

# Feasibility and Safety of Conversion Sleeve Gastrectomy after Failed Primary Adjustable Gastric Banding or Sleeve Gastrectomy

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**Purpose:** Adjustable gastric banding (AGB) and sleeve gastrectomy (SG) are restrictive bariatric surgeries that are popular in Korea. However, patients often require further conversion surgeries because weight loss failure and surgical complications tend to occur. The aim of this study was to evaluate the feasibility and safety of conversion sleeve gastrectomy (CSG) after failed primary AGB (PAGB) or primary SG (PSG). **Materials and Methods:** From February 2010 to April 2016, 21 consecutive patients who underwent CSG after failed PAGB or PSG were enrolled in this study. This study was a retrospective analysis of our prospectively collected database. Demographic, intra and post-operative data were collected and analyzed. **Results:** Twenty-one patients were enrolled in this study. This comprised 20 women and 1 man, with an average BMI of  $31.8 \pm 7.8$  kg/m<sup>2</sup>. Eighteen patients underwent PAGB and 3 underwent PSG. The mean operative time was  $243.6 \pm 76.8$  minutes, and the estimated blood loss was  $190.9 \pm 233.2$  ml. The mean hospital stay was  $4.7 \pm 1.7$  days. The mean follow-up after CSG was  $9.3 \pm 1.0$  months. Two cases developed immediate postoperative complications: one was a stricture (Clavien-Dindo surgical complication grade II) and the other, a pleural effusion (Grade I). **Conclusion:** CSG is a feasible and safe treatment option after failed PAGB or PSG. Further prospective studies are required to establish the strategy for conversion operations after failed primary restrictive bariatric surgery.

**Key Words:** Bariatric surgery, Conversion sleeve gastrectomy, Feasibility, Safety

## INTRODUCTION

The number of bariatric operations in Korea has increased year on year, from 139 in 2003 to 1686 in 2013 [1]. Adjustable gastric banding (AGB, 67.2%) is the most popular operation, followed by sleeve gastrectomy (SG, 14.2%) and Roux-en-Y gastric bypass (RYGB, 12.7%) [1]. AGB is relatively simple to perform, reversible, and safe [2]. However, the AGB can cause numerous complications, including

slippage, erosion, migration, and esophageal dilatation due to gastric outlet obstruction or stenosis [3-5]. In addition, approximately 14.3-50% of these patients require revision or conversion surgeries [5-7]. However, there is no consensus as to the best choice of revision surgery [8-12]. The safety and efficacy of this are still being explored. This study aimed to evaluate the safety and feasibility of conversion SG (CSG) after failed primary adjustable gastric banding (PAGB) and primary sleeve gastrectomy (PSG).

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## MATERIALS AND METHODS

From February 2010 to April 2016, 21 consecutive patients who underwent CSG after failed PAGB or PSG at a minimally invasive obesity surgery center were enrolled in this study. The indications for CSG included failure of weight loss, gastric band complications (stenosis, erosion, slippage, infection), and patient choice.

This study was a retrospective analysis of our prospectively collected database. The following demographic data were collected and analyzed: age, sex, body mass index (BMI), American Society of Anesthesiologists (ASA) physical status classification system score, the type of primary bariatric surgery, reason for conversion, past medical history, duration of follow-up, operative time, estimated blood loss, simultaneous operation, mean duration of hospital stay, and surgical complications. This study was approved by the institutional review board of CHA Gangnam Medical Center, CHA University.

The surgical procedure for CSG has been described previously [13]. The 36-French bougie and a continuous seromuscular suture at the resection margin were used. A point on the greater curvature of the stomach approximately 4 cm proximal to the pylorus was used as the distal resection point [14].

Data were analyzed by descriptive statistical methods with the Statistical Package for the Social Sciences for Windows, version 18.0 (SPSS Inc., Chicago, IL). They were then presented as either means  $\pm$  standard deviations or percentages.

## RESULTS

### 1. Demographics

Twenty-one patients comprising 20 women and 1 man were enrolled in this study. The average BMI was  $31.8 \pm 7.8$  kg/m<sup>2</sup>, and the mean age was  $37.3 \pm 7.7$  (range, 23–58) years. The ASA score in most of the 19 patients was grade I-II. Eighteen patients underwent PAGB and 3 patients underwent PSG prior to CSG. Regarding the indications for conversion, 10 patients underwent CSG due to failure of weight loss; 9 patients due to complications of gastric banding, which included 2 cases of stenosis, 4 gastric

erosions, 2 slippages, and 1 infection; and 2 due to patient choice. Eleven patients had 1 or more co-morbidity; one of these patients had 5, including hypertension, insulin resistance, fatty liver, obstructive sleep apnea, and gout. The mean postoperative follow-up period was  $9.3 \pm 1.0$  months (Table 1).

### 2. Intraoperative data and postoperative outcomes

All 21 cases were completed laparoscopically. There were no open conversions or intraoperative complications. The mean operative time was  $243.6 \pm 76.8$  minutes, and the estimated blood loss was  $190.9 \pm 233.2$  ml. Among the 18 patients who underwent CSG after PAGB, one-step SG

**Table 1.** Patients' general characteristics

Characteristics (n=21)	Variable
Age	37.3 $\pm$ 7.7
Sex	
Female	20 (95.2%)
Male	1 (4.8%)
Weight (kg)	83.9 $\pm$ 26.1
Height (cm)	161.4 $\pm$ 5.7
Body mass index (kg/m <sup>2</sup> )	31.8 $\pm$ 7.8
Co-morbidities <sup>a</sup>	
Dyslipidemia	4 (18.1%)
Fatty liver	3 (13.6%)
GB stone	3 (13.6%)
Reflux esophagitis	3 (13.6%)
Hypertension	2 (9.1%)
Insulin resistance	2 (9.1%)
Obstructive sleep apnea	2 (9.1%)
Type II diabetes mellitus	1 (4.6%)
Arthritis & Back pain	1 (4.6%)
Gout	1 (4.6%)
<sup>b</sup> ASA score	
I-II	19 (90.5%)
III-IV	2 (9.5%)
Previous bariatric surgery	
Gastric banding	18 (85.7%)
Sleeve gastrectomy	3 (14.3%)
Reason of conversion operation	
Failure of weight loss	10 (47.6%)
Complications of gastric band	
Erosion	4 (19.1%)
Stenosis	2 (9.5%)
Slippage	2 (9.5%)
Infection	1 (4.8%)
Wanted	2 (9.5%)
Period of follow up (Months)	9.3 $\pm$ 1.0

<sup>a</sup>Included in duplication.

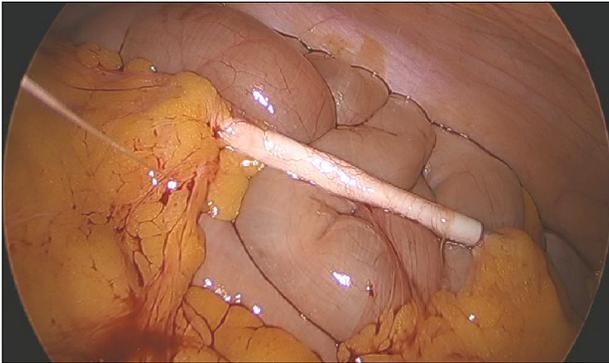
<sup>b</sup>ASA = American society of anesthesiologist.

**Table 2.** Intraoperative and postoperative features

Characteristics	Variable
Operative time (minutes)	243.6±76.8
Estimated blood loss (ml)	190.9±233.2
Co-operation	
Band removal	8 (38.1%)
Band removal, cholecystectomy	1 (4.8%)
Cholecystectomy	3 (14.2%)
Foreign body removal <sup>a</sup>	1 (4.8%)
None	8 (38.1%)
Mean hospital stay (days)	4.7±1.7
Surgical complication	
Stricture	1 (Grade II) <sup>b</sup>
Pleural effusion	1 (Grade I) <sup>b</sup>

<sup>a</sup>Foreign body (part of band material) removal.

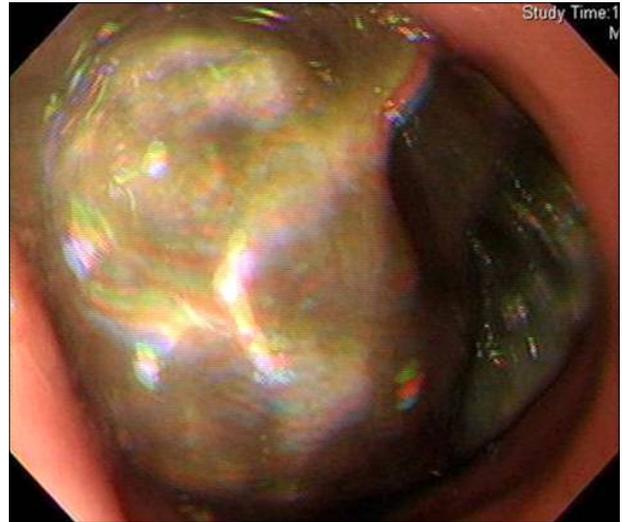
<sup>b</sup>According to Clavien-Dindo surgical complication classification.

**Fig. 1.** The part of the gastric band material.

with gastric band removal was performed in 9 patients, and two-step SG with gastric band removal was performed in the remaining 9. Five of these patients underwent gastric band removal at a different institution (Table 2). In one of the patients with previous band erosion, a foreign body was incidentally noted during CSG. This was found to be part of the gastric band material (Fig. 1).

### 3. Postoperative features

The mean hospital stay was 4.7±1.7 days. There were 2 immediate postoperative complications: 1 was a stricture (Clavien–Dindo surgical complication grade II) and 1 was a pleural effusion (Grade I) [15]. The patient with the gastric stricture was re-admitted thrice after CSG. Each admission lasted 3–4 days, during which she received conservative management. A gastrograffin upper gastrointestinal series

**Fig. 2.** Small phytobezoar was found in the remnant stomach.

did not demonstrate any disturbance of dye flow; however, a small phytobezoar was found in the remnant stomach during gastroscopy (Fig. 2). The patient remained symptom-free at her 3-year follow-up visit. The patient with the postoperative pleural effusion was managed conservatively and discharged 4 days postoperatively; no drainage was required (Table 2). No patients developed anastomotic leakage after CSG, and the mortality rate was zero.

## DISCUSSION

AGB is a restrictive bariatric operation that is reversible, safe, and relatively simple to perform. However, only 30% of patients with gastric bands rated their life as “good” 10 and 14 years after surgery [16]. Indeed, several long-term studies on AGB have reported that revision or conversion operations are frequently required to manage the ensuing complications [5–7,17]. Various types of conversion operations for failed primary bariatric surgery have emerged; examples include SG, RYGB, and AGB [8,9,11,12]. Conversion operations to RYGB (CRYGB) have been reported to be feasible and well tolerated after failed AGB [12]. Other reports demonstrated that both CSG and CRYGB were feasible options and resulted in further substantial weight loss [8]. Another study revealed that CSG might be a valid option for managing PSG complications such as primary or

secondary dilatation [11]. However, there is still insufficient evidence to help establish robust guidelines for conversion operations after failed primary bariatric surgery.

Although SG and RYGB are comparable in terms of perioperative complications and long-term outcomes [18-20], SG has more advantages than RYGB. SG is a purely restrictive operation, causes less malabsorption than RYGB, maintains pylorus function, preserves the natural anatomy of the intestinal tract, and results in a lower risk of ulceration. SG also reduces ghrelin secretion in the stomach, which is associated with greater appetite suppression and greater weight loss [21,22]. In addition, the study by Hong et al., which was also conducted in our institution, suggested that SG might be an effective weight loss option for patients with lower BMI [14]. The average BMI in this present study was  $31.8 \pm 7.8 \text{ kg/m}^2$ .

SG and RYGB are comparable in terms of perioperative complication rates and the need for conversion operations. However, they differ in weight loss outcomes. One study reported that CRYGB was superior to CSG in terms of percentage of excess weight loss (% EWL) (55 vs. 28%,  $P=0.001$ ) [19]. Another report demonstrated that both CSG and CRYGB were safe procedures with similar %EWL (47.4 vs. 45.6%,  $P=0.77$ ) over a 20.7-month follow-up period. And, as CRYGB might cause long-term nutritional complications, the author has suggested that CSG may be a better option in patients with low BMI [23].

The risk of postoperative complications is higher in patients who had revision surgery, and is even higher after multiple revisions [24]. The leak rate is reportedly higher after revision of AGB into SG – this procedure involves stapling over scarred tissue, a longer stapler line, and dissection at the left crus, which can jeopardize the blood supply at the gastroesophageal junction [24-27]. However, several studies have demonstrated SG's feasibility as a revision procedure [28-30]. The overall post-CSG leakage rate was 13.7%, but patients who underwent the two-stage operation did not develop leakage [29]. Another study that analyzed patients with one-stage operations reported only one complication, which was a contained leak that resolved after antibiotic treatment [30]. None of the patients in our study developed a stapler line leakage. The only surgical complication we noted was a stricture, and it was

managed conservatively. This patient had also undergone a two-stage revision operation, which was considered to have a lower complication rate as compared to a one-stage operation [29].

Although we have only analyzed a relatively small amount of cases, we believe that CSG would be a safe and feasible procedure for failed primary bariatric surgery. Our study will also provide evidence to help establish the surgical strategy for revision operations after failed primary bariatric surgery.

The main limitations of this study were that it was a case series conducted at a single institution, and utilized a retrospective study design that might result in bias. In addition, there were no comparative groups such as CRYGB or CAGB, because the institutional policy for revision surgery was to perform SG for patients with low BMI.

In conclusion, CSG is a feasible and safe treatment option for failed ABG or SG. Prospective studies are required to establish an evidence-based strategy for conversion operations after the failure of primary bariatric surgeries.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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