Editorial

Use of laparoscopic hepatectomy by recognizing disadvantages and difficulty level of operative procedure

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In a recent issue of *International Journal of Surgery*, Deng *et al.* published the results of laparoscopic hepatectomy (LH) compared with open hepatectomy (OH) for patients with hepatocellular carcinoma (1). The authors analyzed 157 patients undergoing LH and 157 patients undergoing OH using propensity score matching. The operation time was significantly shorter and the amount of estimated blood loss was significantly less in the LH group than in the OH group. The LH group was associated with a smaller rate of postoperative morbidity than the OH group. However, it should be noted that the type of resection was different between the groups. The proportions of right hepatectomy, extended left hepatectomy, and right anterior sectionectomy were higher in the OH group than in the LH group. In contrast, left lateral sectionectomy and left hepatectomy were more frequently performed in the LH group than in the OH group. This difference between the two groups may have influenced the surgical and postoperative outcomes. Long-term outcomes were assessed on the basis of long median follow-up period, demonstrating the comparative overall and disease-free survivals between the groups.

Adhering to the authors' findings, it is important to use the laparoscopic approach depending on the difficulty of the operative procedure and the technical expertise of surgeons/teams. We have recently reported a new classification of LH on the basis of the operation time, amount of blood loss, and conversion rate (2). This classification stratifies the difficulty of 11 different LH procedures into the following three grades: grade I (low level), grade II (intermediate level), and grade III (high level) (*Table 1*). The operation time, amount of blood loss, and conversion rate of grades I, II, and III in terms of median [range] were as follows: operation time, 135 [25–480] *vs.* 200 [40–420] *vs.* 250 [90–600] min, P<0.001; blood loss, 10 [0–1,000] *vs.* 100 [0–1,500] *vs.* 250 [0–4,500] mL, P<0.001; and conversion rate, 0.5% *vs.* 2.7% *vs.* 8.6%, P<0.001. In this three-level classification, grade I procedures should not be regarded as being "easy", but are less complicated than the other LHs because the surgical outcomes were found to be better than those observed in grade II and III procedures. Thus, grade I procedures can be suitable for liver surgeons at the beginning level of LH. This classification is expected to serve as a guide to determine whether the laparoscopic approach can be used depending on the surgeons' technical expertise. Although the classification was based on intraoperative outcomes, the results of the classification showed that morbidity rates were associated with a significant stepwise increase in grades from I to III: morbidity rate, 8.4% *vs.* 17.3% *vs.* 45.7%, P<0.001, and major complication rate (the Clavien-Dindo classification grade ≥III), 1.1% *vs.* 4.0% *vs.* 20.4%, P<0.001. The major complication and mortality rates were as low as 0% for grade I and II procedures, implying that grade I/II LHs are least likely to be associated with severe postoperative complications and are less complicated operations than grade III LHs. Grade III procedures should be performed

Table 1 New three level classification for laparoscopic liver resection

Grade	Three difficulty levels
Grade I	Low level
	❖ Wedge resection (AL segment[‡])
	❖ Wedge resection (PS segment[§])
	❖ Left lateral sectionectomy
Grade II	Intermediate level
	❖ Segmentectomy (AL segment[‡])
	❖ Left hepatectomy
Grade III	High level
	❖ Segmentectomy (PS segment[§])
	❖ Right hepatectomy
	❖ Extended right hepatectomy
	❖ Right posterior sectionectomy
	❖ Central hepatectomy
	❖ Extended left hepatectomy

Left hepatectomy (resection of segments 2, 3, and 41); right posterior sectionectomy (resection of segments 6 and 7); right hepatectomy (resection of segments 5, 6, 7, and 81); extended right hepatectomy (resection of segments 4, 5, 6, 7, and 81); central hepatectomy (resection of segments 5 and 8, or segments 4, 5, and 8); extended left hepatectomy (resection of segments 1, 2, 3, 4, 5, and 8). [‡], Couinaud's segments 2, 3, 4b, 5, and 6; [§], Couinaud's segments 1, 4a, 7, and 8. AL, anterolateral; PS, posterosuperior.

only by experts because of high major complication rates. This classification can be useful for indicating the appropriate LH depending on surgeons' expertise and ensuring the safety of patients undergoing LH.

The advantages of using the laparoscopic approach include a magnified view (3,4) and hemostatic effect caused by pneumoperitoneum (5). The authors showed that LH group was associated with lower amount of estimated blood loss than the OH group. Conversely, the disadvantages of LH are the lacks of a complete hepatic view and tactile feedback, which may mislead surgeons toward near misses or fatal intraoperative complications (6). The lack of a complete hepatic view may hinder surgeons from noticing bleeding that occurs outside the surgical field and identifying the right or left hepatic vessels. The lack of tactile feedback may hinder surgeons from identifying tumors and securing the surgical margin because surgeons generally use their hands and fingers to feel tumor elasticity and to hold the liver during OH. Such manual palpation and tactile feedback are helpful in identifying tumors that are not exposed on the liver surface and in tailoring the transection line. To compensate for these disadvantages, previous reports have demonstrated the usefulness of new intraoperative modalities, including contrast-enhanced ultrasonography (7), real-time tissue elastography (8,9), and fluorescence imaging (10-14). Contrast-enhanced ultrasonography and real-time tissue elastography enhances visualization of iso-echoic lesions in B-mode images (7,8). Fluorescence imaging using indocyanine green as a fluorophore has been employed in hepatobiliary surgeries (15-18). As intraoperative laparoscopic ultrasonography is inflexible compared with open devices, indocyanine green-fluorescence imaging is helpful in visualizing liver lesions as fluorescence on the liver surface (10,12). Fluorescence imaging also helps in visualizing the bifurcation of the bile ducts, differentiating the portal vein from the bile duct, and identifying the tiny bile duct during hepatic parenchymal transection (11).

Finally, the type of LH procedure to be used should not be decided merely on the basis of technical simplicity. LH has been increasingly used in clinical practice, and surgeons may select technically simpler left lateral sectionectomy instead of parenchyma-sparing liver resection including anatomic resection of segment II or segment III. In fact, the first and second International Consensus Conferences on Laparoscopic Liver Resection recommended that laparoscopic left lateral sectionectomy is associated with lower level of complexity and should be considered as a standard procedure (19,20). Similar to the results of authors' study, the survey results from the Consensus Conference showed that the rate of laparoscopic approach was higher for left lateral sectionectomy than for other liver resection procedures (21). Compared with left lateral sectionectomy, anatomic resection of segment II/III was reportedly associated with better postoperative liver volume recovery than was left lateral sectionectomy (22). The long-term outcomes after anatomic resection of segment II/III were comparable to those after left lateral sectionectomy. As such, the parenchyma-sparing strategy can be useful for resection of hepatocellular carcinoma located at left lateral section and can facilitate repeated liver resection (23).

In conclusion, we congratulate Deng *et al.* for comparing the outcomes of LH and OH using propensity score matching and showing better short-term outcomes and

comparable long-term outcomes in carefully selected patients. LH is increasingly used in clinical practice because of its advantages: magnified view and hemostatic effect caused by pneumoperitoneum (20). However, we must consider the disadvantages of LH, lack of a complete hepatic view and tactile feedback, and then use a laparoscopic approach considering the difficulty of the LH procedure and the surgeons' technical expertise. As the authors' mentioned in their study, the laparoscopic approach should be carefully selected to ensure the safety of patients undergoing LH.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

References

1. Deng ZC, Jiang WZ, Tang XD, et al. Laparoscopic hepatectomy versus open hepatectomy for hepatocellular carcinoma in 157 patients: A case controlled study with propensity score matching at two Chinese centres. Int J Surg 2018;56:203-7.
2. Kawaguchi Y, Fuks D, Kokudo N, et al. Difficulty of Laparoscopic Liver Resection: Proposal for a New Classification. Ann Surg 2018;267:13-17.
3. Hoznek A, Salomon L, Olsson LE, et al. Laparoscopic radical prostatectomy. The Creteil experience. Eur Urol 2001;40:38-45.
4. Asoglu O, Matlim T, Karanlik H, et al. Impact of laparoscopic surgery on bladder and sexual function after total mesorectal excision for rectal cancer. Surg Endosc 2009;23:296-303.
5. Eiriksson K, Fors D, Rubertsson S, et al. High intra-abdominal pressure during experimental laparoscopic liver resection reduces bleeding but increases the risk of gas embolism. Br J Surg 2011;98:845-52.
6. Kawaguchi Y, Velayutham V, Fuks D, et al. Operative techniques to avoid near misses during laparoscopic hepatectomy. Surgery 2017;161:341-6.
7. Kawaguchi Y, Tanaka N, Kokudo N. Surgical value of contrast-enhanced ultrasonography in laparoscopic hepatectomy using energy devices. J Hepatobiliary Pancreat Sci 2014;21:78-9.
8. Kawaguchi Y, Tanaka N, Nagai M, et al. Usefulness of Intraoperative Real-Time Tissue Elastography During Laparoscopic Hepatectomy. J Am Coll Surg 2015;221:e103-11.
9. Kobayashi Y, Omichi K, Kawaguchi Y, et al. Intraoperative real-time tissue elastography during laparoscopic hepatectomy. HPB (Oxford) 2018;20:93-9.
10. Kudo H, Ishizawa T, Tani K, et al. Visualization of subcapsular hepatic malignancy by indocyanine-green fluorescence imaging during laparoscopic hepatectomy. Surg Endosc 2014;28:2504-8.
11. Kawaguchi Y, Velayutham V, Fuks D, et al. Usefulness of Indocyanine Green-Fluorescence Imaging for Visualization of the Bile Duct During Laparoscopic Liver Resection. J Am Coll Surg 2015;221:e113-7.
12. Kawaguchi Y, Nagai M, Nomura Y, et al. Usefulness of indocyanine green-fluorescence imaging during laparoscopic hepatectomy to visualize subcapsular hard-to-identify hepatic malignancy. J Surg Oncol 2015;112:514-6.
13. Boogerd LS, Handgraaf HJ, Lam HD, et al. Laparoscopic detection and resection of occult liver tumors of multiple cancer types using real-time near-infrared fluorescence guidance. Surg Endosc 2017;31:952-61.
14. Aoki T, Murakami M, Koizumi T, et al. Determination of the surgical margin in laparoscopic liver resections using infrared indocyanine green fluorescence. Langenbecks Arch Surg 2018. [Epub ahead of print].
15. Kubota K, Kita J, Shimoda M, et al. Intraoperative assessment of reconstructed vessels in living-donor liver transplantation, using a novel fluorescence imaging technique. J Hepatobiliary Pancreat Surg 2006;13:100-4.
16. Mitsuhashi N, Kimura F, Shimizu H, et al. Usefulness of intraoperative fluorescence imaging to evaluate local anatomy in hepatobiliary surgery. J Hepatobiliary Pancreat Surg 2008;15:508-14.
17. Gotoh K, Yamada T, Ishikawa O, et al. A novel image-guided surgery of hepatocellular carcinoma by indocyanine green fluorescence imaging navigation. J Surg Oncol 2009;100:75-9.
18. Ishizawa T, Bandai Y, Ijichi M, et al. Fluorescent cholangiography illuminating the biliary tree during laparoscopic cholecystectomy. Br J Surg 2010;97:1369-77.
19. Buell JF, Cherqui D, Geller DA, et al. The International Position on Laparoscopic Liver Surgery. Ann Surg 2009;250:825-30.
20. 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.
21. Kawaguchi Y, Hasegawa K, Wakabayashi G, et al. Survey results on daily practice in open and laparoscopic liver resections from 27 centers participating in the second International Consensus Conference. J Hepatobiliary Pancreat Sci 2016;23:283-8.
22. Kobayashi K, Kawaguchi Y, Arita J, et al. Parenchyma-sparing liver resection for hepatocellular carcinoma in left lateral section is associated with better liver volume recovery. HPB (Oxford) 2018. [Epub ahead of print].
23. Mise Y, Hasegawa K, Shindoh J, et al. The Feasibility of Third or More Repeat Hepatectomy for Recurrent Hepatocellular Carcinoma. Ann Surg 2015;262:347-57.

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