



Liver hanging maneuver in laparoscopic right hepatectomy – still to be standardized

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We read with great interest the article by Kim describing pure laparoscopic right hepatectomy (LRH) using a modified liver hanging maneuver (LHM) and the technical evolution from caudal approach towards ventral approach (1). The authors described their technique in 2016 (2), and have used it for different types of laparoscopic liver resections (LLR) (3-5). The modified LHM described by Kim *et al.* (2) adds another solution to overcome the difficulties to perform a LRH. The different published options to perform LRH reflect the lack of standardization of the technique.

LRH is a highly developed surgical procedure. In the classification described in *Annals of Surgery* the past year, according to a score based on operative time, blood loss, and conversion rates, LRH was classified in the highest group of difficulty (6). In fact, following the 2nd Consensus Conference of Morioka, major LLR are classified as “Balliol IDEAL 2b”, and so they are still considered to be in the exploration phase and learning curve. Many hepatobiliary surgeons still hesitate to perform major LLR due to concerns on difficulty in bleeding control and liver mobilization (7). In the review on LLR published by Ciria *et al.* in 2016 (8), including more than 9,500 LLR, only 1,297 (14%), were LRH, reported mainly from centers in which surgeons have a high level of expertise in both liver surgery and in advanced laparoscopy.

Right hepatectomy is a paradigm of liver surgery. First described by Lortat-Jacob in 1952 (9), the technique has evolved during the last decades although it has not yet been standardized even in open approach. Conventional right

hepatectomy includes complete mobilization of the liver and extrahepatic control of the major vascular structures. Ozawa K described the anterior approach for major hepatectomies in 1990 (10), and the technique was popularized by Lai *et al.* (11). Several studies, including two prospective randomized trials and a recent meta-analysis (12), have confirmed the operative and oncological benefits of this approach. The main drawback of the technique is bleeding control at the deeper parenchymal plane. To overcome this problem, Belghiti *et al.* (13) described the classical LHM for right hepatectomy performed via the anterior approach. Feasibility and benefits of LHM have been shown and has led to a wide acceptance of the technique. In our group, we adopted the anterior approach with LHM in 2009 as our standard procedure for open right hepatectomies; we demonstrated its benefits in the scenario of colorectal liver metastases in a prospective study with a propensity-score matching (14). Thus, in open right hepatectomy right anterior approach with LHM has gained wide acceptance in many centers. However, the feasibility and benefits of LHM for laparoscopic resections has not been clearly established.

RLH is radically different from right open hepatectomy because the surgical views of the two approaches are completely distinct. First LRH cases were described in the early 2000' (15). Since then, more than 1,300 LRH have been performed in several centers. Most published studies are single-center, retrospective, case-control and/or propensity score analysis, generally concluding that LRH compared to open approach is feasible and safe when

performed in selected patients and in centers with extensive expertise in hepatic and laparoscopic surgery. Expansion of RLH is still limited, mainly due to: (I) technical difficulties; (II) lack of standardization of the technique and (III) doubts regarding its benefits compared to open hepatectomy.

Major LLR has become possible thanks to new developments in surgical skills and technology that allow to overcome the technical concerns particularly relevant in RLH, such as mobilization of the liver, bleeding control and disorientation. Improvements in technology (16), and further understanding on the special relevance of anesthetic and pneumoperitoneum management in laparoscopy are solving many of these concerns (16,17).

Another main concern is the lack of standardization of the LRH technique. Nowadays there are two main debates on RLH, the controversy between the caudal and ventral approach, and in direct relationship with this first debate, the role and technique of LHM. The caudal approach was described by the group from Tokyo (18) and afterwards conceptualized by Soubrane (19); the technique is based on the anterior approach, but renamed “the caudal approach” in the setting of laparoscopy because of the upward dissection and section of the liver parenchyma. Kim *et al.*, have proposed the evolution toward a ventral approach with the addition of a flexible scope. The authors first described their technique in 2016; in their opinion, the ventral approach using a flexible scope maintains good orientation and the surgical view is similar to the open approach. Kim *et al.* report their results between the caudal approach and ventral approach, comparing 10 to 6 cases. As explained by the authors, the study has two main drawbacks; it included a small number of cases, and it has a retrospective design. In our opinion, the study cannot conclude that there is any clinical advantage of the ventral approach compared to the caudal approach. We can agree with their opinion that the technique may be more familiar to surgeons used to open right hepatectomy and may shorten the learning curve. Another report (20) comparing the ventral to the caudal approach concluded the contrary, that is to say the possible superiority of the caudal approach, but with the same drawbacks as the study from Kim *et al.*

We want to comment on the debate on the usefulness of LHM. An excellent recent review on the LHM in LLR described the use of LHM only in 63 cases of RLH (21). Only two of the authors reported a true reproduction of the original LHM. The modified LHM described by Kim JH, is in fact a lateral approach which does not obtain any anatomical plane. As suggested by the authors of this review,

it is questionable whether this modification of the LHM preserves the advantages of the original open technique and whether it is really an adjuvant to the ventral approach. In fact, in the modified LHM proposed by Kim *et al.*, as well as that from Rotellar *et al.* (22), the procedure starts with liver mobilization. LHM is feasible laparoscopically, but its clinical usefulness has not been addressed. We cannot assume results obtained with LHM in open hepatectomy to be the same in RLH. When performing RLH with the caudal approach it is not deemed necessary the use of LHM, and when using the ventral approach, the LHM is only a transection guidance. The upward traction achieved with the LHM in open surgery is not possible with the laparoscopic approach, and so its role in bleeding control seems questionable.

Finally, benefits of RLH compared to open right hepatectomy have not been shown in any prospective randomized trial. The more recent study comparing both techniques, is based on a propensity score matching analysis, and showed shorter hospital stay and diminished postoperative pain (23). Similarly, there are no prospective randomized trials comparing the different described technical options for RLH (caudal versus ventral approach, with or without LHM). The choice of the technique usually relies on surgical skills, technological development and previous experience (24). Progress in medicine should be based on evidence-based studies. However, in surgery fewer than 5% of published data is based on randomized controlled trials (RCTs) (25). And specifically in the field of hepatobiliary pancreatic surgery, only a few of the RCT published are on operative methods (26). Therefore we cannot rely only in RCT to progress. In fact, most of the current completely established surgical procedures, such as laparoscopic cholecystectomy, were never evaluated in a RCT.

In summary, in the current era of revolution of laparoscopic hepatic surgery, published studies on surgical issues describe practical solutions to be added to the development of the technique. Many of them report personal experiences, and reflect personal surgical skills, rather than facts. Monitoring of the results and development of recommendations are needed. It would be advisable to keep on with the standardization of the technique, to expand safely the indication of RLH.

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References

- Kim JH. Pure laparoscopic right hepatectomy using modified liver hanging maneuver: Technical evolution from caudal approach toward ventral approach. *J Gastrointest Surg* 2018;22:1343-9.
- Kim JH. Laparoscopy-specific ventral approach in laparoscopic hemihepatectomy. *J Surg Oncol* 2017;116:159-63.
- Kim JH, Ryu DH, Jang LC, et al. Lateral approach liver hanging maneuver in laparoscopic anatomical liver resections. *Surg Endosc* 2016;30:3611-7.
- Kim JH, Choi JW. A Modified Liver Hanging Maneuver in Pure Laparoscopic Left Hemihepatectomy with Preservation of the Middle Hepatic Vein: Video and Technique. *J Gastrointest Surg* 2017;21:1181-5.
- Kim JH. A modified liver hanging maneuver in pure laparoscopic extended left hepatectomy (with video). *J Surg Oncol* 2018;118:675-9.
- Kawaguchi Y, Fuks D, Kiokudo N, et al. Difficulty of laparoscopic liver resection: proposal for a new classification. *Ann Surg* 2018;267:13-7.
- 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;261:619-629.
- Ciria R, Cherqui D, Geller DA, et al. Comparative Short-term Benefits of Laparoscopic Liver Resection: 9000 Cases and Climbing. *Ann Surg* 2016;263:761-77.
- Lortat-Jacob JL, Robert HG. Well defined technic for right hepatectomy. *Presse Médicale* 1952;60:549-51.
- Ozawa K. Hepatic function and liver resection. *J Gastroenterol Hepatol* 1990;5:296-309.
- Lai EC, Fan ST, Lo CM, et al. Anterior approach for difficult major right hepatectomy. *World J Surg* 1996;20:314-7.
- Li L, Wang HQ, Wang Q, et al. Anterior vs conventional approach hepatectomy for large liver cancer: a meta-analysis. *World J Gastroenterol* 2014;20:17235-43.
- Belghiti J, Guevara OA, Noun R, et al. Liver hanging maneuver: a safe approach to right hepatectomy without liver mobilization. *J Am Coll Surg* 2001;193:109-11.
- Llado L, Muñoz A, Ramos E, et al. The anterior hanging-approach improves postoperative course after right hepatectomy in patients with colorectal liver metastases. Results of a prospective study with propensity-score matching comparison. *Eur J Surg Oncol* 2016;42:176-83.
- O'Rourke N, Fielding G. Laparoscopic right hepatectomy: surgical technique. *J Gastrointest Surg* 2004;8:213-6.
- Kawai T, Goumard C, Jeune F, et al. 3d vision and maintenance of stable pneumoperitoneum: a new step in the development of laparoscopic right hepatectomy. *Surgical Endoscopy* 2018;32:3706-12.
- Kobayashi S, Honda G, Kurata M, et al. An experimental study on the relationship among airway pressure, pneumoperitoneum pressure, and central venous pressure in pure laparoscopic hepatectomy. *Ann Surg* 2016;263:1159-63.
- Maeda K, Honda G, Kurata M, et al. Pure laparoscopic right hemihepatectomy using the caudodorsal approach (with videos). *J Hepatobiliary Pancreat Sci* 2018;25:335-41.
- Soubrane O, Schwarz L, Cauchy F, et al. A conceptual technique for laparoscopic right hepatectomy based on facts and oncological principles. The caudal approach. *Ann Surg* 2015;261:1226-31.
- Cai L, Wei F, Yu Y, et al. Laparoscopic right hepatectomy by the caudal approach versus conventional approach: a comparative study. *J Laparoendosc Adv Surg Tech A* 2016;26:540-7.

21. Rhaiem R, Piardi T, Kellil T, et al. The liver hanging maneuver in laparoscopic liver resection: a systematic review. *Surg Today* 2018;48:18-24.
22. Rotellar F, Pardo F, Martí-Cruchaga P, et al. Liver mobilization and liver hanging for totally laparoscopic right hepatectomy: an easy way to do it. *Langenbecks Arch Surg* 2017;402:181-5.
23. Tozzi F, Berardi G, Vierstraete M, et al. Laparoscopic versus open approach for formal right and left hepatectomy: a propensity score matching analysis. *World J Surg* 2018;42:2627-34.
24. Choi SH, Choi GH, Han DH, et al. Laparoscopic Right Hepatectomy: Toward Protocolization and Simplification. *Ann Surg Oncol* 2017;24:554-5.
25. Ubbink DT, Legemate DA. Evidence-based surgery. *Br J Surg* 2004;91:1091-2.
26. Kaido T. Randomized controlled trials on hepatobiliary-pancreatic surgery. *J Hepatobiliary Pancreat Surg* 2004;11:381-9.

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