Comparison of laparoscopic versus open liver resection for colorectal liver metastases using propensity score matching

Toru Beppu[1,2], Katsunori Imai[2], Yasuo Sakamoto[2], Yuji Miyamoto[2], Hideo Baba[2]

[1]Department of Surgery, Yamaga Municipal Medical Center, Kumamoto, Japan; [2]Department of Gastroenterological Surgery, Graduate School of Life Sciences, Kumamoto University, Kumamoto, Japan

Correspondence to: Toru Beppu, MD, PhD, FACS. Department of Surgery, Yamaga Municipal Medical Center, Kumamoto, 511 Yamaga, Kumamoto 861-0593, Japan. Email: tbeppu@kumamoto-u.ac.jp.

Comment on: Untereiner X, Cagniet A, Memeo R, *et al.* Laparoscopic hepatectomy versus open hepatectomy for colorectal cancer liver metastases: comparative study with propensity score matching. Hepatobiliary Surg Nutr 2016;5:290-9.

Received: 28 October 2016; Accepted: 14 November 2016; Published: 29 December 2016.

doi: 10.21037/ales.2016.11.25

View this article at: http://dx.doi.org/10.21037/ales.2016.11.25

"*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.

Comparative study of LLR versus OLR for CRLM

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

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

Ref	Pts' number LLR/OLR	Operation time	Blood loss	Morbidity	Mortality	Hospital stay	RFS/DFS	OS
(15)	35/140	Equal	LLR less	LLR less	Equal	LLR shorter	Equal	Equal
(20)	171/342	Equal	LLR less	Equal	Equal	LLR shorter	Equal	Equal
(21)	52/52	Equal	LLR less	Equal	Equal	LLR shorter	Equal	Equal
(22)	36/36	LLR longer	LLR less	Equal	Equal	LLR shorter	Equal	Equal
(23)	153/153	NA	LLR[#] less	LLR less	Equal	LLR shorter	Equal	Equal
(24)	133/133	LLR longer	LLR less	LLR less	Equal	LLR shorter	Equal	Equal
(1)	18/18	Equal	LLR less (P=0.07)	Equal	Equal	Equal	Equal	Equal

[#], blood transfusion rate. Ref, reference number; Pts, patients'; LLR, laparoscopic liver resection; OLR, open liver resection; RFS, recurrence-free survival; DFS, disease-free survival; OS, overall survival; NA, not available.

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.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Annals of Laparoscopic and Endoscopic Surgery*. The article did not undergo external peer review.

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/ales.2016.11.25). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. Untereiner X, Cagniet A, Memeo R, et al. Laparoscopic hepatectomy versus open hepatectomy for colorectal

cancer liver metastases: comparative study with propensity score matching. Hepatobiliary Surg Nutr 2016;5:290-9.
2. Fong Y, Fortner J, Sun RL, et al. Clinical score for predicting recurrence after hepatic resection for metastatic colorectal cancer: analysis of 1001 consecutive cases. Ann Surg 1999;230:309-18; discussion 318-21.
3. Cummings LC, Payes JD, Cooper GS. Survival after hepatic resection in metastatic colorectal cancer: a population-based study. Cancer 2007;109:718-26.
4. Beppu T, Sakamoto Y, Hasegawa K, et al. A nomogram predicting disease-free survival in patients with colorectal liver metastases treated with hepatic resection: multicenter data collection as a Project Study for Hepatic Surgery of the Japanese Society of Hepato-Biliary-Pancreatic Surgery. J Hepatobiliary Pancreat Sci 2012;19:72-84.
5. Buell JF, Cherqui D, Geller DA, et al. The international position on laparoscopic liver surgery: The Louisville Statement, 2008. Ann Surg 2009;250:825-30.
6. Nguyen KT, Gamblin TC, Geller DA. World review of laparoscopic liver resection-2,804 patients. Ann Surg 2009;250:831-41.
7. Wakabayashi G, Cherqui D, Geller DA, et al. Recommendations for laparoscopic liver resection: a report from the second international consensus conference held in Morioka. Ann Surg 2015;261:619-29.
8. Castaing D, Vibert E, Ricca L, et al. Oncologic results of laparoscopic versus open hepatectomy for colorectal liver metastases in two specialized centers. Ann Surg 2009;250:849-55.
9. Kazaryan AM, Marangos IP, Røsok BI, et al. Laparoscopic resection of colorectal liver metastases: surgical and long-term oncologic outcome. Ann Surg 2010;252:1005-12.
10. Vanounou T, Steel JL, Nguyen KT, et al. Comparing the clinical and economic impact of laparoscopic versus open liver resection. Ann Surg Oncol 2010;17:998-1009.
11. Rao A, Rao G, Ahmed I. Laparoscopic or open liver resection? Let systematic review decide it. Am J Surg 2012;204:222-31.
12. Nguyen KT, Laurent A, Dagher I, et al. Minimally invasive liver resection for metastatic colorectal cancer: a multi-institutional, international report of safety, feasibility, and early outcomes. Ann Surg 2009;250:842-8.
13. Schiffman SC, Kim KH, Tsung A, et al. Laparoscopic versus open liver resection for metastatic colorectal cancer: a metaanalysis of 610 patients. Surgery 2015;157:211-22.
14. Parks KR, Kuo YH, Davis JM, et al. Laparoscopic versus open liver resection: a meta-analysis of long-term outcome. HPB (Oxford) 2014;16:109-18.
15. Cannon RM, Scoggins CR, Callender GG, et al. Laparoscopic versus open resection of hepatic colorectal metastases. Surgery 2012;152:567-73; discussion 573-4.
16. Fretland ÅA, Kazaryan AM, Bjørnbeth BA, et al. Open versus laparoscopic liver resection for colorectal liver metastases (the Oslo-CoMet Study): study protocol for a randomized controlled trial. Trials 2015;16:73.
17. D'Agostino RB Jr. Propensity score methods for bias reduction in the comparison of a treatment to a non-randomized control group. Stat Med 1998;17:2265-81.
18. Austin PC. Statistical criteria for selecting the optimal number of untreated subjects matched to each treated subject when using many-to-one matching on the propensity score. Am J Epidemiol 2010;172:1092-7.
19. Lonjon G, Boutron I, Trinquart L, et al. Comparison of treatment effect estimates from prospective nonrandomized studies with propensity score analysis and randomized controlled trials of surgical procedures. Ann Surg 2014;259:18-25.
20. Beppu T, Wakabayashi G, Hasegawa K, et al. Long-term and perioperative outcomes of laparoscopic versus open liver resection for colorectal liver metastases with propensity score matching: a multi-institutional Japanese study. J Hepatobiliary Pancreat Sci 2015;22:711-20.
21. de'Angelis N, Eshkenazy R, Brunetti F, et al. Laparoscopic versus open resection for colorectal liver metastases: a single-center study with propensity score analysis. J Laparoendosc Adv Surg Tech A 2015;25:12-20.
22. Lin Q, Ye Q, Zhu D, et al. Comparison of minimally invasive and open colorectal resections for patients undergoing simultaneous R0 resection for liver metastases: a propensity score analysis. Int J Colorectal Dis 2015;30:385-95.
23. Allard MA, Cunha AS, Gayet B, et al. Early and Long-term Oncological Outcomes After Laparoscopic Resection for Colorectal Liver Metastases: A Propensity Score-based Analysis. Ann Surg 2015;262:794-802.
24. Cipriani F, Rawashdeh M, Stanton L, et al. Propensity score-based analysis of outcomes of laparoscopic versus open liver resection for colorectal metastases. Br J Surg 2016;103:1504-12.

doi: 10.21037/ales.2016.11.25
Cite this article as: Beppu T, Imai K, Sakamoto Y, Miyamoto Y, Baba H. Comparison of laparoscopic versus open liver resection for colorectal liver metastases using propensity score matching. Ann Laparosc Endosc Surg 2016;1:50.

