Letter to the Editor

Pringle maneuver or hemi-hepatic inflow occlusion?—the old debate in a new era of laparoscopic liver resection

Haili Zhang, Ningyuan Wen, Xiang Lan, Fei Liu, Yonggang Wei

Department of Liver Surgery, West China Hospital of Sichuan University, Chengdu 610041, China

Correspondence to: Dr. Yonggang Wei. Department of Liver Surgery & Liver Transplantation Center, West China Hospital of Sichuan University, 37 Guo Xue Road, Wu hou District, Chengdu 610041, China. Email: yourwyg@163.com.

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We thank Dr. Lee *et al.* for their interest in our paper and read their letter with carefulness. We certainly agree with their critical comment that the safety profile of intermittent Pringle (IP) needs further validation. Hereon, we attempt to present the current experience in our center, as two hepatic inflow control strategies applied in surgery along with relative merits and future potential of the maneuver.

The first point made by the authors is that the post-operative course may be more turbulent in patients with liver cirrhosis who have higher Child-Pugh scores as well as borderline remnant liver volumes. At present, Child-Pugh A patients without significant portal hypertension are deemed ideal candidates for minor or major liver resection. Child-Pugh B may be candidates for minor surgical resection, while Child-Pugh C patients are unfit for surgical treatment (1). In other words, the Child-Pugh classification had to be A or B for all patients included in this study. Before matching, there were only 4 Child-Pugh B patients in cirrhosis group, which had been meticulously evaluated. We reiterate the fact that the decision to liver resection would be decided by preoperative risk assessment that includes tumor extent, AFP level and liver function, which is important for prediction of outcome and planning of optimal therapy. Well selected patients are suitable for IP in surgery.

On the second point concerning occlusion times, we would like to foreground that perhaps the benefits outweigh the disadvantages even when the occlusion time is prolonged. It has been demonstrated that liver parenchyma has better tolerance of prolonged ischemic injury than massive bleeding, instable hemodynamics and consequent blood transfusions (2,3). As the author indicated, a wide range of occlusion time characterizes liver resections with various difficulty levels. In some difficult liver resections (unfavorable segments, severe cirrhosis), bleeding remains a potentially life-threatening problem. Especially in laparoscopic liver resection (LLR), it is critical to keep a clean laparoscopic vision, if not, you have to spend most of the time cleaning up bleeding, which seriously affects the surgical process and prolongs the operation time. Although continuous hemi-hepatic vascular inflow occlusion (CHVIO) blocked the hemi-hepatic inflow, the blood flow from other segments through communicating branches and proliferous vessels are usually out of control. In some rare condition, even using IP, the control over blood loss was not as good as expected. So, the variations in the aberrant left hepatic artery from left gastric artery should be considered and need additional occlusion using a laparoscopic bulldog. As for occlusion times, a recent study indicated that hepatectomies carried out with intermittent clamping exceeding 120 minutes are equally safe compared with those performed with shorter time, despite more complex tumor presentations (4). In our study, the longest occlusion time in patients with cirrhosis were 110 minutes in the IP group, and our result certainly showed that IP did not lead to worse liver function postoperatively. The main drawback related to IP is the ischemia-reperfusion injury, partially suggested by the elevation of serum transaminases levels. Among patients with cirrhosis, using IP did not show higher serum transaminases levels compared with

CHVIO (ALT: 237.3±21.3 *vs.* 296.5±69.8 IU/L, P=0.281. AST: 194.6±15.7 *vs.* 264.6±72.1 IU/L, P=0.166), this should be partially attributed to remnant ischemic parenchyma in resection with CHVIO, because under this scenario, cutting line are generally depicted within demarcation line to decrease intraoperative blood loss. Furthermore, serum transaminases levels usually return to normal range after therapy, which suggests that the variation in occlusion times does not exert much influence on postoperative outcomes.

Thirdly, we fully agree that pre-operative indocyanine green (ICG) clearance, future liver remnant volume and nature/extent of liver resections were important factors contribute to post-operative complications in LLR. In our center, ICG test is routinely used to assess liver reserve function before operation. The cutoff values of ICG retention rate at the 15 minutes (ICGR 15) for a safe major and minor hepatectomy were respectively 14% and 22% (5). The lack of specific data is our shortcoming, and we will make further improvement in the future research. In fact, with the combinative evaluation of both preoperative ICG and other important variables, we had only one postoperative patient loss due to liver failure over more than 1,000 LLR patients (data not published).

Lastly, as the author pointed out, this study deserves attention because of its future clinical prospects. Also, we approve of the idea that future researches need to focus on the safety of IP in addition to convincing validation of our findings with multi-institutional cohorts and prospective randomized trials. With many limitations having been overcome, LLR has become a mainstream for liver surgeries. Accordingly, the strategies to reduce intraoperative bleeding will attract more attention. IP, as a traditional and the most commonly used method to decrease bleeding during liver surgery due to its effectiveness and simplicity, needs to be further studied in terms of safety and scope of application. In future studies, we hope to design a randomized controlled trial including a larger sample size.

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References

1. Vogel A, Cervantes A, Chau I, et al. Hepatocellular carcinoma: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. Ann Oncol 2018;29:iv238-55.
2. Man K, Fan ST, Ng IO, et al. Prospective evaluation of Pringle maneuver in hepatectomy for liver tumors by a randomized study. Ann Surg 1997;226:704-11; discussion 711-3.
3. Zhang Y, Yang H, Deng X, et al. Intermittent Pringle maneuver versus continuous hemihepatic vascular inflow occlusion using extra-glissonian approach in laparoscopic liver resection. Surg Endosc 2016;30:961-70.
4. Torzilli G, Procopio F, Donadon M, et al. Safety of intermittent Pringle maneuver cumulative time exceeding 120 minutes in liver resection: a further step in favor of the "radical but conservative" policy. Ann Surg 2012;255:270-80.
5. Fan ST. Liver functional reserve estimation: state of the art and relevance for local treatments: the Eastern perspective. J Hepatobiliary Pancreat Sci 2010;17:380-4.

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