Contribution of the Glissonian approach for laparoscopic anatomical liver resection

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Provenance: This is an invited article commissioned by the Editor-in-Chief Giovanni Battista Levi Sandri (Division of General Surgery, Santa Scolatisca Hospital, Cassino, Lazio, Italy).

Comment on: Smerieri N, Fiorentini G, Ratti F, *et al.* Laparoscopic left hepatectomy for mucinous cystic neoplasm of the liver. Surg Endosc 2018;32:1068-9.

Received: 02 May 2018; Accepted: 15 May 2018; Published: 01 June 2018.

doi: 10.21037/ls.2018.05.05

View this article at: http://dx.doi.org/10.21037/ls.2018.05.05

Laparoscopic surgery has transformed many procedures over the past three decades. Greater experience along advances in laparoscopic devices have augmented the number of laparoscopic liver resection (LLR). Today laparoscopic hepatectomy is a stablished technique worldwide with more than 9,000 cases reported so far (1). International consensus conferences in 2008 and 2014 established steps to safe implementation of this technique such as dual training in advanced minimally invasive surgery and liver surgery, showed short-term equivalence and suggested that laparoscopy should be the standard of care for minor liver resections and left-lateral sectionectomy (2,3).

A great number of liver procedures can be safely performed by laparoscopy with different degrees of surgical difficulty that are not the same of their counterpart, conventional liver resection. Surgical difficulty is subjective and may be influenced by surgical, patient and tumor characteristics. The majority of LLRs being performed today are minor resections, left lateral segmentectomies and hemihepatectomy (1-7).

The declining use of major hepatectomy in favor of parenchymal-preserving procedures will certainly limit the progress of LLR even in large-volume centers. In our view, the best way to perform a parenchymal-preserving procedure is through anatomical resection. However, anatomical removal of liver segments is performed in few centers due to difficulty in reach individual Glissonian pedicles by laparoscopy (8,9).

We and other authors have advocated the use of the Glissonian approach to perform anatomical liver resections (9-12). The Glissonian approach was first proposed by Galperin *et al.*, (10) followed by Takasaki *et al.*, (11) and diffused worldwide by Launois *et al.* (12). A simple way to perform this approach was subsequently published (13,14). Based on incisions performed according specific landmarks, a control of highly selective Glissonian pedicles can be obtained. This technique can be performed without hilar dissection and there is no need for cholangiography or ultrasound control (13,14). These techniques made possible *a la carte* liver resection by removing only the intended liver segments. We have routinely used it for open liver resections since 2001. With the increasing use of LLRs, it seemed natural to use the Glissonian approach to perform LLR (15,16).

Parenchymal-sparing liver resection involves preserving as much of the normal liver by removing only the diseased amount of liver as possible. The benefits of a parenchymal-sparing approach include a decreased risk of post-hepatectomy liver insufficiency and increased opportunity for repeat hepatic resections if needed. Ischemic delineation results from occlusion of the inflow Glissonian thus facilitating more limited liver resection and preserving the future liver remnant (17).

During the last two decades, hepatic resections have remarkably evolved. Better pre- and intra-operative image studies, understanding of segment-oriented liver anatomy and technical advances have made possible resection of tailored segments or sectors of the liver, based on the localization and extent of the hepatic disease. Segment-oriented resection offers many advantages when compared to traditional lobar resections and nonanatomic wedge resections. It allows maximal sparing of hepatic parenchyma, which matters especially in cirrhotic patients and in those with chemotherapy associated steatohepatitis and is even better than wedge resections when intra-operative bleeding and margin positivity are taken under consideration (18). Segment-oriented hepatectomies are also useful in those who require a two-stage hepatectomy or in those in whom a second resection for recurrent disease is expected.

The current approach to a segmental LLR is the dissection of the elements of the hepatic hilum within the hilar plate. This technique may be technically challenging and may result in excessive bleeding, that is directly related to postoperative morbidity and mortality (19). Besides, anatomical variations and portal hypertension may impair vascular and biliary control (20,21).

To overcome these difficulties, the Glissonian approach for laparoscopic anatomical liver resection allowed straightforward control of the Glissonian pedicle (15,16). With small incisions around the hilar plate on specific anatomical landmarks, the Glissonian pedicle correspondent to the area to be resected can be clamped. This technique minimizes bleeding, allows precise ischemic delineation of the area to be resected, allows inflow control, minimizes ischemia to the remnant liver and simplifies the procedure. In addition, this technique can also be used to major hepatic resections and anatomical segmentectomies, by achieving more selective distal control of segmental or sectional pedicles, allowing parenchymal sparing resections.

The use of the Glissonian approach can be hazardous in special cases, especially in the presence of anatomic variations. These variations should be recognized before or even during the operation. More rare, aberrant bile duct anatomy also needs to be perceived by detailed preoperative imaging. Whenever biliary anatomy anomaly is suspected, cholangiography should be considered to identify and avoid any possible bile duct injury (22). Feasibility may depend on previous experience with the technique, specific knowledge of anatomy, selected instruments, and gentle handling of anatomic structures. Moreover, tumors located immediately adjacent to the hepatic hilum is a known contraindication for this technique once adequate margins may not be obtained.

The non-anatomical wedge resection is an alternative approach for parenchymal sparing. Nevertheless, it can present high rates of margin positivity between 16% and 35% (18,23). In our more recent study on LLR using the Glissonian approach, we noted several advantages over standard LLR including shorter operative time, lower transfusion rates, fewer patients with a postoperative positive margin, as well as less morbidity and a shorter duration of hospital stay (22).

Acknowledgements

None.

Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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doi: 10.21037/ls.2018.05.05
Cite this article as: Machado MA. Contribution of the Glissonian approach for laparoscopic anatomical liver resection. Laparosc Surg 2018;2:31.