Comparison of the efficacy of standard bariatric surgical procedures on Saudi population using the bariatric analysis and reporting outcome system

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ABSTRACT

الهدف: لمقارنة فعالية مختلف العمليات الجراحية لعلاج البدانة القياسية باستخدام تحليل السمنة ونظام الإبلاغ الختامية .

الطريقة: إنها دراسة استطلاعية، وصفية تحليلية أجريت في اثنين من المؤسسات الطبية في المملكة العربية السعودية. أدرجت ما مجموعه 270 مريضا خضعوا لجراحة لعلاج البدانة مختلفة خلال الفترة من مارس 2010 إلى ديسمبر 2012. تم تحليل البيانات وسجل ضد ثلاث نتائج، الزائدة وفقدان الوزن، وعلاج أو تحسين شارك في حالة مرضية، ونوعية التغيرات في الحياة.

النتائج: وكان جميع patients who شملت إجراءات لعلاج البدانة مختلفة في دراستنا. من سكاننا، 79 (29.3%) خضعت بالمنظار رو اون–Y تجاوز المعدة (LRYGBP، 159 (58.9%) لديهم بالمنظار كم استئصال المعدة (LSG)، و32 (11.9%) وكان بالمنظار قابل للتعديل المعدة التطويق (LAGB). وذكر Complete remission من الاعتلال المشترك واحد على الأقل في 36% من LRYGBP، و 51% في LSG، و42% في LAGB. في حين أن جميع المرضى الآخرين قد تحسنت التواكب المرضي. النتيجة BAROS كانت جيدة أو أعلى في 78.5% من LRYGBP، 83.6% للLSG، و 84.4% من LAGB patients. وكان متوسط الزائدة وفقدان الوزن 67.9%،75.8%,81.7% على التوالي و. توفر علاج السمنة جراحة انخفاض كبير في الوزن الزائد، وتحسين والشفاء من شارك في حالة مرضية، وتحسين نوعية الحياة: الخلاصة.

الخلاصة: إجراءات لعلاج البدانة القياسية لها درجات مختلفة من النتائج التي يمكن أن تكون مفيدة في اختيار الإجراء المناسب للمؤشرات والمرضى المناسبة.

Objectives: To compare the efficacy of various standard bariatric surgical procedures using the Bariatric Analysis and Reporting Outcome System (BAROS).

Methods: This is a prospective, descriptive analytical study conducted in 2 medical institutions in Saudi Arabia. A total of 270 patients who had different bariatric surgery during the period between March 2010 and December 2012 were included. The data was analyzed and scored against 3 outcomes, excess weight loss, cure or improvement of comorbidities, and quality of life changes.

Results: All patients who had different bariatric procedures were included in our study. Seventy-nine (29.3%) underwent laparoscopic Roux-en-Y gastric bypass (LRYGBP), 159 (58.9%) had laparoscopic sleeve gastrectomy (LSG), and 32 (11.9%) had laparoscopic adjustable gastric banding (LAGB). Complete remission of at least one comorbidity was reported in 36% of LRYGBP, 51% in LSG, and 42% in LAGB. While all other patients have improved comorbidities. The BAROS score was good or higher in 78.5% of LRYGBP, 83.6% for the LSG, and 84.4% of LAGB patients. The average excess weight loss was 67.9% in LRYGBP, 75.8% in LSG, and 81.7% LAGB patients.

Conclusion: Bariatric surgery provides a substantial reduction in excess weight, improvement and cure of comorbidities, and improvement in quality of life. Standard bariatric procedures have different degrees of outcomes that can be beneficial in selecting appropriate procedure for appropriate indications and patients.

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Obesity is now considered a chronic disease, which has attained the proportions of an epidemic all over the world. According to the World Health Organization (WHO) statistics, there is a drastic rise in the obese population reaching to approximately 700 million people in 2015 compared with 300 million population reported in 2005.[1] It is associated with a number of diseases such as diabetes mellitus, hypertension, and respiratory disease to name a few.[2] Walker et al[3] claim that an increase in visceral adipose tissue increases the risk of developing obesity associated metabolic comorbidities. Therefore, depending upon the distribution of fat, its anatomic, cellular, and molecular structure are factors that play a role in the pathogenesis of obesity related problems.[3] In Saudi Arabia, overall overweight/obesity prevalence is progressively increasing from 20% in 1996,[4] to 35% in 2005,[5] up to 75% including Arabian Gulf States in 2011 with 20,000 deaths per year due to obesity and related comorbidities.[6] Various bariatric surgical procedures being practiced have proved to be the most effective and sustainable procedures for body weight loss. In addition, there is a substantial proof that these procedures improve the comorbidities and improve the quality of life (Qol) to a reasonable level.[7,8] The results of these surgical procedures are very encouraging compared to various non-surgical weight loss programs and there is an overall 30% reduction in the mortality in patients who had one of these procedures.[9-12] The aim of this study is to find out optimum standard procedure in Saudi patients using Bariatric Analysis and Reporting Outcome System (BAROS), which very effectively evaluates the results of obesity treatments employed by analyzing 3 domains; weight loss after treatment, changes or cure in the comorbidities, and Qol post treatment. Three points are given for each gain and points are deducted in case of failure, or complications.

Methods. This is a prospective analytical descriptive study of all patients who have had a bariatric surgery procedure performed for morbid obesity during a period between March 2010 and December 2012. A total number of 270 Saudi patients had surgeries using the standard bariatric surgical procedures at 2 different institutes.

The inclusion criteria were patients with valid consent with a body mass index (BMI) of ≥40 as well as physically and mentally fit. The exclusion criteria were patients with BMI of <35 and with physical and psychological unfit profile.

The ethical approval was obtained from the Unaizah College of Medicine, Department of Surgery, Qassim University, and this study was carried out according to the principles of the Helsinki declaration. Patients were thoroughly assessed before surgery for general anesthesia, surgical fitness as well as for the presence of comorbid conditions that required pre-operative management such as diabetes mellitus, hypertension, obstructive sleep apnea, dyslipidemia. The questionnaire was translated into Arabic language and validated in 50 patients using the test-re-test method. Permission and approval from the authors of BAROS were taken and data was collected from the patients upon admission and averaging a year's time postoperatively. Before proceeding to surgery, each patient was inform on the possible complications, such as changes in life style, expected weight loss, and finally an informed consent was taken from the patient or next of kin to undergo surgery and participate in the study, which was optional for latter. The ethical approval (IRB) was obtained from both institutes to carry out the study. Patients were followed-up postoperatively approximately after one week, 6 weeks, 3 months, 6 months, and one year after surgery. Patients were interviewed either face to face or contacted by phone to answer the questionnaire, followed by items scoring. Demographic data, pre- and post- operative weight, BMI, major comorbidities cure, or improvement postoperatively, including hypertension, cardiovascular disease, dyslipidemia, type II diabetes, sleep apnea/obesity hypoventilation syndrome (OHS), osteoarthritis, and infertility were included in the questionnaire when applicable. Other minor comorbidities such as idiopathic intracranial hypertension, lower extremity venous stasis disease, gastroesophageal reflux disease, and urinary stress incontinence were also included. An overall improvement in patient's Qol was also incorporated in the same questionnaire using the Moorehead-Ardelt Quality of Life, which measures postoperative outcomes of self-perceived Qol chart based on 5 key areas: self-esteem, physical activity, social life, work conditions, and sexual activity. Various operative and postoperative major and minor complications were noted in 3 groups and compared. Data was analyzed and scored against 3 outcomes; percentage of excess weight loss, cure or improvement of comorbidities, and Qol changes. The previous data was searched in PubMed, Google scholar and PubMed central by using keywords.

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Results. Two hundred and seventy morbidly obese patients were enrolled in this study conducted at 2 different health institutes in Saudi Arabia during the period between March 2010 and December 2012 comparing outcomes of standard bariatric surgical procedures performed on these patients using the BAROS. Seventy-nine patients (29.3%) underwent laparoscopic Roux-en-Y gastric bypass procedure (LRYGBP), 159 (58.9%) had laparoscopic sleeve gastrectomy (LSG), and 32 (11.95%) had laparoscopic adjustable gastric banding (LAGB). The overall female to male ratio was 2.5:1, 0.8:1, 1.3:1. Gender and age comparisons of patients and the 3 surgical procedures is shown in **Table 1**. The prevalence rate of female was 147 (54.5%) compared with male 45.5%. However, males were significantly higher among sleeve patients, whereas females were significantly higher among bypass patients ($p<0.001$); while LRYGBP patients were significantly older (64 years) in age ($p<0.001$).

The average excess weight loss (EWL) was summarized in **Table 2**. The average weight loss after each procedure was compared using paired t-test between weight in kilograms before and after the surgery within each group, which revealed a substantial weight reduction in patients who had sleeve gastrectomy compared with adjustable banding and bypass surgical procedures ($p<0.001$).

There was an obvious improvement/resolution of the comorbidities during one year follow up of these patients with a 95% improvement in the Qol using the Moorehead-Ardelt Quality of Life questionnaire II (**Table 3**). The Qol was scored highest after gastric banding followed by gastric bypass and sleeve gastrectomy procedures. Improvement of comorbid conditions were best scored after gastric bypass followed by sleeve gastrectomy and gastric banding almost equally. However, cure of comorbidities was scored best after gastric bypass and sleeve gastrectomy almost equally followed by gastric banding.

Most surgical complications came from the 3 procedures accounted for 2.9% (n=8), while minor surgical complications accounted for 21.11% (n=57)

Table 3 - Comparison between 3 types of operations regarding score of Moorehead and Ardelt quality of life, and medical condition after the operation in 270 patients.

Variable	Type of operation			*P*-value
	Bypass (n=79)	Sleeve (n=159)	Banding (n=32)	
Quality of life				0.77
Poor	2 (2.5)	8 (5.0)	1 (3.1)	
Fair	4 (5.1)	9 (5.7)	1 (3.1)	
Good	16 (20.3)	39 (24.5)	5 (15.6)	
Very good	57 (72.2)	103 (64.8)	25 (78.1)	
Medical condition				0.51
No previous illness	54 (68.4)	120 (75.5)	25 (78.1)	
Improved	16 (20.3)	19 (11.9)	4 (12.5)	
One major illness treated	9 (11.4)	20 (12.6)	3 (9.4)	

Table 1 - Demographic data of 270 patients underwent different techniques.

Variables	By pass (n=79)	Sleeve (n=159)	Banding (n=32)	*P*-values
Gender				<0.001
Male	20 (25.3)	89 (56)	14 (43.8)	
Female	59 (74.7)	70 (44)	18 (56.2)	
Age in years (mean±SD)	36.41 ± 8.87	31.87 ± 9.83	34.75 ± 11.24	<0.001
Body mass index	47.51	48.59	38.45	<0.087

Table 2 - Comparison of weight reduction in three types of operations.

Variable	Type of operation		
	Bypass (n=79)	Sleeve (n=159)	Banding (n=32)
Weight before (mean±SD)	126.9 ± 24.97	135.1 ± 30.62	113.2 ± 26.5
Weight after (mean±SD)	88.28 ± 23.87	85.52 ± 23.37	90.06 ± 27.98
P-value	<0.001	<0.001	<0.001

Table 4 - Surgical complications of 270 patients in 3 procedures.

Surgical complications	RYGBS n=79	SG n=159	LAGB n=32
Major surgical complications			
Bleeding	2 (2.5)	1 (0.6)	0
GI leak	1 (1.3)	0	0
Severe wound infection	2 (2.5)	1 (0.6)	0
Pneumonia	2 (2.5)	1 (0.6)	0
Internal herniations	0	0	0
Minor surgical complications			
Nausea	13 (16.5)	11 (6.9)	9 (28.1)
Persistent vomiting	2 (2.5)	1 (0.6)	5 (15.6)
Occasional dysphagia	0	0	2 (6.3)
Heartburns	0	2 (1.5)	0
Dumping	1 (1.3)	0	0

RYGBS - Roux-en-Y gastric bypass, SG - sleeve gastrectomy, LAGB - laparoscopic adjustable gastric banding, GI - gastrointestinal

Table 5 - Non-surgical complications in 270 patients.

Complication	Procedure		
	RYGBS n=79	LSG n=159	LAGB n=32
Depression	2 (2.5)	1 (0.6)	0
Loss of appetite	1 (1.3)	0	0
Dizziness	0	1 (0.6)	1 (3.12)
Hyperphagia	1 (1.3)	0	0

RYGBS - Roux-en-Y gastric bypass, SG - sleeve gastrectomy, LAGB - laparoscopic adjustable gastric banding

(**Table 4**). One patient who had postoperative bleeding was managed effectively by stopping the intravenous heparin and reversing it with Protamine sulphate 1 mg/50 IU heparin. This patient was transfused with 2 units of packed red cells in total.

One gastro-jejunal anastomotic leak after laparoscopic gastric bypass was recognized gastro graf on the first postoperative day and was treated successfully within 24 hours by laparoscopic washings and suture repair of a posterior missed leak supported with an omental patching. Both patients recovered well and discharged in good condition. Overall excellent\very good\good outcomes group scoring was achieved in 62 (78.5%) after gastric bypass, 133 (83.65%) after sleeve gastrectomy, and 18 (56.25%) gastric banding patients. Failure was reported the highest after gastric banding (12.5%), followed by gastric bypass (5.1%), and sleeve gastrectomy (3.8%) (**Tables 5 & 6**).

Discussion. Obesity is now considered to be a chronic ailment, which has gained the status of an epidemic in the world.[13] Various non-surgical methods have failed to bring a substantial reduction in weight and sustaining reduction afterwards. The bariatric surgical procedures evolved as the best way of providing a significant and maintained weight loss, improving or curing the obesity related comorbidities, and improving the Qol.[14] The outcomes of the individual bariatric procedure vary and are unpredictable.[15] This study is performed to compare the results of the 3 most commonly performed surgical procedures including adjustable gastric banding, bypass surgery, and sleeve gastrectomy to discuss the efficacy of each procedures on Saudi population using the BAROS. The BAROS is an effective tool to evaluate success in the bariatric surgery in terms of loss of weight, improved Qol, and improved/cured comorbidities as outcome measures.[16] This study shows a considerable weight reduction for sleeve gastrectomy compared to adjustable gastric banding and gastric bypass surgery. This is consistent with the findings of other similar studies showing sleeve gastrectomy to be superior to other procedures in weight reduction.[17,18] Yazbec et al[19] have claimed sleeve gastrectomy to be a better option in failed gastric banding operation. This is further confirmed by Coskun et al[20] stating that sleeve gastrectomy is a safe and reliable procedure after failed laparoscopic gastric plication and gastric banding procedures. Sleeve gastrectomy has gained a lot of popularity over the past few years due to its efficacy and substantial weight loss properties.[21] There are reports claiming that more patients regain weight in medium term results after undergoing sleeve gastrectomy[22] while others[23] claim that outcomes were similar between Roux-en-Y Gastric bypass (RYGB) and sleeve gastrectomy (LSG), and both of these procedures were superior to adjustable gastric banding.

Table 6 - Comparison between three types of operations regarding Bariatric Analysis and Reporting Outcome System BAROS score.

Variable	Type of operation			*P*-value
	Gastric bypass (n=79)	Sleeve (n=159)	Banding (n=32)	
BAROS score				
Failure	4 (5.1)	6 (3.8)	4 (12.5)	0.12
Fair	13 (16.5)	20 (12.6)	10 (31.2)	0.03*
Good	38 (48.1)	73 (45.9)	11 (34.4)	0.4
Very good	20 (25.3)	48 (30.2)	6 (18.8)	0.37
Excellent	4 (5.1)	12 (7.5)	1 (3.1)	0.56

*Fair BAROS score is significantly higher among patients with banding operation. Also, the prevalence of very good BAROS score in sleeve operation (30.2%) is higher than by gastric pass (25.3%) and banding (18.8%) operations

The present study incorporated Moorehead-Ardelt Quality of Life questionnaire to measure the

improvement in Qol to compare the outcomes of individual bariatric surgery procedure. The prevalence of good Qol after sleeve operation reasonably higher than bypass operation and banding operation in the present study (24.5%, 20.3% and 15.6% respectively). Our results are consistent with other similar studies confirming a substantial improvement in Qol after different bariatric surgical procedures.[24,25] Our study also indicates that SG operation is much superior in improving the comorbidities compared to sleeve LRYGBP and LGB while many other studies have reported that gastric bypass surgery is the gold standard and more reliable and persistent in improving or curing the associated diseases.[26-31] Our study shows the prevalence of very good BAROS score in sleeve (LSG) operation (30.2%) which is fairly higher than by pass (25.3%) and banding (18.8%) operations. Aarts et al[32] also have similar observations about gastric banding in the long term while Suter et al[33] strongly recommend gastric bypass surgery to be superior according to the BAROS scoring. Our study shows the percentage of all types of complications, major or minor, are higher (26.6%) in LRYGBPS compared with other 2 techniques. These results are consistent with findings of similar comparative studies conforming that sleeve gastrectomy is a safe option among other related bariatric surgery procedures.[34,35]

Study limitation. A follow up for a longer duration is a difficult task as majority of patients are lost in follow up.

In conclusion, the standard bariatric procedures are very effective in reducing and sustaining excess body weight, for cure and improvement of comorbidities, and Qol improvement in morbidly obese population. Standard bariatric procedures have different degrees of impact and outcomes that can be beneficial in selecting appropriate procedure for appropriate indications and patients. This study shows that LRYGB seems to work better for comorbid diseases, LSG works well for excess weight loss as well as LAGB in selected patients. We recommend that further RCT's are needed with a long term follow up to assess and establish the long term outcomes and sustainability of the observed outcomes in each group to establish a concrete conclusion.

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