Editorial Commentary

Different inflow control methods in cirrhotic patients undergoing laparoscopic liver resection

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In the last decade, laparoscopic liver resection (LLR) has been adopted increasingly worldwide (1,2). This observed trend is promising despite the initial significant learning curve required for LLR (3-5). Even with today's technological advances such as high definition 3-dimension visualization, improved energy devices and ultrasonic dissectors, hepatobiliary surgeons are still faced with challenges when performing liver resection on cirrhotic livers. This is because cirrhotic patients require not only extensive pre-operative planning and optimization, but also challenging post-operative care (6,7). Intra-operatively, the mobilization and transection of a hard-nodular cirrhotic liver is arduous and regardless of the technique employed, intra-operative vascular control is critical due to the direct impact intra-operative blood loss has on post-operative recovery and long-term oncological outcomes (8).

A non-selective approach towards inflow control with an intermittent Pringle's (IP) maneuver may sometimes be vital when significant bleeding is encountered during liver transection. Proponents of such approach have evidence supporting this strategy by quoting its simplicity, efficacy and safety (9,10). The alternative to this non-selective nature of IP is that of a continuous hemihepatic vascular inflow occlusion (CHVIO). CHVIO is employed by its proponents so as to limit the extend of ischemia sustained by the future liver remnant during surgery (11,12). We read with interest a recent study published in HPB titled "Does liver cirrhosis have an impact on the results of different hepatic inflow occlusion methods in laparoscopic liver resection? a propensity score analysis" by Lan and colleagues which investigated the impact of different inflow occlusion methods in a cirrhotic and non-cirrhotic patient. The impact of both techniques on cirrhotic liver in LLR is a worthy and timely endeavour for investigation to study their effects and if a superior technique can be established in this group of patients (13).

In this study, the authors compared IP versus CHVIO in 264 patients with or without cirrhosis and concluded that IP offered better inflow control versus CHVIO in cirrhotic patients in LLR, as IP offers shorter operative time and lesser blood loss. There are numerous communicating vascular branches between liver segments, therefore, selective inflow may sometimes be inadequate in terms of bleeding control, even when transecting the liver in the presence of appropriate pneumoperitoneum pressure along the segmental plane and with good anesthesia support with low central venous pressure (CVP). Furthermore, due to the hard consistency of the liver, the dissection of the vascular and biliary structures from the hepatocytes is complicated, regardless of whether the crush clamp technique, ultrasonic dissectors, surgical stapler or any other methods used.

Based on their findings although IP seems more beneficial than CHVIO towards the conduct of LLR itself, the safety profile of IP remains a concern. This is especially so in cirrhotic patients with higher Child-Pugh scores and borderline remnant liver volumes, where the post-operative course may be more turbulent. This paper concluded that IP in cirrhotic patients does not lead to a worsening

liver function postoperatively, this remains so even when compared to CHVIO. Nevertheless, a few factors which can affect post LLR outcomes were noticeably not reported. The median occlusion times reported in the paper's data were 48 minutes (5–125 minutes) in the CHVIO group and 40 minutes (10–110 minutes) in the IP group for cirrhotic patients. This data represents a wide range of occlusion times, likely for a variety of liver resections, with varying difficulty levels. Some surgeries required a low occlusion time of only 10 minutes of IP while other surgeries required up to 110 minutes of IP. Therefore it is understandable that a shorter duration of IP is unlikely to have significant impact on post-operative outcomes when compared to CHVIO. If there were longer operative durations of IP and CHVIO, the effect of liver ischemia may have been more pronounced and the post-operative outcomes may have been different. In the study, important factors contributing to post-operative complications in LLR such as pre-operative Indocyanine Green (ICG) clearance, future liver remnant volumetry and nature/extent of liver resections, were also notably missing. This information will be very helpful in the interpretation of their findings and an avenue that could be addressed in future efforts. Finally, the conclusions have been limited by this retrospective nature of the study, its small sample size and short follow-up period. A larger multi-institutional study in experienced or high volume centres, under a prospective randomized trial with appropriate blinding, may be needed to validate the conclusions reached.

Nonetheless, this study addressed an important topic worthy of the interest for the hepatobiliary community. Even with its evidence that IP offers an easier and equally safe technique for LLR, CHVIO, on its own merit, should be considered as some high-volume centres routinely perform CHVIO, while achieving low blood loss and short operative times with good post-operative outcomes (11,12). Therefore, it is difficult to unequivocally recommend IP as a standard of care or optimal technique for LLR. Furthermore, venturing beyond IP and CHVIO, some centres are routinely performing LLR with minimal to no vascular occlusion particularly when performing laparoscopic living donor liver transplantation procurement (14). With today's wider pool of adopters, LLR techniques will continue to improve with time and experience and likely evolve as the standard of care for liver surgeries in the near future. The knowledge that a classic technique like IP, which is easily reproducible and simple can achieve such positive outcomes is not only reassuring for hepatobiliary surgeons but will also certainly promote the adoption and progress of LLR by the general surgical community at large.

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