Editorial

Challenges in consolidating the evidences of robotic surgery for primary hepatobiliary malignancies

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We read "Long-term Oncologic Outcomes Following Robotic Liver Resections for Primary Hepatobiliary Malignancies: A Multicenter Study" with great interest. The report by Khan *et al.* provided a comprehensive analysis of various hepatobiliary cancers (1). Their data indicated that the robotic approach provided oncologic outcomes comparable to those reported previously with standard open and conventional laparoscopic approaches for primary liver and biliary malignancies. However, concerning the nature and different surgical demands of the various procedures, different liver and biliary malignancies shall be discussed in detail herein to clarify the role of the robotic platform.

The application of robotic surgery has been lately extended to a new approach in liver cancer, and comparing oncological outcomes is always required for new approaches. Focusing on the reports of robotic liver resection for hepatocellular carcinoma, the largest propensity-matching analysis that was conducted by our team had suggested that robotic liver resection can be applied for challenging major resections in patients with cirrhotic liver disease without compromising oncological outcomes (2). A recent comparison between robotic and laparoscopic approaches by Lai EC and Tang CN also suggested the robotic approach as an acceptable alternative for hepatocellular carcinoma, with the potential advantages of the robotic system in performing major liver resections and those of tumors in segments that are difficult to access (3). This large series echoed the experience during the accumulation of cases involving the robotic approach and simultaneously yielded the same advantages for dealing with more complex and challenging procedures, as well as facing the dissection difficulties in cirrhotic livers (4,5).

Admittedly, adopting the robotic platform is considered to be an approach, rather than merely an alternative to conventional laparoscopy, to facilitate more delicate and complex procedures, along with the advantage of its instrumental flexibility, three-dimensional surgical vision, and stability (4,6). Nevertheless, dissection of the hepatobiliary hilum remained an early attempt at minimally invasive surgery. The robotic approach has been documented for accurate identification of the hepatobiliary hilum for perilous cases as a liver donor procedure (7,8). However, an initial series for hilar cholangiocarcinoma revealed higher complication rates and cancer positive margin rates, as well as lower disease-free survival. Compared to the comparable oncologic outcomes of HCC that are provided by the robotic approach, the current results do not support robotic surgery for malignancies located in the hepatic hilum that necessitate hilar dissection. We also propose that broad inclusion criteria of various diseases are not always necessary for building solid evidence, even in consideration of the multi-center data analysis.

Even though the advanced platform has overcome some limitations of the conventional laparoscopic surgery, robotic liver resection remains one of the last barriers of robotic surgery (9,10). A carefully cumulated experience has been suggested to overcome the learning curve of robotic liver resection (11,12). For major procedures in the hepatobiliary field, 40 cases may be needed for stable performance with minimal intra-operative blood loss. The report by Khan *et al.*

also led to the concerns that recruited only 61 cases from 4 medical centers. The arbitrarily collected cases and the surgical outcomes might mislead the true performance of experienced hands in large-volume centers. Nevertheless, the report surpassed the crucial barrier and analyzed data from multiple centers, and the intent for the study truly fills the need for consolidating the evidence of robotic liver surgery.

The robotic platform might be helpful for future surgery, and a greater number of patients in need of major liver resection might benefit from this approach. However, more experience is needed to form solid evidence. Moreover, management of tumors arising from the hepatobiliary hilum using a minimally invasive approach remains a challenge. More efforts should be devoted with careful programs to overcome the learning curve and surgical pitfalls.

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