Editorial Commentary

Robotic liver resection for hepatocellular carcinoma: a new dawn?

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I read the article titled "Safety and Efficacy of Robotic *vs* Open Liver Resection for Hepatocellular Carcinoma", published in *JAMA Surgery* with great interest (1). This study marks an important milestone in the field of minimally invasive liver surgery.

Post-operative complications and the associated morbidity are concerns that impact patient recovery and overall healthcare costs. The study by Di Benedetto *et al.* found that patients with hepatocellular carcinoma (HCC) undergoing robotic liver resection (RLR) experienced comparable overall survival and cumulative incidence of death related to tumor recurrence as open liver resection (OLR). The study also demonstrated that RLR, after propensity score matching analysis, was associated with a significantly shorter hospital length of stay, a lower number of admissions to the intensive care unit (ICU), as well as a lower incidence of post-hepatectomy liver failure (PHLF). It represents the largest series from Western countries and the results align with findings from other series from Asia (2,3).

One of the most persuasive arguments favoring RLR is its cost-effectiveness. The minimally invasive nature of robotic surgery minimizes bodily trauma, resulting in reduced hospital stays, diminished postoperative pain, and quicker recovery times for patients. While this study did not directly compare costs or conduct a cost-effectiveness analysis, the reduced length of ICU stays and a six-day reduction in hospital stays will inevitably lead to decreased overall healthcare expenses, which may offset the higher technological costs involved.

While the study by Di Benedetto *et al.* offers valuable insights, it is crucial to acknowledge and address certain limitations. In this cohort study, data on RLR were collected from two European institutions and two US institutions, while data from the control group originated from another international referral center specializing in non-robotic minimally invasive surgery for HCC. Consequently, the performance differences observed might be attributed to inter-institutional variations rather than the distinct surgical techniques employed. The retrospective nature of the study and the potential for selection bias necessitate further prospective investigations to establish the long-term benefits and outcomes of RLR for HCC.

Chen *et al.* proposed that the learning curve of robotic major hepatectomy can be divided into three distinct phases: initial (phase 1, 15 patients), intermediate (phase 2, 25 patients), and mature (phase 3, 52 patients) (4). The learning effects were evident through shorter operation times and hospital stays after phase 1 and reduced blood loss after phase 2. In a recent propensity score-matched analysis conducted by the International Robotic and Laparoscopic Liver Resection study group investigators, comparing robotic and laparoscopic right and extended right hepatectomy, it was found that the robotic approach

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was associated with a lower open conversion rate and shorter postoperative hospital stays compared to the laparoscopic approach (5). Once a center has overcome the learning curve, the difference in open conversion rate was significantly reduced in the laparoscopic group but not in the robotic group. Therefore, the use of the robotic platform may help overcome the initial challenges of performing minimally invasive major liver resection.

In conclusion, this study published in *JAMA Surgery* provides compelling evidence supporting the adoption of RLR as a safe and effective alternative to traditional OLR for HCC. Robotic-assisted surgery offers enhanced safety measures, improved efficacy, and reduced postoperative complications. As we move forward, it is crucial for surgeons, researchers, and healthcare systems to collaborate in further exploring and harnessing the potential of robotics, ensuring its integration into routine clinical practice for the benefit of patients worldwide.

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