomy due to significantly lower morbidity and mortality, with no differences in long-term survival (2-4). The available evidence for PSH, including this study by Kalil *et al.* is predominantly derived from retrospective data, with an intrinsic risk of selection bias. The fact that there is no internationally agreed definition of PSH further confounds interpretation of data in this field. In the study by Kalil *et al.* the majority of patients had solitary tumours but data regarding proximity to vascular structures was not available, and PSH was not defined. The size and number of tumours, distribution (unilobar or bilobar), location within a segment and proximity to major vasculobiliary structures are all factors that are taken into account when deciding the surgical approach (e.g., minor *vs.* major hepatectomy and laparoscopic *vs.* open). A minor hepatectomy (i.e., atypical/wedge resection or anatomical segmentectomy) for a small, peripheral tumour cannot be considered as a PSH in the current era, since major hepatectomy in this scenario would be considered unnecessary, and is not an acceptable alternative. In my view, PSH should refer specifically to the surgical approach for deeply positioned tumours close to either portal inflow structures or major hepatic veins, where a decision to perform a major hepatectomy may reasonably be considered in order to obtain a margin-negative resection. In such cases, a PSH may be technically more challenging than a major hepatectomy, with an increased risk of a margin-positive resection, but with the advantage of reduced perioperative morbidity. A PSH that accepts an R1 resection may be the only option in patients with multiple bilobar disease in order to preserve inflow/outflow to the remnant liver. For solitary deep lesions close to a major portal or hepatic vein, it is not clear whether an R0 major hepatectomy is superior to an R1 PSH (either laparoscopic or open), and a prospective study in a clearly defined patient cohort would be necessary to address this.

Laparoscopic hepatectomy (LH) has become an acceptable alternative to open hepatectomy in selected patients, and the short-term benefits are well established (5). The growth of LH worldwide over recent decades has been exponential, particularly for minor resections (6). Although LH is technically more challenging than OH, the learning curve for second generation laparoscopic liver surgeons has reduced significantly (7-9), and a laparoscopic approach is feasible for tumours in all liver segments (6). The Oslo-Comet randomised trial recently established the superiority of LH over OH for the management of colorectal metastases (10). With respect to PSH, a laparoscopic approach may be feasible in highly selected patients (11-13), but should only be performed by experienced teams working in high volume centres (5). For patients with multicentric bilobar liver metastases, open hepatectomy should still be considered the gold standard, although laparoscopic two-stage hepatectomy and laparoscopic ALPPS procedures have been reported (14,15). An important drawback of PSH compared to major hepatectomy is an increased incidence of intrahepatic recurrence, and the need for repeat

hepatectomy (2). However, the perioperative morbidity and blood loss associated with repeat hepatectomy may be reduced by adopting a laparoscopic approach for both stages (15,16).

The analysis by Kalil *et al.* included patients with a range of indications, predominantly colorectal metastases and hepatocellular carcinoma[1]. The concept of PSH has been applied mainly to the surgical management of patients with colorectal metastases, for the reasons outlined above. The surgical approach to hepatocellular carcinoma is influenced by the presence and severity of underlying cirrhosis, when a 'PSH' is the gold standard. Anatomical segmental rather than non-anatomical resection for hepatocellular carcinoma has been advocated for oncological reasons, and recent propensity matched cohort studies would support this approach (17,18). Laparoscopic anatomical segmentectomy for hepatocellular carcinoma has been reported for all liver segments, but is a technically challenging procedure, particularly for lesions in the posterior and superior segments (IVa, VII, VIII) (19-21). Introduction of new technologies, such as image-guided navigation, augmented reality and near-infrared fluorescence are likely to facilitate safe expansion of laparoscopic parenchymal-sparing anatomical segmentectomy in the future (22,23).

In summary, a laparoscopic approach can be safely applied to PSH for solitary liver tumours, whilst open surgery should be considered the gold standard approach for patients with multicentric bilobar metastases. Future studies should aim to define *PSH* in terms of the tumour size/number and proximity to major vascular structures.

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## Footnote

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

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

## References

1. Kalil JA, Poirier J, Becker B, et al. Laparoscopic Parenchymal-Sparing Hepatectomy: the New Maximally Minimal Invasive Surgery of the Liver-a Systematic Review and Meta-Analysis. J Gastrointest Surg 2019;23:860-9.
2. Lordan JT, Roberts JK, Hodson J, et al. Case-controlled study comparing peri-operative and cancer-related outcomes after major hepatectomy and parenchymal sparing hepatectomy for metastatic colorectal cancer. HPB (Oxford) 2017;19:688-94.
3. Deng G, Li H, Jia GQ, et al. Parenchymal-sparing versus extended hepatectomy for colorectal liver metastases: A systematic review and meta-analysis. Cancer Med 2019;8:6165-75.
4. Moris D, Ronnekleiv-Kelly S, Rahnemai-Azar AA, et al. Parenchymal-Sparing Versus Anatomic Liver Resection for Colorectal Liver Metastases: a Systematic Review. J Gastrointest Surg 2017;21:1076-85.
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. Ciria R, Cherqui D, Geller DA, et al. Comparative Short-term Benefits of Laparoscopic Liver Resection: 9000 Cases and Climbing. Ann Surg 2016;263:761-77.
7. Tomassini F, Scuderi V, Colman R, et al. The single surgeon learning curve of laparoscopic liver resection: A continuous evolving process through stepwise difficulties. Medicine (Baltimore) 2016;95:e5138.
8. Sultana A, Nightingale P, Marudanayagam R, et al. Evaluating the learning curve for laparoscopic liver resection: a comparative study between standard and learning curve CUSUM. HPB (Oxford) 2019. [Epub ahead of print].
9. Halls MC, Alseidi A, Berardi G, et al. A Comparison of the Learning Curves of Laparoscopic Liver Surgeons in Differing Stages of the IDEAL Paradigm of Surgical Innovation: Standing on the Shoulders of Pioneers. Ann Surg 2019;269:221-8.
10. Fretland ÅA, Dagenborg VJ, Bjørnelv GMW, et al. Laparoscopic Versus Open Resection for Colorectal Liver Metastases: The OSLO-COMET Randomized Controlled Trial. Ann Surg 2018;267:199-207.
11. Cipriani F, Shelat VG, Rawashdeh M, et al. Laparoscopic Parenchymal-Sparing Resections for Nonperipheral Liver Lesions, the Diamond Technique: Technical Aspects, Clinical Outcomes, and Oncologic Efficiency. J Am Coll Surg 2015;221:265-72.
12. D'Hondt M, Yoshihara E, Vansteenkiste F, et al. Laparoscopic parenchymal preserving hepatic resections

 

in semiprone position for tumors located in the posterosuperior segments. Langenbecks Arch Surg 2016;401:255-62.
13. Conrad C, Ogiso S, Inoue Y, et al. Laparoscopic parenchymal-sparing liver resection of lesions in the central segments: feasible, safe, and effective. Surg Endosc 2015;29:2410-7.
14. Kazaryan AM, Aghayan DL, Barkhatov LI, et al. Laparoscopic Multiple Parenchyma-sparing Concomitant Liver Resections for Colorectal Liver Metastases. Surg Laparosc Endosc Percutan Tech 2019;29:187-93.
15. Okumura S, Goumard C, Gayet B, et al. Laparoscopic versus open two-stage hepatectomy for bilobar colorectal liver metastases: A bi-institutional, propensity score-matched study. Surgery 2019. [Epub ahead of print].
16. Peng L, Zhou Z, Xiao W, et al. Systematic review and meta-analysis of laparoscopic versus open repeat hepatectomy for recurrent liver cancer. Surg Oncol 2019;28:19-30.
17. Li SQ, Huang T, Shen SL, et al. Anatomical versus non-anatomical liver resection for hepatocellular carcinoma exceeding Milan criteria. Br J Surg 2017;104:118-27.
18. Zhao H, Chen C, Gu S, et al. Anatomical versus non-anatomical resection for solitary hepatocellular carcinoma without macroscopic vascular invasion: A propensity score matching analysis. J Gastroenterol Hepatol 2017;32:870-8.
19. Kim S, Han HS, Sham JG, et al. Laparoscopic anatomical S7 segmentectomy by the intrahepatic glissonian approach. Surg Oncol 2019;28:158.
20. Jang JY, Han HS, Yoon YS, et al. Three-Dimensional Laparoscopic Anatomical Segment 8 Liver Resection with Glissonian Approach. Ann Surg Oncol 2017;24:1606-9.
21. Xiao L, Li JW, Zheng SG. Laparoscopic anatomical segmentectomy of liver segments VII and VIII with the hepatic veins exposed from the head side (with videos). J Surg Oncol 2016;114:752-6.
22. Qi C, Zhang H, Chen Y, et al. Effectiveness and safety of indocyanine green fluorescence imaging-guided hepatectomy for liver tumors: A systematic review and first meta-analysis. Photodiagnosis Photodyn Ther 2019. [Epub ahead of print].
23. Le Roy B, Ozgur E, Koo B, et al. Augmented reality guidance in laparoscopic hepatectomy with deformable semi-automatic computed tomography alignment (with video). J Visc Surg 2019;156:261-2.

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