Editorial

Liver resection in the setting of obesity

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An estimated 2.5 billion adults are classified as overweight or obese globally, a figure that has risen rapidly over the last number of decades (1). Deaths and disability related to high body mass index (BMI) have increased more than 2.5-fold since 1990, with the sharpest rise seen in low- and middle-income countries (2). A proportion of 3.6% of all new cancer cases, and 4.6% of all cancer deaths are attributable to high BMI globally (3). As a result of the obesity epidemic, and of the resultant metabolic syndrome, the prevalence of non-alcoholic fatty liver disease (NAFLD) is now 30% worldwide, with Latin America and Middle East-North Africa experiencing the highest rates (4). Obesity is a significant risk factor not only in the development of primary malignancy of the liver, chiefly hepatocellular carcinoma (HCC), but also for colorectal cancer and colorectal liver metastases (CRLM) (5,6).

The liver surgeon can, therefore, expect to encounter increasing numbers of obese patients requiring hepatectomy going forward. Obesity itself can present challenges to the surgeon, not least by limiting exposure and increasing the technical difficulty of a procedure, but also by complicating access techniques to the abdominal cavity for minimally invasive surgery (MIS). Of particular concern to the surgeon is that parenchymal dissection in the presence of NAFLD can prove problematic, with higher rates of intra-operative blood loss than for those without NAFLD (7). Excess blood loss, and sarcopaenic obesity, have been shown to be risk factors for post operative bile leakage, likely reflecting poorer quality parenchyma and increasing technical difficulty of resection (8). The effect of obesity on liver quality can be compounded by the presence of chemotherapy-associated steatohepatitis (CASH) for patients with CRLM, with irinotecan in particular associated with increased steatohepatitis, with negative impacts on patient outcomes and mortality risk (9).

Some authors have found higher rates of post-hepatectomy liver failure (PHLF) following liver resection in obese patients or those with NAFLD, but this has not been shown by Kampf *et al.* in their paper in this journal (10). They retrospectively evaluated 888 patients undergoing elective liver resection for all causes in their centre and examined the impact of increased BMI (both overweight and obese) primarily on the incidence of PHLF, but also on overall morbidity, mortality, and the incidence of non-alcoholic steatohepatitis (NASH). Unsurprisingly, obesity was associated with significantly higher rates of NASH (41.3%) than seen in overweight (23.3%) or normal weight (16.1%) patients (P<0.001). Interestingly, neither obesity nor NASH was found to be a risk factor for PHLF or perioperative morbidity or mortality in the overall cohort, but NAFLD activity score was a predictor of PHLF in patients undergoing resection for cholangiocarcinoma. The only independent risk factor for PHLF in their study was major liver resection (resection of >3 segments)

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[odds ratio (OR) 2.8, 95% confidence interval (CI): 1.87–4.27; P<0.001]. The authors rightly conclude that hepatectomy is safe for patients with obesity, a finding that has been replicated elsewhere (6).

The surgeon can help mitigate the risks of hepatectomy for patients by adopting an MIS approach where feasible, which offers the potential to significantly reduce intraoperative blood loss, peri-operative morbidity, and in-hospital length of stay (LOS) for obese and non-obese patients alike (11). An open question is whether strategies to reduce obesity and/or NAFLD pre-operatively might benefit patients undergoing hepatectomy. Certainly, a low-calorie diet used pre-operatively in the setting of bariatric surgery can reduce liver volume and steatosis, but evidence in hepatectomy is more limited. A randomized controlled trial (RCT) by Barth *et al.* that randomised 63 patients with BMI ≥25 kg/m^2 who were due to undergo hepatectomy to either usual care or a highly restricted diet for 1 week prior to surgery showed significantly reduced blood loss and subjectively easier liver manipulation by the surgeon in the intervention group, without any difference in peri-operative morbidity, mortality, or LOS (12). Twenty-eight of 30 patients (94%) randomised to the highly restricted diet adhered to it for the length of the intervention. These results are of potentially significant impact, and further multicentre studies are ongoing to assess the role for diet therapy in pre-operatively optimising patients with hepatic steatosis (13). Bariatric surgery has been shown to improve steatosis in 92% of patients, and resolve NASH entirely in 70% of patients postoperatively (14). What is not currently known is how pre-hepatectomy bariatric surgery, or indeed, bridging strategies such as intragastric balloon placement, may allow for hepatectomy in those with severe obesity, and the potential impact on peri-operative outcomes (15).

In conclusion, as Kampf *et al.* have shown in their paper, hepatectomy in the setting of obesity is already a common problem faced by liver surgeons. The increasing incidence of obesity, obesity-associated malignancy and NASH means that liver resections for patients with obesity will become a more frequent occurrence. The challenge going forward for the surgical community is how to optimise patient outcomes, utilising advances in surgical technology such as MIS and also nascent prehabilitation strategies.

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