Is robot necessary for left lateral sectionectomy?

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Rapid growth has been seen in the development of laparoscopic liver resection (LLR) since the first laparoscopic wedge liver resection done by Reich *et al.* in 1991 (1). The first anatomical laparoscopic left lateral sectionectomy (L-LLS) was performed by Azagra *et al.* 5 years later (2). L-LLS represented one of the commonest types of LLR done around the world. Actually, it was one of the most indicated type of LLR as recommended by the first consensus statement for LLR published in Louisville in 2008 (3). In the Second International Consensus Conference on Laparoscopic Liver Resections held in Morioka in 2014, L-LLS was recommended as a standard procedure in LLR (4).

Robotic liver resection has emerged as the latest development in minimally invasive approach in liver surgery. Robot provides a steady working platform, high resolution three-dimensional image with instruments of 7 degrees of freedom, all these can theoretically overcome some of the limitations of conventional laparoscopic surgery. Whether there is added benefit of robotic left lateral sectionectomy (R-LLS) over L-LLS remains to be answered. Several studies including one from my center have retrospectively compared R-LLS and L-LLS (5-8). The results showed that either the two approaches were comparable in operative outcome or R-LLS was slightly inferior due to longer operative time, more minor complications, longer hospital stay and increased cost. In essence, there is no evidence that use of robot offers additional benefit to L-LLS.

In the paper "*Robotic versus laparoscopic liver resection in complex cases of left lateral sectionectomy*", Hu *et al.* tried to evaluate the value of robot in a subset of complex cases requiring LLS (9). The defined criteria they used for complex case were: (I) tumor size >10 cm; (II) proximity of tumor to major vessels; (III) obesity with BMI >30; (IV) combined lymphadenectomy or choledochoscopy and (V) huge left lateral section embedded in splenic fossa. Any patient met any one of the above criteria was classified as complex case. The authors found that in these complex cases, R-LLS (n=21) outperformed L-LLS (n=12) by reducing blood loss (131.9±221.9 *vs.* 320.8±293.5 mL, P=0.03) while other surgical outcomes were similar. Thus, they concluded that R-LLS was a better choice for complex cases of LLS despite higher overall medical costs.

The main drawback of this study is that the authors did not state the distribution of patients in the complex group according to the said criteria. It may turn out that the complex group might just be dominated by one or two particular criteria only. Besides, criteria No. 2 and No. 5 are quite subjective and not easy to define. This may underscore the usefulness of the criteria. Some suggestions are for criteria No. 2, to define tumor within 1 cm of left portal vein or hepatic vein or inferior vena cava, and for criteria No. 5, to define the left lateral section extend to left mid-axillary line. For criteria No. 4, the operation is more than an LLS and is questionable to be grouped under LLS alone. Even for criteria No. 1, it appears that site of tumor (criteria No. 2) is even more crucial than the exact size of tumor e.g., a very large pedunculated tumor arise from peripheral part of segment 2/3 is more easy to handle than a smaller tumor close to left portal vein. Finally, the total number of patients in the complex group is small, difference in outcome may not be shown up due to too small a sample size.

Actually, a difficulty scoring system for LLR has been proposed previously (10). It included parameters like tumor location, extent of liver resection, tumor size, proximity to major vessel and liver function. Another recently proposed scoring system consisted of extent of liver resection, location of tumor, BMI and platelet count (11). Such scoring systems cannot be directly applied in LLS as the extent of liver resection and location of tumor has been defined. However, in Hu *et al.* study, it is interested to note that they omit the liver function or platelet count factor which is an indicator of underlying liver cirrhosis.

Nevertheless, this paper conveys an important message. Tough L-LLS remains the gold standard for patients requiring lateral sectionectomy, from time to time cases may be encountered which recreate a great hurdle to conventional laparoscopic approach whereas robot can confer real advantage. This is especially true for disease entity like hepatolithiasis. Kim *et al.* found that though the operative time was longer for R-LLS compared with L-LLS in general, it became comparable when they analysed patients with intrahepatic stones only and they recommended R-LLS for this condition (7). As addressed by the authors, laparoscopic approach was difficult due to perihepatic adhesion, anatomic distortion and fibrotic liver parenchyma in patients with hepatolithiasis. This is in consistence with the experience from our center. We compared 10 R-LLS with 27 open LLS, the robotic group had no conversion, reduced blood loss and shorter hospital stay as compared with the open counterpart (12). More importantly there was no complication in the R-LLS group while it was 33.3% in the open group, though it did not reach statistical significance (P=0.079). Whether L-LLS could have achieved same benefit was unknown as we have limited experience on L-LLS for hepatolithiasis. Experienced center has reported a shorter operating time, less blood loss and shorter hospital stay by a randomized trial comparing L-LLS with open LLS for hepatolithiasis (13). However, 2 out of 49 L-LLS patients (4.1%) needed conversion due to abdominal adhesion. It appears that use of robot may further facilitate the minimally invasive approach in hepatolithiasis.

In summary, in the era of robotic surgery, laparoscopic approach remains the golden standard for patients requiring LLS. Robot can have a role in selected cases of LLS but its indications and efficacy still need further evaluation with larger scale clinical trials.

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