



Minimally invasive surgery for hepatocellular carcinoma

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Hepatocellular carcinoma (HCC) is one of the leading causes of morbidity and mortality worldwide, particularly in Taiwan because of her high incidence of infectious hepatitis (hepatitis B virus, hepatitis C virus, and hepatitis D virus) and rapidly increased incidence of metabolic dysfunction-associated fatty liver diseases.¹⁻⁴ Despite recent far-advanced medical treatments, primary surgical resection of the tumor remains the gold standard treatment for resectable HCC and/or an isolated metastatic hepatic cancer.⁵ Similar to all other cancers, traditional surgery (exploratory laparotomy) and minimally invasive surgery (MIS: laparoscopy or robot) have been reported to be applicable for the aforementioned purpose, although some uncertainties are still in concerns if MIS is applied to many cancers.⁶⁻⁹ It is well known that MIS may have taken many advantages, such as a better recovery, a better cosmetic need, and a shortening hospital stay (all are called a better quality of life [QoL]) compared with traditional surgery, some surgical oncologists still hesitate to receive the MIS as the choice of treatment for their patients because of much concern for the long-term oncological safety.^{9,10} All need continuous studies to provide a better chance to prolong life span of diseased people and minimize the therapy-related adverse events (AEs).^{11,12} The trend to use MIS as the first consideration has been progressively increased and becomes popular⁸; however, it is always stated in the dilemma between the saving life and loss of QoL, presenting a heavy burden to patients themselves, family, and society, and also forming a biggest challenge for both physicians and patients.¹¹ The recent publication in the current issue of the *Journal of the Chinese Medical Association* entitled “Robot-assisted versus open hepatectomy for liver tumors: Systematic review and meta-analysis” attempted to discuss the highly debated issue,¹³ since these cancer patients not only wish to be managed successfully (cure) for

saving life but also look eagerly forward to having enjoying the immediate and better QoL after cancer treatment.^{10,11}

The authors conducted a systematic review and meta-analysis, including eight studies and 1079 patients to compare the surgical outcomes between robotic hepatectomy (RH) and open hepatectomy (OH).¹³ The authors found that RH had shorter hospital stay (standard mean difference [SMD] -2.8 days, 95% confidence interval [CI], -4.2 to -1.4 days), fewer postoperative complication rate (odds ratio [OR], 0.67; 95% CI, 0.47-0.95), and lower recurrence rate (OR 0.42; 95% CI, 0.23-0.77) than OH did.¹³ Additionally, RH also provided a trend of decreased intraoperative blood loss (SMD -225 mL; 95% CI, -464 to 13 mL) than OH did.¹³ By contrast, RH had statistically significantly longer surgical time (SMD 71 minutes; 95% CI, 38-104 minutes) than OH did.¹³ In term of other parameters, such as resection-free margin (SMD -0.3 cm; 95% CI, -0.75 to -0.16), and the need of blood transfusion (OR, 1.01; 95% CI, 0.33-3.07) were similar between RH and OH groups.¹³ Based on the aforementioned findings, the authors concluded that RH is safe and feasible in the treatment of HCC.¹³ The current article is very interesting and worthy of further discussion.

It is well known that complete tumor resection (sometimes it can be reflective by wideness of resection-free margin) is the most critical and independent prognostic factor involving both progressive-free survival (PFS, reflective by recurrence rate) and overall survival (OS) in patients undergoing the surgical treatment for their malignant diseases,¹⁴ contributing to the critical and major concern about the choice of surgical methods as well as an identification of the risk factors associated with incomplete resection. In the current study,¹³ neither incomplete resection nor OS was investigated. However, the relationship between wideness of resection-free margin and recurrence rate seemed to be conflicted, since in theory, traditionally, many surgeons favor the “radicality” for complete resection of the malignant tumor as a standard surgical therapy.⁹ Additionally, incomplete resection and/or positive surgical margin (PSM) is always the key cause of the failure after treatment.^{6,8,11} In the current study,¹³ the difference of wideness of resection-free margin between RH and OH did not reach the statistical significance. The authors found the wideness of resection-free margin was less but recurrence rate was lower in the RH group than OH group.¹³ Additionally, recurrence of cancer is a reflective of therapeutic failure, which is often related to survival (mortality).¹⁴ This needs clarification.

First, it is interesting to know what is the minimal resection-free margin to be needed for hepatectomy. A recent study using indocyanine green (ICG) tumor imaging to help determine the

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safe surgical margin in MIS hepatectomy found the minimum width of fluorescence surrounding tumors in poor differentiated HCC was 0.24 ± 0.19 cm,¹⁵ suggesting that 0.45 cm of width of surrounding tissue to HCC may be a simple reference to guide the complete resection of HCC with minimalized risk of the presence of PSM, we supposed. Unfortunately, the authors failed to provide the data and also did not discuss this critical component.

As shown by authors, due to more powerful technology from the robotic machine to enhance better exposure of surgical field (high-definition three-dimensional image system with magnification) and improve the surgical “skills” (facilitation of more detailed positioning and instrument operation with resultant more accurate, flexible, and stable with less intraoperative damage to surrounding normal tissues to the HCC),¹³ more clear demonstration of tumor size, location and margin can be obtained, resulting in the less radicality of hepatectomy without compromising the therapeutic outcome. In fact, according to the results in the current systematic review and meta-analysis,¹³ we may highlight the value of using robot technology in patients with resectable HCC. One advantage as shown by authors,¹³ and the other advantage may be the function and/or organ-preservation after surgery,¹¹ since the less radicality of RH compared with OH was found.¹³ The risk of reduced liver functional reserve after resection of HCC was reported nearly half of patients (47.7%).⁵ A recent retrospective study in five high-volume centers in 2023 also supported the advantages of using RH in the management of HCC patients compared with OH, based on a significantly shorter hospital length of stay (median [IQR: interval of reference], 4 [3-6] days vs 10 [7-13] days), a lower number of admissions to the intensive care unit (7 [6.6%] vs 21 [19.8%]), and a lower incidence of posthepatectomy liver failure (8 [7.5%] vs 30 [28.3%]), with no cases of grade C failure, although a significantly longer operative time (median [IQR], 295 [190-370] minutes vs 200 [165-255] minutes, including docking) was found in the RH group compared to OH.¹⁶ Additionally, the survival rate was also better in the RH group, with the similar 90-day OS rate between the 2 groups (RH, 99.1% [95% CI, 93.5%-99.9%]; OH, 97.1% [95% CI, 91.3%-99.1%]), and a better trend of cumulative incidence of death related to tumor recurrence (RH, 8.8% [95% CI, 3.1%-18.3%]; OH, 10.2% [95% CI, 4.9%-17.7%]).¹⁶

Taken together, according to evidence revealed in the current systematic review and meta-analysis,¹³ we believed that robotic-assistance of hepatectomy may become more and more popular and/or acceptable in patients with resectable HCC. A large scale of prospective randomized trial may be needed to provide the definite conclusion of the safety and QoL of RH in the management of patients with resectable HCC.

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