



Laparoscopic liver resection in cirrhosis: the challenge of the posterosuperior segments

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Hepatobiliary surgery is among the last frontiers in terms of the advancement and wide acceptance of minimally invasive approaches; particularly with liver resections (1). Given the difficulty of these operations when performed via laparotomy in regard to exposure, hemostasis and adequate oncologic resection; it is understandable why laparoscopic liver resection (LLR) was initially viewed with a healthy dose of skepticism. However, since LLR began in the 1990s, review of the data has continued to show there is at least a non-inferiority of LLR to open resection in terms of blood loss, hospital stay, post-op complications, and oncologic outcome (2). LLR in cirrhotics presents a unique challenge because of the physiology of portal hypertension, the difficulty of dividing the fibrotic parenchyma, and the narrow margin for error in patients with limited hepatic reserve. However, a small number of authors have demonstrated that, with adjustments in technique (3), LLR can be performed in cirrhotic patients with appropriate safety and outcomes that match or exceed open resection (4). Haber *et al.* in their *Surgical Oncology* article entitled “Laparoscopic liver surgery in cirrhosis – addressing lesions in posterosuperior segments” attempts to ‘up the ante’ on these previous studies and asks if LLR can be safely performed in cirrhotic patients with lesions on the posterosuperior segments (5); generally thought to be the most technically challenging location.

Haber *et al.* performed a retrospective review of all patients that underwent LLR with at least one lesion in the posterosuperior liver segments (IVa, VII or VIII) over a period of six years. In a total of 158 patients, 43 patients (26.7%) had underlying cirrhosis, while 115 patients

(73.3%) did not. Their primary outcomes were length of intensive care unit (ICU) stay, length of hospital stay and R1 resection status; secondary outcomes were mortality and morbidity as defined by Clivien-Dando classification score of ≥ 3 . To their great credit they found no significant difference in any of their primary or secondary outcomes; showing both groups had favorable outcomes with adequate resection and low post-operative morbidity. One interesting discovery that the authors made was that there was no correlation between pre-operative MELD score and post-operative complications; even in patients with a score >10 . Because the non-cirrhotic group underwent significantly more ‘major resections’ (defined as greater than 3 segments) than the cirrhotic group, they then narrowed their focus to patients in both groups that only underwent segmentectomy or Subsegmentectomy. This narrowed their analysis to 30 patients in the cirrhosis group and 42 in the non-cirrhotic group. In this smaller analysis, they again found no difference in major complications, ICU stay, and total hospital stay.

This study is a valuable contribution given the relative paucity of literature looking at outcomes associated with LLR in cirrhosis and their technical question is an important one. Their volume of resections is impressive and their outcomes admirable. But their analysis, perhaps, doesn’t achieve all they intended. In order to maximize the size of their total cohort, they included patients that underwent standard right or left hemihepatectomy for posterosuperior lesions. Clearly, however, this muddies the technical question. If one removes the patients who underwent a major hepatectomy (right, left, extended), this

removes nearly 45% of their cohort (70 patients). Though left a smaller “n”, analysis of the remaining patients more narrowly reflects outcomes based on the technical difficulty of removing posterosuperior segment lesions, which is the stated aim of this paper. So, we can conclude that they safely performed laparoscopic posterosuperior resections in 30 cirrhotics...but how?

This is an exceptionally high-volume liver center: 383 liver resections performed, 94 (24.5%) were performed laparoscopically. But that means that 75% of their cases are performed open (certainly a reasonable split LLR vs. open). How many of those were posterosuperior tumors? By what criteria do they select patients for the laparoscopic vs. open approach? Do they avoid livers that are “too cirrhotic”? “Too close” to the hepatic veins? “Too big”? Of these cirrhotic patients with posterosuperior lesions that underwent open surgery what were their outcomes compared to those who underwent LLR? We have the numerator without a denominator, so we learn little about selection, which is a huge part of achieving good outcomes.

And once deemed appropriate based on preoperative imaging and laboratory studies, what of technique? In the article the author’s state “*different surgical techniques were applied.*” Surgeons used anywhere from 3–8 trocars, some used hand ports, there was intermittent drain usage and there were at least 4 different techniques for dividing the liver. There was a very brief discussion of trocar placement, a mention of intermittent inflow control and the importance of “exposure being pivotal in success.” They don’t offer commentary on which tools worked best on fibrotic parenchyma or critical missteps in trocar placement that could make exposure too difficult nor a guide to duration of inflow clamping (which still makes many surgeons uncomfortable in the setting of cirrhosis). The greatest concerns surgeons have while operating on cirrhotic patients are the intra-operative misadventures; this team of remarkably successful laparoscopic liver surgeons could provide much needed tips and tricks. Even with wide variation in technique, there were likely some overarching principles that could have been shared.

Haber *et al.* are to be congratulated. They have demonstrated that, in their hands, LLR is safe in cirrhotic patients with posterosuperior lesions. Hopefully their next manuscript will share the secrets to their success.

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