



Clinical advantages and efficacy of sleeve gastrectomy in the treatment of non-alcoholic fatty liver disease

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Non-alcoholic fatty liver disease (NAFLD) is characterized by the accumulation of liver fat in the absence of alcohol consumption and has become one of the most common liver diseases worldwide. If left untreated, NAFLD can progress to non-alcoholic steatohepatitis (NASH), which may eventually lead to cirrhosis and even liver cancer (1). Obesity, particularly abdominal obesity, is a major risk factor for the development of NAFLD (2), making weight loss a key therapeutic strategy (3). While current treatments, including lifestyle modifications and pharmacotherapy, have shown limited effectiveness in patients with moderate to severe NAFLD, bariatric surgery, especially Sleeve gastrectomy (SG) and Roux-en-Y gastric bypass (RYGB), has emerged as an effective treatment option for obese individuals with concurrent NAFLD (4). Although both procedures lead to significant metabolic improvements, they differ in terms of surgical technique, associated risks, clinical outcomes, and postoperative recovery. This review focuses on the advantages of laparoscopic SG in the treatment of NAFLD.

Although bariatric surgery has been extensively recognized for its efficacy in treating obesity and ameliorating NAFLD, it has yet to be routinely incorporated as a standard treatment in current NAFLD management guidelines. This is primarily attributable to the stringent eligibility criteria for bariatric surgery, which typically necessitate a body mass index (BMI) ≥ 35 kg/m², or a BMI between 30 and 35 kg/m² (with

a threshold of BMI ≥ 27.5 kg/m² for Asian populations), accompanied by metabolic comorbidities (5). Furthermore, while bariatric procedures, particularly RYGB, are proven to significantly reduce body weight and improve metabolic outcomes, they are not without risks. These include, but are not limited to, postoperative hemorrhage, anastomotic leaks, infection, dumping syndrome, and vitamin deficiencies (6,7). Additionally, the applicability and therapeutic efficacy of bariatric surgery in patients with lower BMI and NAFLD remain insufficiently validated. These factors collectively restrict the broader adoption of bariatric surgery in the treatment of NAFLD.

SG and RYGB are the two primary surgical options for the treatment of obesity. While both procedures have demonstrated significant effectiveness in treating NAFLD, they differ substantially in terms of surgical technique, associated risks, and outcomes. Compared to RYGB, SG offers the advantage of preserving the natural gastrointestinal anatomy, resulting in fewer complications and a faster postoperative recovery. SG involves the removal of a large portion of the stomach, leaving a sleeve-shaped remnant to restrict food intake without altering the gastrointestinal tract's natural structure (8). This approach not only reduces surgical risks but also allows for more intact nutrient absorption, as it does not involve intestinal rerouting or reconstruction, thereby maintaining relatively

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normal digestive function. Consequently, SG is generally superior to RYGB in minimizing postoperative malnutrition and vitamin deficiencies (6). In contrast, RYGB involves the complex reconstruction of the stomach and small intestine, which carries a higher risk of complications such as bowel obstruction, delayed gastric emptying, and nutritional deficiencies. SG, with its simpler surgical procedure and lower complication rates, facilitating quicker recovery and improved postoperative quality of life for patients.

Existing studies have demonstrated that both laparoscopic SG and RYGB significantly improve NAFLD, particularly in reducing liver fat accumulation, enhancing insulin sensitivity, and improving glucose metabolism. A meta-analysis by Lim *et al.*, which included 35 studies, found that, compared to SG, RYGB resulted in a significant reduction in steatosis grading ($P < 0.001$), BMI ($P = 0.003$), and low-density lipoprotein (LDL) levels ($P = 0.008$). However, both RYGB ($P < 0.01$) and SG ($P = 0.03$) significantly increased the likelihood of fibrosis resolution, with no significant difference in fibrosis score improvement between the two procedures ($P = 0.06$) (9). In a previous study conducted at Department of General Surgery, Third Xiangya Hospital, we found that SG outperformed RYGB in reversing NAFLD-associated liver fibrosis (10). These findings indicate that while RYGB may offer some advantages over SG in certain aspects of NAFLD treatment, the differences between the two are not clinically significant. Therefore, such efficacy differences may not be a decisive factor in choosing the preferred surgical approach for NAFLD treatment.

Although both laparoscopic SG and RYGB have demonstrated good efficacy in treating NAFLD, the treatment needs and surgical indications vary among different patients. Different treatment strategies may be necessary for NAFLD patients at various stages of the disease. For the majority of NAFLD patients, laparoscopic SG may be the more appropriate treatment, as it effectively improves body weight, reduces liver fat accumulation, and carries lower risks with fewer postoperative complications. In contrast, for patients with severe NAFLD or those with comorbid type 2 diabetes, RYGB may be more suitable due to its notable advantages in improving glucose metabolism (11). However, whether different surgical approaches should be selected based on the stages of NAFLD still requires further validation through additional clinical research.

Conclusions

Both SG and RYGB have demonstrated significant

efficacy in the treatment of NAFLD. While RYGB shows more pronounced effects in certain aspects of NAFLD management, the overall therapeutic difference between the two procedures is not substantial. Furthermore, SG offers distinct advantages over RYGB in terms of surgical risk and postoperative recovery. With continued research, laparoscopic SG may emerge as a more favorable option for treating NAFLD. However, for NAFLD patients at different stages or with varying comorbidities, whether different surgical approaches and treatment strategies should be adopted still requires validation through further high-quality randomized controlled trials.

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