Revision Surgery in Bariatric Surgery: Initial Experience

Bariatrik Cerrahide Revizyonel Cerrahi: İlk Deneyim

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ABSTRACT Objective: Revision surgery in bariatric surgery is becoming an important issue. It has been associated with higher complication rates, and there is no consensus on the standardized surgical approach to revision surgery. The aim of this study was to review the revision procedures performed in our institute. **Material and Methods:** A retrospective review of a prospectively maintained database was performed. One hundred thirty three operations were performed for morbid obesity. Primary procedures were laparoscopic adjustable gastric banding (LAGB) in 61 patients, vertical band gastroplasty (VBG) in 24 patients, Roux-en-Y gastric bypass in 21 patients, sleeve gastrectomy in 10 patients and biliopancreatic diversion with duodenal switch in six patients. Eleven patients were reoperated due to mechanical complications or inadequate weight loss. Data including age, gender, preoperative weight, body mass index (BMI) and postoperative complications were reviewed for all patients undergoing a revision procedure. **Results**: In patients with previous VBG, failure of weight loss (3/4) and outlet stenosis (1/4) were the indications. In patients with previous LAGB, mechanical side effects were the indications of surgery. The gastrocolic fistula was the indication of surgery in patient who had been revised from VBG to sleeve gastrectomy. At the mean follow-up of 13 months, the mean BMI and percentage of excess BMI were 32.3 kg/m^2 and 37.4%, respectively. There was one stapler-line leakage. **Conclusion:** Our study suggests that revision bariatric surgery can be performed with satisfactory short-term weight loss. The knowledge of the potential complications associated with revision surgery and their management is crucial for patients' safety.

Key Words: Obesity; bariatric surgery; reoperation; body mass index

ÖZET Amaç: Bariatrik cerrahide revizyonel cerrahi önemli bir konu haline gelmektedir. Yüksek komplikasyon oranları ile ilişkili bulunmuştur ve revizyonel cerrahide standart cerrahi yaklaşımla ilgili fikir birliği yoktur. Bu çalışmanın amacı bizim merkezimizde yapılan revizyonel cerrahilerin gözden geçirilmesidir. **Gereç ve Yöntemler:** İleri dönük olarak sürdürülen veri tabanı geriye dönük olarak gözden geçirildi. Morbid obezite nedeniyle 133 ameliyat yapıldı. Birincil ameliyat 61 hastada laparoskopik ayarlanabilir gastrik bantlama (LAGB), 24 hastada vertikal bantlı gastroplasti (VBG), 21 hastada Roux-en-Y gastrik baypas, 10 hastada sleeve gastrektomi ve altı hastada duodenal switch ile biliopankreatik diversiyondu. Onbir hasta mekanik komplikasyonlar veya yetersiz kilo kaybı nedeniyle tekrar ameliyat edildi. Yaş, cinsiyet, ameliyat öncesi ağırlık, beden kitle indeksi (BKİ) (bariatrik ve revizyonel cerrahiden önce) ve postoperatif komplikasyonları içeren veriler revizyon işlemi yapılan tüm hastalarda gözden geçirildi. **Bulgular:** Daha önce VBG yapılan hastalarda endikasyon kilo kaybı olmayışı (3/4) ve çıkışta darlıktı (1/4). Daha önce LAGB yapılanlarda cerrahi endikasyonları mekanik yan etkilerdi. VBG yapılmış olup sleeve gastrektomi uygulanan bir hastada cerrahi endikasyonu gastrokolik fistüldü. Ortalama 13 aylık takipte (6-19 ay) ortalama BKİ ve aşırı BKİ yüzdeleri sırasıyla 32,3 kg/m^2 ve %37,4 idi. Bir tane stapler hattı kaçağı vardı. **Sonuç:** Çalışmamız revizyonel bariatrik cerrahinin tatmin edici kısa süreli kilo kaybı ile yapılabilir olduğunu göstermektedir. Revizyon cerrahisi ile ilişkili potansiyel komplikasyonların ve bunlara yaklaşımın bilinmesi hasta güvenliği için çok önemlidir.

Anahtar Kelimeler: Şişmanlık; şişmanlık cerrahisi; reoperasyon; beden kitle indeksi

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Obesity is a chronic disease with increasing incidence worldwide and has become a major public health problem. Obesity is a worldwide pandemic. World Health Organization estimates that more than 1.6 billion people are currently overweight and 400 million are obese.[1] Drug therapy or conservative treatment of obesity is generally ineffective. Bariatric operations for patients who suffer from morbid obesity are effective for reducing body weight and comorbidities. Bariatric surgery can have long-term complications that require revision procedures. Due to the wide use of bariatric procedures, combined with its complications and failure rate, bariatric surgeons are faced with a growing number of patients who necessitate revision operation. The revision rate following primary bariatric surgery is reported between 10% and 25%.[2] Revision operations comprise 10% to 15% of the operations performed and most of which are referred from other bariatric surgeons, in experienced centers.[3] Bariatric surgery and revision surgery have been performed in our clinic at a wide range with all techniques. The aim of this study was to review the revision procedures performed for inadequate weight loss or mechanical complications.

MATERIAL AND METHODS

The study was conduced in Selçuklu Medical Faculty, Selçuk University, Konya, Turkey. The study was approved by the Ethics Committee. The prospectively maintained database of our bariatric team was retrospectively reviewed. All patients with revision bariatric procedure were included. Data included age, gender, preoperative weight, BMI (prebariatric and pre-revision surgery), indications for surgery, the revision procedure, operation time, hospital stay and postoperative complications. One hundred thirty-one morbidly obese patients (82 women and 49 men) with a mean age of 35.8±3.1 years undergone 133 bariatric operations. One hundred twenty-two primary bariatric procedures were performed: Laparoscopic adjustable gastric banding (LAGB) in 61 patients, vertical banded gastroplasty (VBG) in 24 patients, Roux-en-Y gastric bypass in 21 patients, sleeve gastrectomy (SG) in 10 patients and biliopancreatic diversion with duodenal switch in six patients. Of the 133 operations for morbid obesity, 11 were reoperations. In this group, two patients had primary procedure in our hospital and nine in other regional hospitals. Nowadays, bariatric operations could be performed even in district hospitals, but patients who need revision are referred to experienced centers because of technical difficulties and possible serious complications. Primary procedures were LAGB in six patients and VBG in five patients; one of those patients had been revised to sleeve gastrectomy (VBG to SG).

A thorough preoperative work-up including upper gastrointestinal series and endoscopy, abdominal ultrasound and medical approval from the bariatric team were performed in all patients. All patients gave written informed consents. All patients were evaluated by an anesthesiologist and received 1 mg/kg subcutaneous enoxaparine every 12 hours for venous thrombosis prophylaxis. Weight loss was expressed as a percentage of excess BMI (EBMI) using the formula below:

%EBMI=[(prerevisional BMI-current BMI)/(prerevisional BMI-25)]x100.[4]

RESULTS

In our series, 54.4% of patients had LAGB and 46.6% had VBG as the primary procedure. Of initial bariatric procedures, two were performed in our institution (LAGB in two patients) and nine in other regional hospitals (VBG to SG in one patient, VBG in four patients and LAGB in four patients). The mean interval between primary bariatric operation and revision/reversal operation was 36.8 months (range 16-59 months). Most of the patients were women. There were six comorbid conditions in five patients at the time of revision (Table 1). All patients were operated on either by or under the supervision of the same surgeon (M.S.).

In patients with previous VBG, failure in weight loss (in three of four patients) and outlet stenosis (in one of four patients) were the indications. Disruption of staple line and stenosis of the gastric pouch outlet were demonstrated with upper

TABLE 1: Patients preoperative characteristics.

Case no	Sex	Age	Prior operation	BMI pre-bariatric (kg/m^2)	BMI pre-revisional (kg/m^2)	Interval between primary operation and re-operation (month)	Comorbid disease
1	M	29	VBG	43,1	39.2	34	DM
2	F	36	LAGB	48,7	36.5	56	DM
3	F	31	VBG	44.3	37.4	27	-
4	F	34	VBG	42.7	30.2	43	-
5	F	28	VBG	38.8	36.4	21	DM
6	F	25	VBG to SG	41.2	21.3	16	-
7	F	30	LAGB	37.3	33.2	41	DM
8	F	33	LAGB	40.7	36.6	28	-
9	F	36	LAGB	53,9	37,2	47	-
10	F	32	LAGB	41.7	34.3	33	-
11	F	43	LAGB	39.8	36.3	59	DM, HT

gastrointestinal series and endoscopy. In this group, one patient underwent ring removal, one patient underwent Roux-en-Y gastric bypass and two patients underwent SG as revision/reversal procedures. In patients with previous LAGB, mechanical side effects were the indications (band slippage in one patient and band migration in five patients) of surgery: One patient underwent band removal, two patients underwent SG, two patients underwent VBG and one patient underwent mini-pouch gastric bypass as revision/reversal procedures. The patient who had been revised from VBG to SG had excessive weight loss. A gastrocolic fistula between transverse colon and stomach was determined in upper gastrointestinal series (Figure 1). Total gastrectomy and segmental colon resection were performed. At the mean follow-up of 13 months (6-19 months), the mean BMI and %EBMI were 32.3 kg/m^2 and 37.4%, respectively (excluding cases 4, 6 and 7). Tables 1 and 2 show demographic information, revision procedure and postoperative outcomes of the patients.

The overall morbidity rate in our series was 27.2%. There was leak in one patient who had previous VBG (Figure 2). In this patient, SG was performed as the revision procedure and the patient did not require a reoperation. Other complications included pneumonia in one patient and pulmonary embolism in one patient. None of the patients died.

FIGURE 1: Upper gastrointestinal series showing gastrocolic fistula.

The length of hospital stay was longer in patients with leak.

DISCUSSION

As the number of bariatric operations increases, bariatric surgeons face with increasing number of patients requiring revision operations. In our study, the most common reasons for revision operations were inadequate weight loss and mechanical complications and this finding was consistent with literature.[5-7] Van Gemert et al. reported the inci-

TABLE 2: Postoperative outcomes of patients.

Case no	Revision type	Current BMI (kg/m^2)	%EBM	Follow-up period (month)	Operative time (min)
1	Roux-en-Y gastric bypass	33.9	37.3	6	145
2	mini-pouch gastric bypass	32.7	33	8	184
3	SG	33.2	33.8	10	93
4	Ring removal	33.6	*	11	78
5	SG	32.8	31.5	12	85
6	Total gastrectomy+Roux-en-Y reconstruction	25.1	*	14	165
7	Band removal	35	*	14	69
8	VBG	31.9	40.5	15	100
9	VBG	31.8	43.4	17	74
10	SG	30.6	39.7	17	110
11	SG	31.7	40	19	95

* not calculated.

dence of revision as 56% after VBG as the primary operation.[8] The incidence of revision has been reported between 3.5% and 60% after LAGB.[9,10] In our study, all patients who underwent revision had previous restrictive procedures.

The most common complications in LAGB were esophagitis, pouch dilatation, esophageal dilatation, port problems, band migrations and band leakage.[11-13] Five patients with LAGB underwent revision surgery because of mechanical complications. It is important to consider the reason for surgery while deciding the type of revision surgery. In general, we prefer bypass operations as revision procedures in patients with inadequate weight loss, and we prefer VBG or SG as revision procedures if mechanical complications occur in patients who previously underwent restrictive procedures. Failed or complicated bands are normally re-banded, or band is removed and the patient is revised to SG or bypass.[4,14] We performed SG (in two patients) and VBG (in two patients) as revision procedures. Mini-pouch gastric bypass was performed in one patient because of patient preference. It is known that SG could provide weight loss after previously failed LAGB. In the past, VBG has been the common surgical procedure, but long-term follow-up has shown unsatisfactory weight loss.[15] The reason for failure of procedure was disruption of the stapler-line, after patients are able to eat large meals or due to maladaptive eating habits. Many authors criticize VBG as a revision procedure. Nevertheless, VBG has a historical value and can be a procedure in the future if performed through endoscopic channels. Recently, successful transoral endoscopic revision of the gastric pouch and stoma following bypass surgery has been reported.[16] We hope that VBG can be a procedure for the future if performed through endoscopic channels. When staple line dehiscence occurs in a patient who previously underwent VBG, transoral endoscopic revision may be feasible.

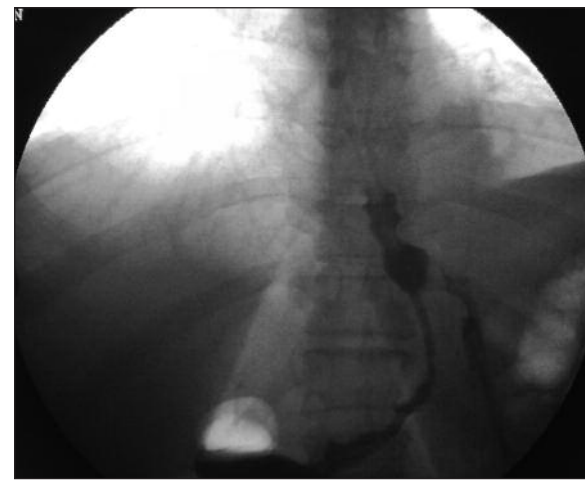

FIGURE 2: Upper gastrointestinal series showing stapler-line leaka at the gastroesophageal junction.

There is no consensus so far to evaluate properly the results of revision surgery. Many studies

have shown that Roux-en-Y gastric bypass is the operation of choice for satisfactory weight loss in revision surgery.[6] On the other hand, a prospective series has demonstrated that weight regain was observed in 24 months after Roux-en-Y gastric bypass in approximately 50% of patients.[17] We think that VBG can still be used in selected patients with adaptive eating habits. Hence, we performed VBG in two patients with failed LAGB as revision procedures. The VBG as a revision procedure seems to be effective in selected patients. Further studies are needed to evaluate its long-term feasibility.

VBG is pure restrictive procedure and its efficacy to achieve weight loss has largely been demonstrated.[18] Unfortunately, regain of weight occurs frequently and the patients with VBG require a revision surgery. Several technical options are offered as an alternative to failed VBG: Revision VBG, conversion to Roux-en-Y gastric bypass, to gastric banding and recently to SG.[8,14,19-23] Studies have shown that SG is safe and effective in achieving adequate weight loss in most patients.[24,25] We performed Roux-en-Y gastric bypass in one and SG in two patients with failed VBG. The polypropylene rings were removed to prevent occurrence of late inflammation in patients who were revised from VBG to SG.

Overall, revision cases in this series achieved better weight loss when compared to their prerevisional values. Mean EBMI% was 37.4% (31.5-43.4) and mean BMI was 32.3 kg/m^2 (30.6-33.9). The therapeutic success of bariatric surgery was defined as the presence of one of the following factors: Excess weight loss >50% or BMI <35 for morbidly obese patients (preoperative BMI <50) and BMI<40 for super-obese patients (preoperative BMI>50).[26] Cases 4, 6 and 7 should be excluded as band/ring removal was performed in two patients (case 4 and 7) and total gastrectomy was performed in patient with gastrocolic fistula. The patients with VBG (case 4) had a stenosis of the gastric pouch outlet, and the patient with LAGB (case 7) had a partial band migration. Both patients requested band/ring removal but not revision surgery. Naturally, these patients gained weight after the operation. The patient who had been revised from VBG to SG (case 6) complained of excessive weight loss and diarrhea occurring immediately after meals. We performed total gastrectomy and segmental colon resection in this patient because of gastrocolic fistula. Excluding these three patients, the results have showed that revision surgery is effective in achieving weight loss. All complications of the primary procedure were reversed after revision procedure.

Revision surgery is technically more difficult and associated with higher morbidity and mortality rates when compared to primary procedures. Revision of previous bariatric procedures has a higher risk of leakage.[27] Jones reported mortality and morbidity rates as 0.86% and 14%, respectively.[28] The rate of stapler-line leak varies from 0.7% to 5.3%.[29,30] The majority of series describe the failure in the upper third of the stomach.[29,30] In our patient, it was at the gastroesophageal junction. Diagnosis was made by upper gastrointestinal series. The patient was treated conservatively. Healing time of the fistula was 53 days.

CONCLUSION

Revision surgery should be available in all Bariatric Centers of Excellence. Although, the number of patients was small, this is the first series of revision surgery from Turkey. Our study suggests that revision bariatric surgery can be performed with satisfactory short-term weight loss and should be included in the continuum of care of morbid obesity. The knowledge of the potential complications associated the revision surgery and their management is crucial for patient's safety. The type of revision procedure as well as the appropriate patient follow-up and compliance are important for the final outcomes.

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