



# Role of laparoscopic liver resection in the elderly: promising results but more high-level evidence needed

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We thank Dr Nitta for his interest in our recent article ‘Perioperative outcomes of laparoscopic minor hepatectomy for hepatocellular carcinoma in the elderly’ and his insightful comments (1).

In our propensity matched comparison between laparoscopic minor hepatectomy (LMH) *vs.* open minor hepatectomy (OMH) in elderly patients, we had mixed results whereby the laparoscopic approach resulted in a significantly reduced frequency of pulmonary complications and shorter length of stay at the expense of an increased blood loss and longer operation time (2). Our finding of higher estimated blood loss (EBL) is contrary to other studies (3-5) and warrants further investigation. We fully concur with Dr Nitta that age in itself is not associated with a prolonged operative time or increased blood loss in laparoscopic hepatectomies (LH). In our study, when we compared our cohorts of young and elderly ( $\geq 70$  years old) patients who underwent LMH, patients in our elderly group were found to have significantly more chronic diseases such as cardiac disease, diabetes, hypertension, hyperlipidemia as well as an increased incidence of having  $>1$  co-morbidity and higher American Society of Anaesthesiologist (ASA) score. The presence of these co-morbidities made it difficult for our anaesthesia colleagues to maintain low central venous pressures intra-operatively and this was largely responsible for the increased amount of blood lost via venous bleeding. Hypertension and hyperlipidemia are part of the spectrum of metabolic syndrome, which is frequently associated with fatty liver disease. Several

studies have shown that patients with metabolic syndrome undergoing liver resection often have increased blood transfusion requirements (6,7). Kawaguchi *et al.* performed a review of 438 patients who underwent LH and found that hypertension [odds ratio (OR) 2.82, 95% CI: 1.27–5.78,  $P=0.006$ ] was an independent predictor of high EBL in LLR (8).

In addition, up to 40% of our patients in the elderly group had tumours located in difficult postero-superior segments, 37.5 % had liver cirrhosis and 12.5% underwent laparoscopic repeat liver resection for recurrent HCC (2). These factors likely increased the complexity of the surgeries and may have contributed to the longer surgical time. Persistent oozing of blood from the cut surfaces during a prolonged parenchymal transection period, together with difficult CVP control, especially in the setting of liver cirrhosis, may have resulted in the increased EBL. This is concordant with the findings from several studies. In Kawaguchi’s study, resection of posterior-superior (PS) segments (OR 3.73, 95% CI: 1.33–12.17,  $P=0.012$ ) was an independent predictor of higher EBL (8). Xiang *et al.* reported that performing LH for tumours in the PS segments was associated with prolonged operative times, higher blood loss and blood transfusion rates, more frequent usage of and longer duration of Pringle maneuver as well as a higher conversion rate (9). Chen *et al.* described their LLR experience with 436 patients and found that there was a higher median blood loss, higher transfusion rate, longer median operative time as well as higher conversion rates

and higher complication rates for tumours in difficult PS segments which required a resection of  $>2$  segments (10). Of note, more than half our elderly patients had resection of  $\geq 2$  segments. The PS location of the tumour renders proper exposure and visualization difficult, and full mobilization is required to allow control of the right hepatic vein as well as short hepatic veins, which can be tedious and time-consuming (9). Transection planes may be multiplanar, curved or angled if the lesions are deep-seated (11). Laparoscopic hemostasis is also more difficult as it is not possible to manually compress the whole liver or lift it to reduce venous pressure (8).

Additionally, the elderly patients in our study were also more likely to have larger tumors compared to younger patients, which necessitated resection of a larger amount of parenchyma. All these factors together, may have likely contributed to the inferior peri-operative outcomes for LH in the elderly group in our study.

Finally, we agree with the authors that further studies ideally in the form of an RCT are needed to determine the outcome of LLR in this subgroup of elderly patients, particularly for those who require more challenging resections.

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