



Indication of laparoscopic liver resection

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Laparoscopic liver resection (LLR) began with the initial publications in 1991 and 1992 (1). In terms of the style of procedures, LLR was first introduced to the partial resection of the anterolateral segments (easy access area under laparoscope; segments 2, 3, caudal part of 4, 5, 6). The reports of left lateral sectionectomy followed in 1996 (2). Thereafter, the procedures of LLR expanded to hemihepatectomy (3), and then medial, anterior and posterior sectionectomies (4,5). The laparoscopic approach to the liver is the approach in which laparoscope and forceps intrude into the subphrenic rib cage, where the liver is protected inside, directly from the caudal direction [“caudal approach” (5,6)]. After developing the devices and techniques for hemostasis, the inter-lobar or -segmental planes, which are all flat planes straightly aligned in the direction from the caudal edge to the cranial edge of liver, are suitable for handling in laparoscopic approach. Thereafter, LLR was expanded to segmentectomy and partial resection of posterosuperior segments (segments 7, 8, 1) (7-10), using intercostal ports, tracoscopic approach, position changes etc., and limited (for parenchymal sparing) and modified (combining limited and/or extended) anatomical resection (11-13), using simulation/navigation with precise imaging studies. This expansion of LLR procedures was based on technological and technical advances with conceptual changes.

The indication of LLR was also expanded. Indication to the diseases is expanded from benign diseases to malignant tumors, such as hepatocellular carcinoma (HCC) and liver metastases mainly from colorectal carcinoma, during the period. Two propensity score matching studies with large number of cases reported about LLR for HCC and

metastases, respectively, and both showed the short-term benefits without compromising long-term outcomes (14,15). However, the indication to biliary tract carcinomas, such as intrahepatic cholangiocarcinoma, hilar carcinoma and gallbladder carcinoma, are still controversial due to the needs for lymph-node dissection and vessel reconstruction after resection. Although there are increasing number of reports for those diseases (16) and they are thought to be feasible in experienced centers, they are recognized yet to be common procedures. Also, donor LLRs became feasible in centers with high-volume experiences for both LLR and living donor liver transplantation (17). However, it has also yet to be a common procedure, since donor safety is the most important issue to be secured and the handlings of bile duct, especially in right hepatectomy with anatomical complication, is concerned about (18). Tumor size could be also one of the limitations of LLR indication. Since there are the difficulties of handling large tumors without tumor-rupture and securing the adequate working space without abdominal wall incision in LLR, tumors over 5 cm in size were thought to be out of LLR indication in the early era. However, there are several recent reports about the feasibility and the efficacy of LLR for those tumors (19) with technical advances. Though LLR for the posterosuperior tumors is still demanding, the factor of tumor location has almost been overcome with technical advance and using additional techniques, such as intercostal ports (8), tracoscopic approach (20) and postural changes (9) in experienced centers.

Although this paper of describing “*Practical guidelines based on the second international laparoscopic liver consensus conference*” mentioned that “*LLR should be applied only when*

open hepatectomy is clearly indicated”, LLR may lead to the expansion of LR indication in the therapeutic strategy for HCC and CLD patients. Improved direct access to the liver protected inside the rib cage could be obtained under the laparoscopic specific view and approach [“caudal approach” (5,6)]. Liver is resected after opening up the cage with big subcostal incision and picking-up the liver with mobilization from the retroperitoneum in open procedure. These manipulations can damage the liver and the associated structures by compression and destruction, besides the damages from liver resection itself. The laparoscopic approach allows direct access to the surgical field in the rib cage by the intrusions of laparoscope and forceps without the damage on the associated structures, such as collateral vessels in patients with liver cirrhosis, and with less compression damage on the liver parenchyma. This leads to reduce postoperative ascites and liver failure in CLD patients after LLR (21). We evaluated the short-term results of liver surface small LLR for the severe CLD patients (22). It showed comparable perioperative results of the patients with severe CLD to those with mild-to-moderate CLD. These surgeries were performed with direct access to the surface tumors and minimum dissection of attachments and adhesions, even without inflow control, non-touching any associated structures around the tumors. This is an important difference from OLR and there is a possibility that the indication of LR to severe CLD patients can be expanded by laparoscopic approach. However, the median overall survival of the 12 patients with severe CLD who underwent LLR was 28.5 months. Among them, there are two patients who underwent LT after LLR and one of them survived more than 5 years after LLR (the other died of an accident not related to liver disease at 36 months after LLR). Although LLR could be a bridging therapy to LT for severe CLD patients with HCC, the impact of LLR on LR indication and the consequent survival benefit should be further evaluated and discussed. LLR is also speculated for less deterioration of liver function after LR by its smaller damage mentioned before. Furthermore, LLR facilitates better visibility and manipulation between adhesions under the condition of repeat LR (23). There are several studies comparing repeat procedures in LLR and OLR for HCC patients with CLD and they showed reduced blood loss, reduced transfusion rates, reduced postoperative complications, and a shorter hospital stay, in repeat LLR, regardless of the initial approach (24,25). It can be translated that LLR is advantageous not only in producing fewer adhesions but also in reducing the needs

for adhesiolysis in repeat LR. The laparoscopic view and manipulation [“caudal approach” (5,6)] allows for the better access in a small operative field between adhesions and the decreased need for adhesiolysis.

LLR may prolong the overall survival of the HCC and CLD patients as a powerful local therapy which can be applied repeatedly with minimal liver functional deterioration. The impact of laparoscopic approach on the expansion of LR indication and the consequent survival benefit should be further evaluated.

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References

1. Reich H, McGlynn F, DeCaprio J, et al. Laparoscopic excision of benign liver lesions. *Obstet Gynecol* 1991;78:956-8.
2. Kaneko H, Takagi S, Shiba T. Laparoscopic partial hepatectomy and left lateral segmentectomy: technique

- and results of a clinical series. *Surgery* 1996;120:468-75.
3. O'Rourke N, Fielding G. Laparoscopic right hepatectomy: surgical technique. *J Gastrointest Surg* 2004;8:213-6.
 4. Cho A, Yamamoto H, Kainuma O, et al. Safe and feasible extrahepatic Glissonian access in laparoscopic anatomical liver resection. *Surg Endosc* 2011;25:1333-6.
 5. Tomishige H, Morise Z, Kawabe N, et al. Caudal approach to pure laparoscopic posterior sectionectomy under the laparoscopy-specific view. *World J Gastrointest Surg* 2013;5:173-7.
 6. Soubrane O, Schwarz L, Cauchy F, et al. A conceptual technique for laparoscopic right hepatectomy based on facts and oncologic principles: the caudal approach. *Ann Surg* 2015;261:1226-31.
 7. Cho JY, Han HS, Yoon YS, et al. Feasibility of laparoscopic liver resection for tumors located in the posterosuperior segments of the liver, with a special reference to overcoming current limitations on tumor location. *Surgery* 2008;144:32-8.
 8. Ogiso S, Conrad C, Araki K, et al. Laparoscopic Transabdominal With Transdiaphragmatic Access Improves Resection of Difficult Posterosuperior Liver Lesions. *Ann Surg* 2015;262:358-65.
 9. Morise Z. Laparoscopic liver resection for posterosuperior tumors using caudal approach and postural changes: A new technical approach. *World J Gastroenterol* 2016;22:10267-74.
 10. Dulucq JL, Wintringer P, Stabilini C, et al. Isolated laparoscopic resection of the hepatic caudate lobe: surgical technique and a report of 2 cases. *Surg Laparosc Endosc Percutan Tech* 2006;16:32-5.
 11. Ho CM, Wakabayashi G, Nitta H, et al. Total laparoscopic limited anatomical resection for centrally located hepatocellular carcinoma in cirrhotic liver. *Surg Endosc* 2013;27:1820-5.
 12. Morise Z, Kawabe N, Tomishige H, et al. How Far Can We Go with Laparoscopic Liver Resection for Hepatocellular Carcinoma? Laparoscopic Sectionectomy of the Liver Combined with the Resection of the Major Hepatic Vein Main Trunk. *Biomed Res Int* 2015;2015:960752.
 13. Isetani M, Morise Z, Kawabe N, et al. A case of deeply located small hepatocellular carcinoma in cirrhotic liver treated with laparoscopic small anatomic liver resection. *Fujita Med J* 2015;1:15-9.
 14. Takahara T, Wakabayashi G, Beppu T, et al. Long-term and perioperative outcomes of laparoscopic versus open liver resection for hepatocellular carcinoma with propensity score matching: a multi-institutional Japanese study. *J Hepatobiliary Pancreat Sci* 2015;22:721-7.
 15. 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.
 16. Cho A, Yamamoto H, Kainuma O, et al. Laparoscopy in the management of hilar cholangiocarcinoma. *World J Gastroenterol* 2014;20:15153-7.
 17. Cherqui D, Soubrane O, Husson E, et al. Laparoscopic living donor hepatectomy for liver transplantation in children. *Lancet* 2002;359:392-6.
 18. Han HS, Cho JY, Kaneko H, et al. Expert Panel Statement on Laparoscopic Living Donor Hepatectomy. *Dig Surg* 2018;35:284-8.
 19. Kwon Y, Han HS, Yoon YS, et al. Are large hepatocellular carcinomas still a contraindication for laparoscopic liver resection? *J Laparoendosc Adv Surg Tech A* 2015;25:98-102.
 20. Murakami M, Aoki T, Kato T. Video-assisted thoracoscopic surgery: hepatectomy for liver neoplasm. *World J Surg* 2011;35:1050-4.
 21. Morise Z, Ciria R, Cherqui D, et al. Can we expand the indications for laparoscopic liver resection? A systematic review and meta-analysis of laparoscopic liver resection for patients with hepatocellular carcinoma and chronic liver disease. *J Hepatobiliary Pancreat Sci* 2015;22:342-52.
 22. Morise Z, Sugioka A, Kawabe N, et al. Pure laparoscopic hepatectomy for hepatocellular carcinoma patients with severe liver cirrhosis. *Asian J Endosc Surg* 2011;4:143-6.
 23. Morise Z. Status and perspective of laparoscopic repeat liver resection. *World J Hepatol* 2018;10:479-84.
 24. Kanazawa A, Tsukamoto T, Shimizu S, et al. Laparoscopic liver resection for treating recurrent hepatocellular carcinoma. *J Hepatobiliary Pancreat Sci* 2013;20:512-7.
 25. Belli G, Cioffi L, Fantini C, et al. Laparoscopic redo surgery for recurrent hepatocellular carcinoma in cirrhotic patients: feasibility, safety, and results. *Surg Endosc* 2009;23:1807-11.

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