

Sleeve gastrectomy plus uncut jejunojejunal bypass for the treatment of obesity and type 2 diabetes

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Bariatric metabolic surgery has been confirmed as an effective, safe, and feasible method for achieving weight loss, treating obesity-related diseases, and improving the quality of life. Due to its simplicity, sleeve gastrectomy (SG) has been more commonly used in the past ten years than Roux-en-Y gastric bypass (RYGB).^[1] However, RYGB is superior to SG in terms of excess weight loss effect and type 2 diabetes mellitus (T2DM) remission over a 5-year follow-up period. On the other hand, micro-nutritional deficiencies and gastrointestinal disorders after RYGB were established to be almost universal. Sleeve gastrectomy with jejunal bypass (SGJB) was first described by Munir Alamo in 2003.^[2] Their subsequent study revealed the effectiveness of the procedure in achieving weight loss and ameliorating T2DM remission.^[3] Similar results were recently reported by Lin *et al*.^[4] in Chinese patients. The latter authors also found that SG with jejunojejunal bypass (SG + JJB) [Figure 1A] leads to less pronounced post-operative nutritional deficiency and fewer complications than RYGB. Here, we present a new technique: sleeve gastrectomy plus uncut jejunojejunal bypass (SG uncut JJB). We tried to further simplify bypass procedures and accessed its short-term safety and efficacy.

The study was approved by the Ethics Committee of Beijing Chao-Yang Hospital of Capital Medical University (No. 2020ke431). We retrospectively analyzed 24 patients who underwent SG uncut JJB, which was performed by the same surgeon who designed the technique, between January and September 2019. Informed consent was obtained from all participants before treatment. The inclusion and exclusion criteria for bariatric surgery complied with the Chinese Society for Metabolic and Bariatric Surgery guidelines.

We used five ports in the laparoscopic operation (Supplementary Video, <http://links.lww.com/CM9/A998>). The supraumbilical port was used for laparoscopic observations.

A 10-mm trocar was placed at 5 cm on the left side of the navel as the operator right main operating port, a 12-mm trocar was inserted in the right upper abdomen as the operator left main operating port, and two 5-mm trocars were allocated 3 to 5 cm below the xiphoid process and the left subcostal margin as the auxiliary operation ports. The pneumoperitoneum pressure was adjusted to 12 to 15 mmHg. Then, SG was performed using a 38-Fr orogastric tube. We completed the devascularization of the greater curvature of the stomach with a 5-mm LigaSure™ (Covidien, Mansfield, MA, USA) vessel-sealing device, starting from 4 cm proximal to the pylorus to the left crus of the diaphragm. Gastrectomy then was carried out under the guidance of a 38-Fr orogastric tube with a 60-mm Endo GIA™ (Covidien) and Endo-GIA Tri-Staple device (Endo-GIA Tri-Stapler, Medtronic, Fridley, MN, USA) reloads. Oversewing of the staple line on the remnant stomach was added to prevent leakage and bleeding. The gastric sleeve was fixed to the surrounding omentum or ligament.

Subsequently, we conducted the uncut jejunal bypass procedure. The ligament of Treitz was identified. Then, a side-to-side anastomosis was established between the jejunum (at 20 cm distal to the ligament of Treitz and the jejunum (at 220 cm distal to the ligament of Treitz) using 45 mm Endo GIA (Covidien™) with a white cartridge (3.5 mm). At three centimeters proximal to this anastomosis site, the jejunum was tied with a 0 silk suture and reinforced by suturing the upper and lower serosal layers. The location of the silk tie was marked with a titanium

Access this article online	
Quick Response Code:	Website: www.cmj.org
	DOI: 10.1097/CM9.0000000000002087

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Chinese Medical Journal 2022;135(18)

Received: 19-08-2021; Online: 05-09-2022 Edited by: Lishao Guo

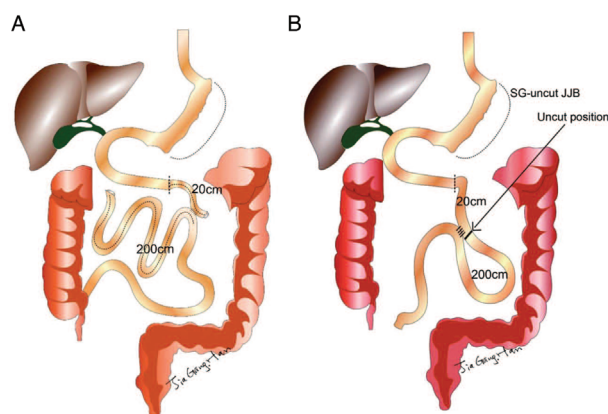


Figure 1: (A) SG with jejunojejunal bypass; (B) SG uncut JJB. SG uncut JJB: Sleeve gastrectomy plus uncut jejunojejunal bypass; SG: Sleeve gastrectomy.

clip. The mesentery defect was next repaired with a continuous suture.

An endoscopic observation was performed to check for leakage and bleeding from all staple lines, and a soft Penrose drain was inserted next to the gastric sutures in all patients to finish the procedure. Finally, the excised gastric specimen was removed from the port of the right upper abdomen.

All patients were usually discharged on the third day post-operatively. Post-operative diet management was the same as used for SG or RYGBP. After discharge, oral multivitamin, high-protein liquid, and other nutritional supplements, such as calcium, iron, and zinc, were prescribed for the first 6 months. All patients were discharged with PPI medication for 4 weeks. They were followed up in the outpatient clinic at 1, 3, 6, 9 and 12 months post-operatively. Statistical analysis was performed with the SPSS 22.0 software (IBM Corp, Armonk, NY, USA).

Patient baseline characteristics are listed in [Supplementary Table 1, <http://links.lww.com/CM9/A999>]. One patient presented with hemoperitoneum; staple-line bleeding was diagnosed and treated conservatively with fluids and a suspension of red blood cells. One patient developed a stricture in the gastric sleeve 1 week post-operatively and was treated by gastrofiberscope-assisted balloon catheter dilatation. There was no post-operative mortality. Follow-up data are presented in [Supplementary Table 2, <http://links.lww.com/CM9/A999>]. In patients with diabetes, average glycated hemoglobin and fasting sugar levels also decreased gradually. Detailed results can be found in [Supplementary Table 3, <http://links.lww.com/CM9/A999>]. One patient had mild anemia and vitamin B12 deficiency. Additionally, eight patients had

mild vitamin D deficiency. None of the patients had hypoproteinemia or folate acid deficiency and afferent recanalization.

An ideal surgical procedure that is better than SG and associated with less morbidity than RYGB is urgently needed.^[5] SGJB creates higher physiological rearrangement of the gastrointestinal tract in comparison with other bariatric surgical procedures. SG uncut JJB combines the advantages of SGJB and the uncut technique. Bypassing almost 200 cm of the small bowel may cause bacterial overgrowth as well as blind loop syndrome. In SG-uncut JJB, the uncut limb preserves the original, normal electrical conduction, and direction of muscle contraction. Hence, the bacterial overgrowth syndrome is even more unlikely to happen in theory.

There were some potential limitations in this study. First, this was a retrospective study with a low level of evidence and a short follow-up time. In addition, we did not directly compare this novel approach with SGJB for results. A control group should be included in further studies.

In summary, SG-uncut JJB has the advantages of SGJB and the uncut technique. It led to a satisfactory reduction of body weight in this cohort of patients after 1 year. Technically, this procedure is feasible, and the incidence of surgery-related complications is acceptable. However, vitamin deficiencies should be monitored closely.

Conflicts of interest

None.

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How to cite this article: Zhai Z, GL, Tao Y, Wang Z, Han J. Sleeve gastrectomy plus uncut jejunojejunal bypass for the treatment of obesity and type 2 diabetes. *Chin Med J* 2022;135:2240–2241. doi: 10.1097/CM9.0000000000002087