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Prior Bariatric Surgery in Liver Transplant Candidates: Unforeseen Consequences?

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In the United States, bariatric surgeries for obesity-related complications increased from 158,000 in 2011 to 228,000 in 2017.⁽¹⁾ As obesity rates continue to rise, this trend can be expected to continue because bariatric surgery is the only therapeutic intervention shown to yield durable weight loss, remission of obesity-related comorbidities, and improved all-cause mortality.⁽²⁾ Importantly, for those with nonalcoholic fatty liver disease (NAFLD) as a component of obesity-related complications, bariatric surgery results in histologic improvement and reduced likelihood of NAFLD progression.⁽³⁾ Despite these recognized benefits, the positive and negative consequences of prior bariatric surgery on wait-list and post-liver transplantation (LT) outcomes is understudied.

In this issue of *Liver Transplantation*, Idriss et al.⁽⁴⁾ report on 78 adults (83% female) who underwent evaluation for LT at a median of 7 years after their bariatric surgery (63% with Roux-en-Y gastric bypass [RYGB]). When compared with controls without a history of bariatric surgery (matched on age, Model for End-Stage Liver Disease score, and etiology of liver disease), LT candidates with a history of bariatric surgery were more likely to be listed for LT, suggesting a benefit of prior bariatric surgery in making patients eligible for transplant. This is of particular relevance because some US LT centers have implemented body mass index cutoffs for LT listing because of concerns about an increased risk of post-LT morbidity in patients with severe obesity.⁽⁵⁾ Sleeve gastrectomy (SG) prior to or at the time of LT has been reported to be safe and to reduce weight and/or metabolic complications before and after LT, though published experience is modest and patients are carefully selected.⁽⁶⁾ In contrast to this positive experience, Idriss et al.⁽⁴⁾ found a higher rate of delisting or death on the waiting list in patients with versus without bariatric surgery. This finding is striking and concerning, although a single-center study of modest sample size might be subject to bias and unmeasured confounding. Idriss et al.⁽⁴⁾ have identified a potentially vulnerable population in need of specialized management while on the waiting list.

Although all bariatric procedures lead to alterations in the anatomy and physiology of the gastrointestinal tract, longterm risks of malnutrition may differ between procedure types.⁽⁷⁾

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The 2 most common bariatric procedures performed in the United States are SG, a restrictive procedure limiting gastric volume, and RYGB, a procedure that combines restrictive and malabsorptive components.⁽¹⁾ Although SG accounted for approximately 60% of bariatric procedures in 2017, RYGB has historically accounted for a larger proportion of bariatric procedures,⁽¹⁾ which is relevant because these patients may come to future LT either as a consequence of NAFLD or other causes. Although there is no consensus on the bariatric modality that is best suited for patients with liver disease, the Idriss et al.⁽⁴⁾ study suggests that procedures with malabsorptive components (such as RYGB) may be particularly risky for patients who develop complications of cirrhosis.

In the general population, bariatric surgery increases susceptibility to the development of deficiencies of micronutrients (fat- and water-soluble vitamins as well as trace minerals) and macronutrients (ie, protein-calorie malnutrition).⁽⁷⁾ For example, up to 45% of patients experience iron deficiency, and 100% develop vitamin D deficiency if not maintained on appropriate supplementation after bariatric surgery.⁽⁷⁾ Nutrient deficiencies take on even more consequence in advanced liver disease because the majority of LT wait-list candidates already suffer from malnutrition, attributable to a variety of factors including reduced appetite and early satiety (exacerbated in the setting of ascites) combined with alterations in protein metabolism.⁽⁸⁾ Furthermore, malnutrition is a risk factor for sarcopenia, a syndrome characterized by degenerative loss of skeletal muscle mass and strength that is observed in up to 40% of LT candidates.⁽⁸⁾ Importantly, sarcopenia may be underrecognized in obese patients, where excess adiposity may mask the underlying loss of muscle mass.⁽⁹⁾ LT candidates with sarcopenia have poor physiologic reserve,⁽⁸⁾ and the Idriss et al.⁽⁴⁾ study found that patients with prior bariatric surgery who were delisted or died on the waiting list were more likely to have sarcopenia. One might hypothesize that patients with decompensated cirrhosis and prior bariatric surgery may be at greater risk of decline in physiologic reserve than those without bariatric surgery. Further studies are needed to evaluate the trajectory of weight and muscle loss in patients with bariatric surgery who develop decompensated cirrhosis with the hope that this will enhance nutritional and exercise interventions to prevent physiologic decline.⁽¹⁰⁾

The type of bariatric surgery used in patients with cirrhosis or at high risk for cirrhosis warrants careful consideration. SG appears to offer several benefits over RYGB. In addition to the potentially lower risk of malnutrition, SG also allows endoscopic accessibility of the entire gastrointestinal tract for management of varices and biliary complications. Additionally, and for those who undergo LT, SG may be associated with less risk of malabsorption of immunosuppressive medications and intolerance of oral intake after LT.⁽⁶⁾ Among the few transplant centers reporting the use of bariatric surgery before LT and simultaneously with LT, SG and not RYGB has been used.⁽⁶⁾ Thus, knowing the stage of liver fibrosis prior to finalizing the plan for bariatric surgery is crucial in selecting the right bariatric procedure for a given patient.

How should this study influence our current practice? First, as hepatologists caring for patients with or at risk for cirrhosis, providing input on the type of bariatric procedure used in the management of obesity complications is important. Second, those LT candidates with prior bariatric surgery must be viewed as a high risk group for poor wait-list outcomes, and

provision of a multifaceted team with expertise in nutrition and physiologic optimization will be critical to improving their chances of surviving to LT.

Abbreviations:

LT	liver transplantation
NAFLD	nonalcoholic fatty liver disease
RYGB	Roux-en-Y gastric bypass
SG	sleeve gastrectomy

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