



Long-term outcome of laparoscopic liver resection for hepatocellular carcinoma

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We thank Dr. Daniel Seehofer and Robert Sucher for their valuable comments on our article and for their suggestions for further study designs (1). Our responses to the issues raised are outlined hereafter.

Cirrhosis is a topic of interest raised by the current editorial because it also affects survival rates, similar to tumors. In patients with hepatocellular carcinoma (HCC), the background liver is cirrhotic to a certain degree. It is difficult to rank the extent of cirrhosis in a detailed manner based on the current liver damage classification system and because of the different levels of individual compensation to cirrhosis. Therefore, the same category of liver damage according to the Child-Pugh score does not represent the same liver function or extent of cirrhosis. Consequently, collecting a homogenous cohort of patients with cirrhosis is difficult. In all nonrandomized studies evaluating the survival of patients with HCC, this aspect is inevitably observed. However, the impact of cirrhosis does not influence metastatic liver tumors and there are relatively fewer confounding factors. However, the comparison of long-term survival rates in colorectal liver metastases is not available in the only high-quality randomized controlled trial (RCT) to date (2).

Numerous retrospective studies as well as a recent meta-analysis (3) have confirmed the short-term advantages of laparoscopic liver resection (LLR). Most of these studies have revealed similar long-term results between LLR and open liver resection (OLR) groups. However, biases in the selection of patients for the LLR group are inevitable in retrospective studies, despite some studies matching their patients with the propensity score. Therefore, the

selection or indication for laparoscopic resection must be clearly defined in studies. Completing a report based on solid evidence such as an RCT is difficult because the clinical reality is that most patients are not willing to receive larger wounds and an increasing number of hepatobiliary surgeons now perform minimally invasive liver surgeries. In addition, the learning curve is another element that affects the surgical outcomes of a new technique because open surgeries have been performed for a long time. Future studies regarding surgical outcomes might reveal different results after learning curves are overcome.

In our opinion, the differences and advantages of LLR are the caudal approach, high-definition display from the camera, mild hemostatic effect due to the pneumoperitoneum, and smaller wounds. The caudal approach may be the most unfamiliar part to surgeons who are used to performing open liver surgeries. The standardization of laparoscopic surgical procedures facilitates overcoming the aforementioned learning curve. We also suggest a two-surgeon approach in the early phase of the learning curve in LLR. It can reduce surgical time, disorientation, and bleeding due to incidental injuries to vessels based on our experiences. For patients with cirrhosis, laparoscopic surgery causes less destruction of the abdominal wall and portal collateral circulation. It also decreases inflammatory responses because the reduction of trauma. Pneumoperitoneum during surgery counters the common bleeding tendency in patients with cirrhosis. Therefore, LLR may extend surgical candidacy in patients with cirrhosis. As for the long-term results, only one propensity score analysis has demonstrated improved

survival thus far (4).

In the current study, a potential bias was indicated in patient selection because the OLR group consisted of more patients with large tumors and major resections than the LLR group. The LLR group consisted of more patients with cirrhosis. Two possible reasons could explain this phenomenon. First, performing LLR for smaller tumors was an attractive option. The difference in the rates of major resection was supposedly related to the tumor-size effect. Second, laparoscopic resection was also preferred for patients with more severe cirrhosis in our experience. However, laparoscopy is certainly not an indication of less radicality according to the treatment guidelines and experiences in our institute.

Numerous authors posit that scientific evidence is limited by a lack of RCT studies. However, based on medical history, the application of new technologies often does not follow methodologically perfect studies such as RCTs. Several of the limitations associated with conventional LLR have been overcome by new developments in energy devices, 3-dimensional scope systems, flexible scopes, indocyanine green fluorescence cameras, and even robotic platforms. The interest and application of minimally invasive liver surgery continue to advance relentlessly.

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