Research Square

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Conversion to Laparoscopic Sleeve Gastrectomy After Gastric Plication: Clinical Presentation, Intraoperative Findings, and 5-Year Outcomes

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Abstract

Introduction: Laparoscopic greater curvature plication (LGCP) was adopted for its low cost and reversibility, but high rates of recurrent weight gain and complications have led to its abandonment. Evidence on the management of patients after LGCP remains scarce. We describe the clinical presentation, intraoperative findings, and 5-year outcomes of conversion to laparoscopic sleeve gastrectomy (LSG) after LGCP.

Methods: Single-center retrospective analysis of a prospectively maintained database (2014–2020). Adults with a history of LGCP who underwent laparoscopic conversion to LSG were included. Clinical presentation, intraoperative and pathological findings, complications, and body mass index (BMI) at 6, 12, 24, 36, and 60 months were analyzed.

Results: Seventeen patients were included (mean age 39.7 ± 10.6 years; 52.9% male), a mean of 26 ± 12.3 months after LGCP. The main complaints were recurrent weight gain (88.2%) and abdominal pain (82.4%). Adhesions were found in all patients, chronic inflammation in 41.2%, gastric perforation in 17.6%, and a gastroesophageal fistula in one patient (5.9%). Two patients (11.8%) underwent concomitant hiatal hernia repair. No early or late complications occurred. Mean BMI decreased from 31.2 ± 4.5 to 28.5 ± 4.1 kg/m² at 6 months and 23.8 ± 1.7 kg/m² at 5 years ($n = 13$; $p < 0.001$).

Conclusion: Complications after LGCP presented mainly as recurrent weight gain and abdominal pain. Laparoscopic conversion to LSG was safe and achieved sustained BMI reduction at 5 years in this series.

Key Points

• Recurrent weight gain and abdominal pain were the main reasons for conversion.

• All patients had adhesions; 17.6% had gastric perforation at conversion.

• No early or late complications occurred after conversion to sleeve gastrectomy.

• Mean BMI fell from 31.2 to 23.8 kg/m² at 5 years, with 76.5% follow-up.

INTRODUCTION

Obesity has become a global public health problem that demands effective and attainable solutions [1–3]. Available treatments range from lifestyle and pharmacological therapy to metabolic bariatric surgery (MBS), which provides the most durable weight loss and control of associated medical problems [4]. Current ASMBS/IFSO guidelines recommend MBS for individuals with a body mass index (BMI) ≥ 35 kg/m², regardless of associated medical problems, and suggest considering it for those with a BMI of 30–34.9 kg/m² and metabolic disease; nevertheless, the choice of procedure must be tailored to each patient [5].

In the early 2000s, Talebpour introduced laparoscopic greater curvature plication (LGCP) as a non-resective alternative to sleeve gastrectomy, in which the greater curvature is invaginated with sutures to reduce gastric volume [6–9]. The procedure gained rapid acceptance because of its low cost, potential reversibility, and technical simplicity, avoiding the use of staplers [10, 11]. However, suboptimal long-term weight loss and high rates of reintervention and complications have led to controversy and progressive abandonment of the technique [8, 12].

Complications after LGCP range from nausea and vomiting to gastric outlet obstruction (1.4%), suture-line prolapse (2.3%), and gastric perforation or leak (0.7%), and their management and setting of care depend on their type and severity [13]. Furthermore, associated medical problems persist in up to 42.3% of patients, and patient satisfaction reaches only 76.9%, mainly because of unmet weight-loss expectations [13, 14].

Conversion to laparoscopic sleeve gastrectomy (LSG) is a pathophysiologically sound option after LGCP, as it removes the chronically inflamed, fibrotic, and potentially dysmotile plicated tissue, creates a standardized gastric tube, and reduces the ghrelin-producing fundic mass. However, evidence on the optimal management after LGCP is limited tosmall series with short follow-up [15, 16]. Therefore, our aim was to describe the clinical presentation, intraoperative findings, and 5-year postoperative outcomes of patients who underwent conversion to LSG after LGCP at a high-volume tertiary referral center between 2014 and 2020. We hypothesized that conversion to LSG is safe and achieves sustained weight loss and symptom resolution after LGCP.

METHODS

This was a single-center retrospective analysis of a prospectively maintained database, approved by the Institutional Review Board (approval number blinded for review). All patients older than 18 years with a documented history of LGCP performed at another institution who underwent laparoscopic conversion to LSG between January 2014 and December 2020 were included (Fig. 1). Patients lacking detailed surgical descriptions or missing critical clinical data were excluded. The study was conducted in accordance with the Declaration of Helsinki, Colombian research regulations (Resolutions 8430 of 1993 and 2378 of 2008), Colombian data protection legislation (Law 1581 of 2012), and the International Committee of Medical Journal Editors (ICMJE) recommendations.

Surgical technique

All procedures were performed laparoscopically with the patient in the French (split-leg) position. After adhesiolysis, the plication fold was completely dismantled, and all non-absorbable sutures were identified and removed. The gastric wall was then inspected for perforation, fistula, or ischemic areas. Sleeve gastrectomy was performed over a 36-Fr bougie, starting 5–6 cm from the pylorus and ending 1.5 cm lateral to the angle of His, using purple or black stapler cartridges (Tri-Staple™, Medtronic, Minneapolis, MN, USA) according to tissue thickness. Staple-line integrity was confirmed with an air leak

test. The resected specimen, including the plication fold, was sent for histopathological analysis. The hiatus was routinely assessed, and hiatal hernias were repaired with the modified Hill technique as previously described [17].

Outcomes

Preoperative data included demographics, BMI, and symptoms (Table 1). Intraoperative data included findings, procedures performed, and histopathology (Table 2). All surgical procedures were conducted by the same specialized bariatric team. Early complications were defined as those occurring within 30 days of surgery and late complications as those occurring thereafter until the end of follow-up. Patients were followed at 6 and 12 months and annually thereafter up to 5 years, with assessment of symptoms and weight (Table 3).

Table 1
Demographic and clinical characteristics of patients at conversion (n = 17).

Variable		**n**	**%**
Sex	Male	9	52.9
	Female	8	47.1
Preoperative Symptoms	Abdominal pain	14	82.4
	Recurrent weight gain	15	88.2
	Dyspepsia	8	47.1
	Nausea	7	41.2
	Vomiting	7	41.2
		Mean	**SD**
Age (years)		39.7	10.6
BMI at conversion (kg/m²)		31.2	4.5
Time from LGCP to conversion (months)		26	12.3

Table 2
Intraoperative and Pathological Findings (n = 17)

Variable		n	%
Procedure Performed	Sleeve gastrectomy	15	88.2
	Sleeve gastrectomy + modified Hill procedure	2	11.8
Intraoperative Findings	Intra-abdominal adhesions	17	100.0
	Chronic inflammation	7	41.2
	Dense calcified fibrosis	2	11.8
	Gastroesophageal fistula	1	5.9
	Perforation	3	17.6
	Hiatal hernia	2	11.8
Pathology Report	Chronic gastritis	17	100.0
	Edema and fibrosis	10	58.8
	H. pylori infection	2	11.8
	Desmoid tumor	1	5.9

Table 3
Postoperative complications, follow-up, and BMI outcomes.

Variable		Value / n	SD / %
Complications	Early (< 30 days)	0	0.0%
	Late (> 30 days)	0	0.0%
6 Months	BMI (kg/m²)	28.5	4.1
	Patients assessed, n (%)□	17	100.0%
12 Months	BMI (kg/m²)	27.7	3.8
	Patients assessed, n (%)	16	94.1%
24 Months	BMI (kg/m²)	24.0	1.6
	Patients assessed, n (%)	16	94.1%
36 Months	BMI (kg/m²)	23.7	1.1
	Patients assessed, n (%)	15	88.2%
60 Months	BMI (kg/m²)	23.8	1.7
	Patients assessed, n (%)	13	76.5%

□ All assessed patients were free of plication-related symptoms. Four patients (23.5%) were lost to follow-up at 60 months.

Statistical analysis

Data were analyzed with IBM SPSS Statistics 25 (IBM Corp., Armonk, NY, USA). Continuous variables are presented as mean ± standard deviation (SD) and categorical variables as frequencies and percentages. Normality was assessed with the Shapiro-Wilk test. Longitudinal BMI change was evaluated with repeated-measures analysis of variance (ANOVA) with Greenhouse-Geisser correction, including patients with complete follow-up data (n = 13). A p value < 0.05 was considered statistically significant.

RESULTS

Between January 2014 and December 2020, 17 patients underwent laparoscopic conversion to LSG after LGCP. Mean age was 39.7 ± 10.6 years, 9 patients (52.9%) were male, and mean BMI at conversion was 31.2 ± 4.5 kg/m² (Table 1). Conversion was performed at a mean of 26 ± 12.3 months after LGCP. All primary procedures had been performed at other institutions, and their operative records were unavailable. All patients were evaluated by a multidisciplinary team (bariatric surgery, nutrition, endocrinology, sports medicine, and psychiatry) in accordance with Joint Commission International standards before conversion to LSG. The most frequent preoperative complaints were recurrent weight gain (88.2%), abdominal pain (bloating and epigastric discomfort; 82.4%), dyspepsia (postprandial pain;

47.1%), and nausea and vomiting (41.2%). Intra-abdominal adhesions were found in all patients, chronic inflammation in 7 (41.2%), gastric perforation in 3 (17.6%), dense calcified fibrosis in 2 (11.8%), and a gastroesophageal fistula in 1 (5.9%) (Table 2). Two patients (11.8%) with a hiatal hernia underwent concomitant repair with the modified Hill technique, with no conversions to open surgery. Histopathology showed chronic gastritis in all specimens, edema and fibrosis in 10 (58.8%), and Helicobacter pylori infection in 2 (11.8%). One specimen (5.9%) showed a desmoid tumor.

No early or late complications (including leak, stricture, or internal hernia), readmissions, reoperations, or deaths occurred. Follow-up was completed by 16 patients (94.1%) at 1 and 2 years, 15 (88.2%) at 3 years, and 13 (76.5%) at 5 years **(**Table 3**)**. All assessed patients were free of plication-related symptoms at each follow-up visit. Mean BMI decreased to 28.5 ± 4.1, 27.7 ± 3.8, 24.0 ± 1.6, 23.7 ± 1.1, and 23.8 ± 1.7 kg/m² at 6, 12, 24, 36, and 60 months, respectively ($p < 0.001$).

DISCUSSION

LGCP is currently considered an investigational procedure by the American Society for Metabolic and Bariatric Surgery (ASMBS) because of its high rates of reintervention and complications [18]. In this series, conversion to LSG was safe and achieved sustained BMI reduction at 5 years in patients presenting with recurrent weight gain and abdominal pain after LGCP.

Follow-up after MBS is a cornerstone of patient management, and weight trajectory is a principal indicator of progress [19]. Talebpour et al. reported recurrent weight gain in 5.5% of patients 4 years after LGCP, increasing to 31% and 42% at 8 and 10 years, respectively [6]. Other features after LGCP include dyspepsia, chronic abdominal pain, nausea, vomiting, and recurrence of associated medical problems [19]. In our series, 15 patients (88.2%) presented with recurrent weight gain, 14 (82.4%) with chronic abdominal pain, and 8 (47.1%) with dyspepsia, similar to the findings of Zerrweck et al. [15].

Revisional procedures account for 7–15% of all bariatric operations [19], and Hjorth et al. reported reoperation rates of up to 28% over 26 years of follow-up [20]. Evidence on the optimal approach after LGCP is scarce. Albanese et al. described 13 patients who required reoperation after LGCP, of whom 10 underwent LSG and 3 underwent re-plication [16]. In our series, all patients underwent conversion to LSG. LSG was preferred over Roux-en-Y gastric bypass (RYGB) because it removes the chronically inflamed plicated tissue without adding an anastomosis in a reoperative field, and it avoids the long-term nutritional burden of a bypass in patients with a relatively low BMI. RYGB remains the preferred option for patients with GERD or erosive esophagitis [4, 21]. Concomitant hiatal hernia repair with the modified Hill technique [17] was required in 2 patients (11.8%).

Adhesions were present in all cases, and perforation and fistula were identified in 17.6% and 5.9% of patients, respectively. These rates exceed the 1–2% perforation risk reported for revisional bariatric procedures [22] and likely reflect chronic inflammation and ischemia of the plicated fold, supporting its complete resection. Histopathology showed chronic gastritis in all specimens and edema and fibrosis in 58.8%. No patient had intestinal metaplasia, consistent with the 0.2–0.7% rates reported in bariatric

specimens [23, 24]. H. pylori was identified in 2 patients (11.8%), who received eradication therapy postoperatively. One specimen showed a desmoid tumor. Desmoid tumors have been described after bariatric procedures and are thought to be triggered by surgical trauma [25]; in our patient, chronic tissue injury at the plication site may have played a similar role.

In our cohort, conversion to LSG achieved a mean BMI reduction of 7.4 kg/m² at 5 years (from 31.2 ± 4.5 to 23.8 ± 1.7 kg/m²; n = 13). This reduction is lower than the 12.7 kg/m² reported by Zerrweck et al. after reoperation for LGCP [15], likely reflecting the lower preoperative BMI of our patients. Although weight loss after revisional procedures is generally lower than after primary surgery [26], our patients reached and maintained a BMI within the normal range, together with complete resolution of plication-related symptoms. Follow-up was 76.5% at 5 years, which is noteworthy given that few bariatric studies report outcomes beyond 2 years with adequate follow-up [27].

This study has limitations. First, the small sample size (n = 17) and single-center retrospective design limit generalizability and statistical power. Second, the absence of detailed primary operative reports from external institutions introduces potential information bias regarding the exact suturing techniques and initial imbrication extent. Third, 23.5% of patients were lost to follow-up at 5 years, and longitudinal analyses were restricted to patients with complete data. Fourth, there was no comparison group, and GERD was not systematically assessed. Nevertheless, this series is among the few reporting 5-year outcomes after conversion from LGCP to LSG and provides a basis for multicenter comparative studies.

CONCLUSION

Complications after LGCP presented mainly as recurrent weight gain and abdominal pain. Laparoscopic conversion to LSG was feasible and safe, with no postoperative complications and sustained BMI reduction at 5 years. Concomitant hiatal hernia repair with the modified Hill technique was feasible in the two patients who required it. Larger multicenter studies are needed to confirm these findings.

Declarations

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Ethical Approval:

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration

and its later amendments or comparable ethical standards. This study was approved by the Institutional Review Board (approval number blinded for review).

Informed Consent:

For this type of study formal consent is not required.

Data Availability:

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Conflict of Interest:

The authors declare that they have no conflict of interest.

References

1. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011–2012. JAMA. 2014;311(8):806–14.
2. Gastrointestinal surgery for severe obesity. NIH Consensus Development Conference, March 25–27, 1991. Nutrition. 1996;12(6):397–404.
3. Mechanick JI, Youdim A, Jones DB, Garvey WT, Hurley DL, McMahon MM, et al. Clinical practice guidelines for the perioperative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient–2013 update: cosponsored by American Association of Clinical Endocrinologists, The Obesity Society, and American Society for Metabolic & Bariatric Surgery. Obes (Silver Spring). 2013;21(Suppl 1):S1–27.
4. Salminen P, Grönroos S, Helmiö M, Hurme S, Juuti A, Juusela R, et al. Effect of Laparoscopic Sleeve Gastrectomy vs Roux-en-Y Gastric Bypass on Weight Loss, Comorbidities, and Reflux at 10 Years in Adult Patients With Obesity: The SLEEVEPASS Randomized Clinical Trial. JAMA Surg. 2022;157(8):656–66.
5. Eisenberg D, Shikora SA, Aarts E, Aminian A, Angrisani L, Cohen RV, et al. 2022 American Society for Metabolic and Bariatric Surgery (ASMBS) and International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO): Indications for Metabolic and Bariatric Surgery. Obes Surg. 2023;33(1):3–14.
6. Talebpour M, Motamedi SM, Talebpour A, Vahidi H. Twelve year experience of laparoscopic gastric plication in morbid obesity: development of the technique and patient outcomes. Ann Surg Innov Res. 2012;6(1):7.
7. Bužga M, Holéczy P, Švagera Z, Zonča P. Laparoscopic gastric plication and its effect on saccharide and lipid metabolism: a 12-month prospective study. Wideochir Inne Tech Maloinwazyjne. 2015;10(3):398–405.

8. Verdi D, Prevedello L, Albanese A, Lobba A, Foletto M. Laparoscopic Gastric Plication (LGCP) Vs Sleeve Gastrectomy (LSG): A Single Institution Experience. Obes Surg. 2015;25(9):1653–7.
9. Vanguri P, Brengman M, Oiticica C, Wickham EP 3rd, Bean MK, Lanning DA. Laparoscopic gastric plication in the morbidly obese adolescent patient. Semin Pediatr Surg. 2014;23(1):24–30.
10. Coskun H, Cipe G, Bozkurt S, Bektasoglu HK, Hasbahceci M, Muslumanoglu M. Laparoscopic sleeve gastrectomy in management of weight regain after failed laparoscopic plication. Int J Surg Case Rep. 2013;4(10):872–4.
11. Ji Y, Wang Y, Zhu J, Shen D. A systematic review of gastric plication for the treatment of obesity. Surg Obes Relat Dis. 2014;10(6):1226–32.
12. Shen D, Ye H, Wang Y, Ji Y, Zhan X, Zhu J, et al. Comparison of short-term outcomes between laparoscopic greater curvature plication and laparoscopic sleeve gastrectomy. Surg Endosc. 2013;27(8):2768–74.
13. El Soueidy T, Kassir R, Nakhoul M, Balian A, Nunziante M, Safieddine M, et al. Laparoscopic Greater Curvature Plication for the Treatment of Obesity: a Systematic Review. Obes Surg. 2021;31(3):1168–82.
14. Khidir N, Al Dhaheri M, El Ansari W, Al Kuwari M, Sargsyan D, Bashah M. Outcomes of Laparoscopic Gastric Greater Curvature Plication in Morbidly Obese Patients. J Obes. 2017;2017:7989714.
15. Zerrweck C, Rodríguez JG, Aramburo E, Vizcarra R, Rodríguez JL, Solórzano A, et al. Revisional Surgery Following Laparoscopic Gastric Plication. Obes Surg. 2017;27(1):38–43.
16. Albanese A, Prevedello L, Verdi D, Nitti D, Vettor R, Foletto M. Laparoscopic Gastric Plication: An Emerging Bariatric Procedure with High Surgical Revision Rate. Bariatr Surg Pract Patient Care. 2015;10(3):93–8.
17. Nassar R, Giron F, Garcia AM, Rodríguez LM, Ricaurte AE, Rueda-Esteban RJ, et al. Hill Modified, a Novel Approach: Technique Description and Experience in Patients with Laparoscopic Sleeve Gastrectomy. Obes Surg. 2021;31(9):3970–6.
18. Clinical Issues Committee. ASMBS policy statement on gastric plication. Surg Obes Relat Dis. 2011;7(3):262.
19. Mirkin K, Alli VV, Rogers AM. Revisional Bariatric Surgery. Surg Clin North Am. 2021;101(2):213–22.
20. Hjorth S, Näslund I, Andersson-Assarsson JC, Svensson PA, Jacobson P, Peltonen M, et al. Reoperations After Bariatric Surgery in 26 Years of Follow-up of the Swedish Obese Subjects Study. JAMA Surg. 2019;154(4):319–26.
21. Yeung KTD, Penney N, Ashrafian L, Darzi A, Ashrafian H. Does Sleeve Gastrectomy Expose the Distal Esophagus to Severe Reflux? A Systematic Review and Meta-analysis. Ann Surg. 2020;271(2):257–65.
22. Lim R, Beekley A, Johnson DC, Davis KA. Early and late complications of bariatric operation. Trauma Surg Acute Care Open. 2018;3(1):e000219.

23. Sohn VY, Arthurs ZM, Martin MJ, Sebesta JA, Branch JB, Champeaux AL. Incidental pathologic findings in open resectional gastric bypass specimens with routine cholecystectomy and appendectomy. Surg Obes Relat Dis. 2008;4(5):608–11.
24. Walędziak M, Różańska-Walędziak A, Kowalewski PK, Janik MR, Paśnik K. Histopathological examination of tissue resected during bariatric procedures - to be done or not to be done? Wideochir Inne Tech Maloinwazyjne. 2017;12(2):135–9.
25. Medas R, Coelho R, Bessa-Melo R, Pereira P, Macedo G. Desmoid Tumor after Sleeve Gastrectomy: Case Report and Literature Review. GE Port J Gastroenterol. 2024;31(4):283–7.
26. Brethauer SA, Kothari S, Sudan R, Williams B, English WJ, Brengman M, et al. Systematic review on reoperative bariatric surgery. Surg Obes Relat Dis. 2014;10(5):952–72.
27. Puzziferri N, Roshek TB 3rd, Mayo HG, Gallagher R, Belle SH, Livingston EH. Long-term Follow-up After Bariatric Surgery: A Systematic Review. JAMA. 2014;312(9):934–42.

Figures

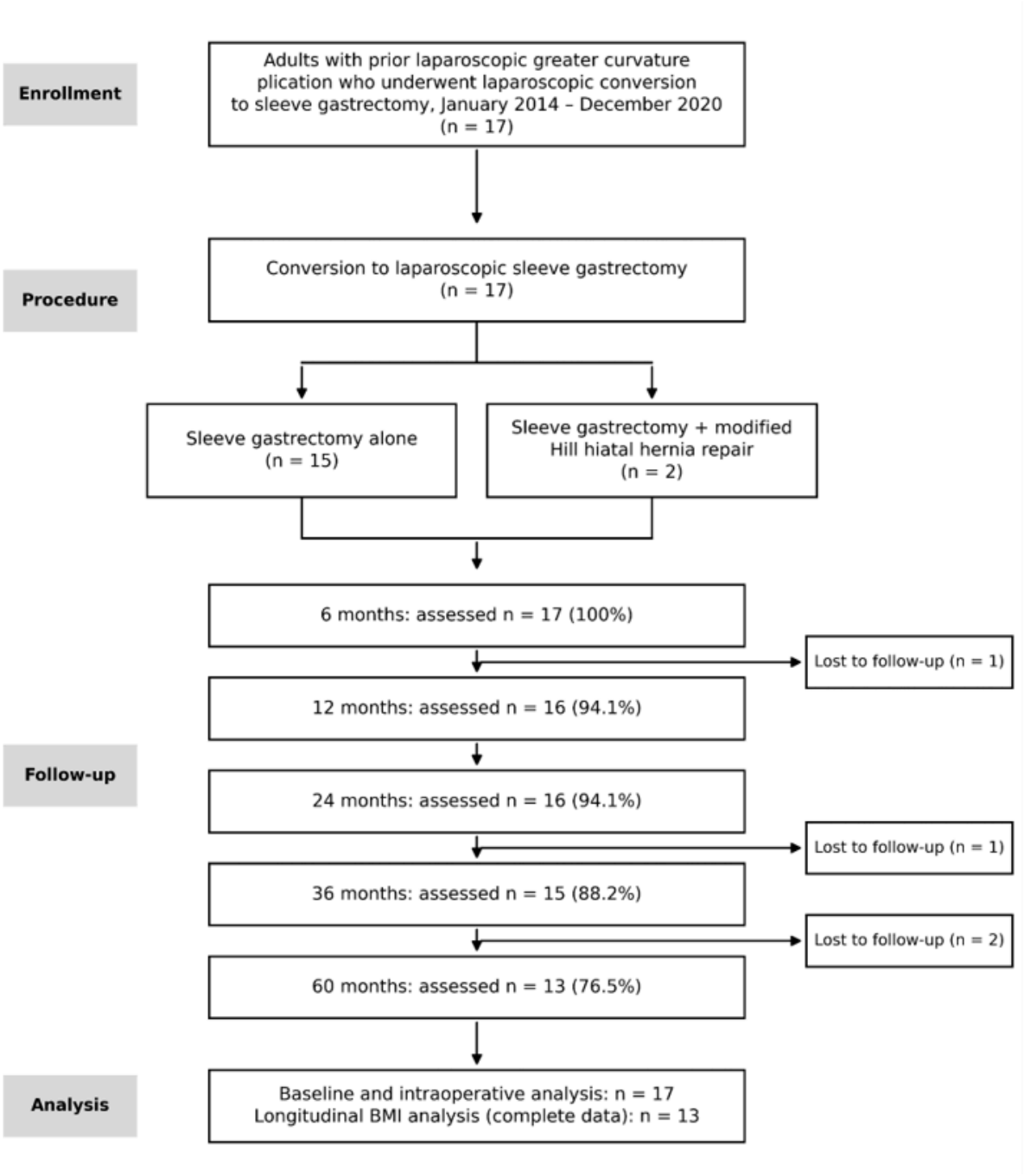


Figure 1

STROBE flow diagram of patients who underwent laparoscopic conversion from greater curvature plication to sleeve gastrectomy, including follow-up at each time point.