Laparoscopic hepatectomy versus open hepatectomy for colorectal cancer liver metastases: comparative study with propensity score matching has recently been published by Untereiner et al. in "HepatoBiliary Surgery and Nutrition" (1). Here we reviewed the surgical impacts of a laparoscopic liver resection (LLR) compared to a conventional open liver resection (OLR) for colorectal liver metastases (CRLM) patients.

A liver resection is the gold standard treatment for CRLM and can provide excellent long-term survival (2-4). Nowadays, LLR has become a popular treatment for CRLM (5,6). Not only a focal minor hepatectomy but also a major hepatectomy, such as a hemihepatectomy, can be performed for CRLM patients according to the 2014 2nd world consensus meeting in Japan (7).

Numerous papers have demonstrated that LLR can provide better short-term outcomes, including reduced intraoperative bleeding, a lower morbidity rate, shorter hospital stay, and a lower overall cost compared to a conventional OLR (8-14). Nevertheless majority of these findings were based on investigations of retrospective case-matched studies or meta-analyses of non-randomized studies. In clinical CRLM patients, various selection biases can exist with regard to selecting LLR; therefore, the results are not conclusive.

Randomized control study (RCT) of LLR versus OLR for CRLM

Unfortunately, there have been no RCTs comparing the oncological values of LLR and OLR. A major problem to achieving an RCT is that patients may not be willing to be randomized into the OLR group. Additional reasons are some kind of learning curve, lack of standardized techniques, or high cost of LLR (15). In our knowledge, two RCTs comparing LLR and OLR are currently in progress—the OSLO CoMet study (http://clinicaltrials.gov/ct2/show/NCT01516710) and the ORANGE II PLUS trial (http://clinicaltrials.gov/ct2/show/record/NCT01441856) (7,16). The former is an RCT that compares LLR and OLR for CRLM; however, the final result is still unknown.

LLR versus OLR for CRLM using propensity score matching (PSM)

There are many background selection bias factors in an LLR cohort. A PSM analysis is a quite useful tool to compare different therapies with a reduced selection bias in retrospective studies (17,18). Lately, it has been reported that treatment effects were not statistically different between non-randomized studies using a well-designed PSM analysis and an RCT (19).

Cannon et al. (15) first reported a PSM study that...
compared the oncological effects of LLR and OLR for CRLM patients; however, they included a relatively small sample size of 35 LLR patients. To include enough CRLM patients, we conducted a multicenter study including specialized centers for both hepatobiliary and endoscopic surgery in Japan (20). After one to two PSM analyses, 171 LLR and 342 OLR were enrolled; this study includes the greatest number of patients reported thus far. Before and after our publication, several PSM studies were published regarding LLR and OLR for CRLM patients (Table 1) (1,15,20-24). After PSM matching, 18–171 LLR patients and 18–342 OLR patients were analyzed. In terms of perioperative parameters, the operation time for LLR was similar in five studies and longer in two compared with OLR; similarly, the blood loss amount or blood transfusion rate was less in six of seven studies. Morbidity was equal in four studies and less in three for LLR compared with OLR; mortality was comparable in all studies. The hospital stay was shorter in all studies except one. Recurrence-free or disease-free survival and overall survival were comparable in all studies.

In conclusion, LLR can provide excellent perioperative benefits without oncologic disadvantages for properly selected patients with CRLM. These PSM studies clearly demonstrated that LLR is certainly recommended as a standard practice for selected patients with CRLM.

### Acknowledgements

None.

### References


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### Table 1: Outcomes in CRLM patients undergoing LLR and OLR using PSM

<table>
<thead>
<tr>
<th>Ref</th>
<th>Pts' number LLR/OLR</th>
<th>Operation time</th>
<th>Blood loss</th>
<th>Morbidity</th>
<th>Mortality</th>
<th>Hospital stay</th>
<th>RFS/DFS</th>
<th>OS</th>
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<td>35/140</td>
<td>Equal</td>
<td>LLR less</td>
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<td>Equal</td>
<td>LLR less</td>
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<tr>
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</table>

*Note: Pts, patients; LLR, laparoscopic liver resection; OLR, open liver resection; RFS, recurrence-free survival; DFS, disease-free survival; OS, overall survival; NA, not available.

### Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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