

One-Year Outcomes of Laparoscopic Adjustable Gastric Banding Based on Bariatric Analysis and Reporting Outcome System (BAROS) in Morbidly Obese Korean Patients

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Purpose: This study aimed to compare amount of weight loss, serum laboratory results, and bariatric analysis and reporting outcome system (BAROS) scores obtained before surgery with those obtained 1 year after laparoscopic adjustable gastric banding (AGB). **Materials and Methods:** From January 2013 to November 2014, 32 consecutive patients who underwent AGB were enrolled in this study. This study was a retrospective analysis of our prospectively collected database. The BAROS score included BAROS weight, medical condition, quality of life, and complications recorded 1 year after AGB. Demographic and post-operative data were also collected and analyzed. **Results:** Thirty-two patients were enrolled in this study, comprising 26 women and 6 men, with an average body mass index of 39.0 ± 6.1 kg/m². The total BAROS score 1 year post AGB was 4.6 ± 1.7 , and it was classified as excellent grade. Among them, the quality of life score was 1.8 ± 0.6 . Four minor complications were noted. The serum laboratory values improved 1 year post surgery, including hemoglobin A1c, c-peptide, insulin, Homeostatic model assessment of estimated insulin resistance (HOMA IR), Homeostatic model assessment of beta-cell function (HOMA B), triglyceride, total protein, and uric acid. **Conclusion:** AGB showed that it is acceptable in aspect of BAROS outcome as well as weight loss, and serum laboratory result in short-term period.

Key Words: Bariatric surgery, Adjustable Gastric banding, BAROS

INTRODUCTION

Laparoscopic adjustable gastric banding (AGB) is a restrictive operation that has the advantages that it is readily performed by minimally invasive surgery, is adjustable, and can be reversed if necessary. In Korea, from 2003 to 2013, AGB (67.2%) was the most popular operation compared to any other surgical methods such as sleeve gastrectomy (14.2%) and Roux-en-Y gastric bypass (12.7%) [1].

Several methods to evaluate the outcomes of bariatric surgery have been introduced. Bariatric analysis and reporting outcome system (BAROS) is one of the most acceptable questionnaires. It is easy to use among several evaluation tools such as SF-36 scale [2], Sickness Impact Profile [3], and Bariatric Quality of Life [4]. BAROS provides a standard for comparing outcomes of different bariatric procedures using a simple, objective, unbiased method in an evidence-based fashion [5,6]. This system is a simple

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perioperative period. Each major complication led to deduction of one point and a minor complication led to deduction of 0.2 points. Outcomes of BAROS were classified into five groups according to the total score: failure (0 points or less), fair (>0 to 1.5 points), good (>1.5 to 3 points), very good (>3 to 4.5 points), and excellent (>4.5 to 6 points) [5].

Percentage excess body mass index loss (%EBMIL) was calculated by using the formula $(\text{Initial BMI} - \text{current BMI}) \times 100 / (\text{initial BMI} - 25)$. The %EBMIL was calculated every 3 months until 1 year.

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. The comparisons of serum laboratory values and %EBMIL before and after surgery were performed by a paired T-test or the Wilcoxon signed rank test. The data were evaluated by the normality test through Kolmogorov-Smirnov test and Shapiro-Wilk test.

RESULTS

1. General characteristics

Thirty-two patients, comprising 26 women and 6 men, were enrolled in this study. The mean age was 33.0 ± 8.7 years, and the average BMI, before adjusting gastric banding, was $39.0 \pm 6.1 \text{ kg/m}^2$. They had an average of 3.7 comorbidities (range, 0 to 6). Twenty-nine patients had 1 or more co-morbidity. Five patients underwent a revisional or conversion operation. All operations were performed after 1 year from the primary adjusting gastric banding. The mean interval of re-operation from primary surgery was 27.8 ± 9.2 months. Two patients underwent sleeve gastrectomy. Three patients underwent a revisional surgery, including included band reposition, band removal, and gastric plication during their follow-up period. The mean period of follow up was 32.3 months (Table 1).

2. Bariatric analysis and reporting outcome system score at 1 year post AGB

No patients gained weight at 1 year post surgery. Two patients (6.3%) reported between 0% EWL and 24.9% EWL,

9 (28.1%) reported 25% EWL to 49.9% EWL, 12 (37.5%) reported 50% EWL to 74.9% EWL, and 9 (28.1%) achieved greater than 75% EWL. No patients had aggravated medical condition. The number of patients with no change in medical condition was 5 (15.6%). Twenty-three (71.9%) patients showed improvement and 4 (12.5%) patients showed resolved comorbidities. The average of total QOL scores was 1.8. The mean score of self-esteem was 0.7 ± 0.3 (range, 0 to 1.0), physical activity was 0.4 ± 0.2 (range, 0 to 0.5), social activity was 0.3 ± 0.2 (range, 0 to 0.5), labor activity was 0.3 ± 0.2 (range, 0 to 0.5), and sexual activity was 0.1 ± 0.2 (range, -0.25 to 0.5), respectively. The number of patients with minor complications was 4 (12.5%), and the other 28 patients (87.5%) did not have any complications. All 4 patients who were noted to have minor complications developed pouch dilatation that resolved with defiling hand.

The mean combined BAROS score was 4.6 ± 1.7 and it belonged to excellent grade. According to this system, no patients were classified as having a failure. One patient (3.1%) had a fair outcome, 4 patients (12.5%) had a good outcome, 9 patients (28.1%) had very good outcome, and 18 patients (56.3%) had an excellent outcome (Table 2).

Table 1. Patients' general characteristics

Characteristics (n=32)	
Age	33.0 \pm 8.7
Sex	
Female	26 (81.3%)
Male	6 (18.7%)
Weight (kg)	104.6 \pm 17.9
Height (cm)	163.7 \pm 8.7
Body mass index (kg/m ²)	39.0 \pm 6.1
Co-morbidities ^a	
Fatty liver	23
Dyslipidemia	20
Arthritis & back pain	18
Obstructive sleep apnea	15
Hypertension	11
Dys- or amenorrhea	10
Type II diabetes mellitus	8
Reflux esophagitis	7
Gout	2
Hiatal hernia	2
GB stone	1
Asthma	1
Period of follow up (Months)	32.3 \pm 7.9

^aIncluded in duplication.

Table 2. Bariatric analysis and reporting outcome system score 1 year after AGB

Characteristics	Value	Failure	Fair	Good	Very good	Excellent
BAROS weight	1.9±0.9	0 (0%)	2 (6.3%)	9 (28.1%)	12 (37.5%)	9 (28.1%)
Medical condition*	1.0±0.5	0 (0%)	5 (15.6%)	23 (71.9%)	4 (12.5%)	
Quality of life	1.8±0.6					
Self-esteem	0.7±0.3	0 (0%)	0 (0%)	1 (3.1%)	15 (46.9%)	16 (50.0%)
Physical activity	0.4±0.2	0 (0%)	0 (0%)	2 (6.3%)	15 (46.9%)	15 (46.9%)
Social activity	0.3±0.2	0 (0%)	0 (0%)	3 (9.4%)	18 (56.3%)	11 (34.4%)
Labor activity	0.3±0.2	0 (0%)	0 (0%)	5 (15.6%)	13 (40.6%)	14 (43.8%)
Sexual activity	0.1±0.2	0 (0%)	2 (6.3%)	16 (50.0%)	12 (37.5%)	2 (6.3%)
Complications	0.0±0.1		4 (12.5%)**	28 (87.5%***)		
Total	4.6±1.7	0 (0%)	1 (3.1%)	4 (12.5%)	9 (28.1%)	18 (56.3%)

*Comorbidities resolution gives +2 points (very good), its improvement gives +1 point (good), no change is scored 0 (fair) and worsening gives 1 point (failure).

**Minor complication = deduct 0.2 points.

***No complication.

Table 3. Changes in serum laboratory values

Parameter	Before surgery	After 1 year	P-value
HbA1c (%) [*]	6.3±2.0	5.5±0.6	0.003
C-peptide (ng/ml)	3.5±2.0	2.5±1.3	0.043
Insulin (uU/ml) [*]	19.9±11.8	8.6±5.0	<0.001
HOMA IR ^{a*}	5.2±3.3	2.1±1.4	<0.001
HOMA B ^{b*}	519.8±1708.4	96.5±58.1	<0.001
Fasting blood glucose (mg/dl) [*]	110.6±46.8	96.5±11.6	0.091
Total cholesterol (mg/dl)	202.7±33.2	200.7±32.0	0.835
High density lipid (mg/dl) [*]	54.9±12.2	55.7±10.1	0.330
Low density lipid (mg/dl)	126.2±26.9	125.3±32.1	0.909
Triglyceride (mg/dl)	148.4±68.3	109.7±56.6	0.007
Total protein (g/dl)	7.3±0.4	7.1±0.4	0.021
Albumin (g/dl)	4.6±0.4	4.6±0.3	0.297
Uric acid (mg/dl) [*]	5.9±1.5	5.3±1.7	0.027

*They were analyzed by a non-parametric statistical test.

^aHomeostatic model assessment of estimated insulin resistance.

^bHomeostatic model assessment of beta-cell function.

3. Changes in serum laboratory values

The laboratory results related to type 2 diabetes mellitus had improved significantly at 1 year post surgery, including HbA1c (from 6.3±2.0 to 5.5±0.6 %, P=0.003), C-peptide (from 3.5±2.0 to 2.5±1.3 ng/ml, P=0.043), insulin (from 19.9±11.8 to 8.6±5.0 uU/ml, P<0.001), Homeostatic model assessment of estimated insulin resistance (HOMA IR) (from 5.2±3.3 to 2.1±1.4, P<0.001), and Homeostatic model assessment of beta-cell function (HOMA B) (from 519.8±1708.4 to 96.5±58.1, P<0.001). In addition, the results of triglyceride (from 148.4±68.3 to 109.7±56.6 mg/dl, P=0.007), total protein (from 7.3±0.4 to 7.1±0.4

g/dl, P=0.021), and uric acid (from 5.9±1.5 to 5.3±1.7 mg/dl, P=0.027) had also improved (Table 3).

4. Changes of percentage of excess body mass index loss (%EBMIL)

The weight loss presented with a mean 30.8±14.6% EBMI in the first 3 months and 48.0±22.1% EBMI at 6 months, 61.8±28.6% EBMI at 9 months, and 73.0±33.9% at 12 months after surgery. Moreover, there were significant differences in the values between 3 months and 6 months (P<0.001), between 6 months and 9 months (P<0.001), and between 9 months and 12 months (P<0.001) (Fig. 2).

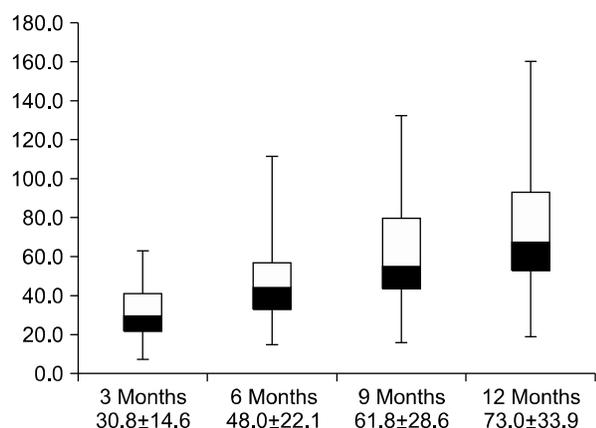


Fig. 2. Changes in percentage of excess body mass index loss (%EBMIL).

DISCUSSION

AGB is a restrictive bariatric operation that is reversible, safe, and relatively simple to perform. The outcomes of AGB have been well-known in Western countries and also demonstrated through several reports in Korea [1,7-9]. However, there were no reports of Korean owned data to be evaluated by BAROS score, yet. Whether the results of bariatric surgery in Korea are comparable with those in Western countries remains unknown. This study is the first in Korea that reports that the outcome of AGB when evaluated by BAROS.

The result of BAROS score in this study was better than that of other study. There was no “failure” grade, and 56.3% of patients belonged to the “excellent” category. In contrast, one study reported that about 22% of patients were categorized as having “fair”, about 39% of patients as having “good”, about 18.5% of patients as having “very good”, and about 2% of patients as having “excellent” outcomes [9]. The other study demonstrated that the outcome was considered “very good” in 3%, “good” in 7%, “fair” in 40%, and “failure” in 50% patients [10]. We postulated that our result was better compared to that of studies because the time to fill in the BAROS questionnaire was as short as 12 months compared to 55 months [9] and 48 months [10] in those studies. AGB appeared to result in relatively poor long-term outcomes associated with several complications and a high incidence of reoperation [11-14].

BAROS gives a broader assessment of the outcome than

solely the use of percentage of the excess weight loss [5]. Among the limitations of BAROS is an exclusion of patients with perioperative deaths and the ones lost to follow-up. However, BAROS is a valuable and easy tool for the evaluation of patients who have undergone bariatric surgery. It is simple to apply, does not depend on the bariatric operation, and takes complications, reoperations and aggravated medical diseases easily into consideration. Several other evaluation tools of QOL are available and several studies have reported improvement in the quality of life using all of the indices, which has given inconsistent results [6,15-17]. One study was introduced as Bariatric Quality of Life-questionnaire of Weiner, which contained 24 difficult questions, and complication, reoperation, and aggravated medical diseases were not included [18]. With BAROS, the objective, as well as subjective information, was used to derive the score and compare operations and centers [19].

In our study, 4 minor complications were noted in year 1. All these patients suffered from pouch dilatation and the complications were resolved by non-surgical intervention. Interestingly, during the total follow-up period, 5 patients had a revisional or conversion operation performed after 1 year of primary AGB. Out of the 5 patients, 2 patients underwent a sleeve gastrectomy and 3 patients had a band reposition, band removal, and gastric plication. The mean interval between primary AGB and a revisional or conversion operation was 27.8 ± 9.2 . However, the 4 patients with minor complications who were included in BAROS score of this study were not included in the group of revisional or conversion operations. Although AGB has many advantages, only 30% of patients with gastric bands rated their life as “good” 10 and 14 years after surgery [8]. Indeed, several long-term studies on AGB have reported that revision or conversion operations are frequently required to manage the ensuing complications [11-14]. After 1 year, the BAROS score in this study presented a good outcome. However, because major complications might occur 1 year after surgery, another long-term study about BAROS scoring will be needed.

The main limitations of this study were that it was a small case series conducted at a single institution and utilized a retrospective study design that might have resulted in bias.

However, this is the first study using BAROS scoring to evaluate the outcome of AGB for Korea patients after 1 year.

In conclusion, in a short-term period, AGB showed acceptable BAROS outcomes as well as weight loss and serum laboratory result.

CONFLICT OF INTEREST

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

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