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Research Article

Are Anesthetic and Psychiatric Outcomes Improved with two Stages Laparoscopic Bariatric Surgery?

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Abstract

Background: Bariatric patient is associated with hemodynamic and pulmonary changes and considered as a challenge for anesthesiologists. The aim of the present work was to compare the peri operative anesthetic and psychiatric outcomes of two stages Laparoscopic-Roux en-Y Gastric Bypass (L-RYGB) bariatric surgery.

Subject and methods: Thirty morbidly obese patients with body mass index (BMI) > 40 kg/m2 and aged 18-50 years were scheduled for two stages modified laparoscopic Roux-en-Y bariatric surgery. Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS).

Results: Significant improvement of mean blood pressure, heart rate, pulmonary function tests and blood gases at the second stage compared to the first stage surgery. This study displayed significant surgeon satisfaction at the second stage compared to the first stage. There was improvement for type II diabetes, hypertension, cholesterol level and gastro esophageal reflux. In our study there was a significant weight loss (17.5±3.9kg versus 53.5±7.6kg), Excess Weight Loss (EWL) (70% versus 22.9%), and BMI (30.1±4.6 kg/m2 versus 42.9±4.3 kg/m^2) six months following second stage compared to one month following the first stage surgery. Regarding Symptoms Check List 90-Revised (SCL 90-R) clinical scale scores there was significant difference when we compared the preoperative psychiatric symptoms with six months after the first and second stage surgery.

Conclusion: This study displayed controlled peri operative anesthesia course, effective weight loss, significant surgeon and anesthetist satisfactions, improved pulmonary function, blood pressure, heart rate, improvement of some psychiatric symptoms with the second stage compared to the first stage bariatric surgery.

Keyword: Anesthesia; Bariatric surgery; Body mass index; Hemodynamic; Pulmonary; Psychiatric

Introduction

Overweight and obesity are defined as abnormal or excessive fat accumulation that interferes with normal health. BMI is calculated as weight in kilograms divided by the square of height in meters (kg/m2). Overweight, obesity, morbid obesity and super obese are considered when BMI are (≥ 25, ≥30, >35, >55 kg/m^2) respectively [1,2]. Obesity is a global health problem and has nearly doubled since 1980. In 2008 more than 1.4 billion adults were overweight and it is known that obesity kills more people than underweight [1]. In 1996, Egypt had the highest average BMI in the world at 26.3 [3].

Excessive body weight may cause impaired pulmonary function and could lead to restrictive or occasionally obstructive pulmonary disorder. Obese subject presents damage to the respiratory mechanics causing adverse effects on the pulmonary function

such as increased respiratory effort and reduced of pulmonary volumes [4]. Obesity has a major impact on anesthesia and intensive care medicine. Peri operative anesthesia is very crucial in such patients and in turn reduces the peri operative morbidity and mortality. Bariatric anesthesia is associated with problems of intubation, oxygenation, ventilation, anesthetic dose, fluid management, and postoperative analgesia [2]. Overweight and obesity are risk factors for cardiovascular diseases, diabetes, and cancer and these co morbidities are associated with increased anesthetic risk and are expected to respond well to bariatric surgery. Bariatric surgery is indicated in patients with BMI $\geq$ 40 kg/m^2, or BMI $\geq$ 30 kg/m2 with associated co morbidities [5]. Bariatric surgery is considered very effective and sustainable way for weight loss and reducing the overall mortality [6].

A number of studies have demonstrated that patients burdened by depression and other psychiatric difficulties may have greater difficulty with weight loss after surgery [7]. The Symptom Checklist 90 Revised [SCL-90-R] [8] is a brief, commonly used self-report inventory. It consists of 90 items that assess global psychiatric distress, as well as more specific problem areas including depression, anxiety, psychosis, somatic complaints, and interpersonal strain. Between 7- 8 % of programs surveyed in 2005 reported use of the SCL-90-R in bariatric Psychiatric evaluations. The aim of the present work was to compare the peri operative anesthetic and psychiatric outcome of two stages bariatric surgery over one year study.

Subject and Methods

Thirty morbidly obese patients (BMI > 40 kg/m^2), were scheduled for two stages modified laparoscopic Roux-en-Y bariatric surgery [9]. The study was approved by ethical committee and Institutional Research Board (IRB) (Code number: R/16.11.29), also informed written consent was signed. This Quasi experimental study (pre and post) was carried out on patients with age 18-50 years at a University Hospital between August 2014 and July 2016. A convenient technique was used to recruit 66 patients and only 30 patients fulfilled the inclusion criteria, and agreed to join the study on a voluntary basis and were followed up and analyzed. Exclusion criteria included renal, liver, neuromuscular diseases, allergy to neuromuscular drugs, pregnancy and major psychological illness. Pulmonary function tests, chest-X ray, Electrocardiogram (ECG) and complete blood count were done for all patients before surgery. Bronchodilators, diuretics, aspirin, and antihypertensive drugs were continued. L-RYGB surgery was done in the form of sleeve gastrectomy (1st stage) followed by Roux-en-Y Gastric Bypass (RYGBP) or duodenal switch procedure (2nd stage). The 2nd stage procedure was performed six months after the 1st stage operation. Increased sensitivity to sedatives is very common in patients with Obstructive Sleep Apnea Syndrome (OSAS) and the dose was reduced or even avoided. Handling of the airway is a major step in managing obese patients. McCoy laryngoscope, Glidoscope, laryngeal mask airway and fiber optic laryngoscope were available. Non-invasive blood pressure, ECG, pulse oximetry, capnography, core temperature, and nerve stimulator were used for monitoring.

Crystalloid solution at a rate of 20 ml /kg for the first hour was administered to all patients before induction of anesthesia, followed by 5 ml /kg/h until the end of the surgery. Rapid sequence induction with 2.5mg/kg propofol in addition to 2mg/kg suxamethonium and the correct position of the cuffed armored end tracheal tube was confirmed with capnography and lung auscultation. Patients were mechanically ventilated with a volume preset mode using 50% oxygen /air mixture. Respiratory rate and tidal volume were adjusted according to Peripheral Oxygen Saturation (SPO2) and end tidal carbon dioxide ($EtCO_2$) (32-36 mm Hg). Positive End Expiratory Pressure (PEEP) was adjusted at 10 cmH2O. Anesthesia was maintained by 2 % sevoflurane, 1-2 ug/kg/h fentanyl, and 0.6 mg/kg rocuronium followed by 0.2 mg/kg boluses every 30 minutes to assure T1 response of train of four. Carbon dioxide was insufflated into the peritoneal cavity until the intra abdominal pressure reached 11–15 mm Hg.

Hemodynamic stability was achieved through the use of antihypertensive and short-acting beta-blockers and the patient was kept away of the deep level of anesthesia. Intra operative hypotension (≥25% baseline decrease in mean arterial blood pressure) was treated with 250 ml bolus of normal saline and/or incremental doses of intravenous (IV) 5 mg ephedrine or 50ug phenyl phrine. Upon completion of surgery sevoflurane was discontinued, and Fraction of Inspired Oxygen (FiO2) was increased to 100%. Muscle relaxant was reversed by 0.05mg/kg neo stigmine and 0.015 mg/kg atropine sulfate where train of four displayed T1–T2 response and the patient was extubated. Our extubation criteria were hemodynamic and neurological stability, Respiratory rate 10-25 breaths/min, and tidal volume more than 5 ml/kg and SPO2 $\geq$ 95% on Fio2 of 0.4.

Patients were shifted to the Post-Anesthesia Care Unit (PACU) and were under the supervision of the anesthesiologist until considered ready for discharge to the ward. In the PACU, patients were in a semi sitting position and given 8 L/min oxygen via nasal catheter. Respiratory and hemodynamic parameters were monitored and recorded every 5 min for the first 30 min and every 15 min afterwards. Nausea, vomiting, and Visual Analogue Scale (VAS) [10] [0 = no pain, 10 = worst possible pain] were also recorded. Paracetamol (Perfalgan®) 1-2 gm and modest doses of fentanyl was administered to patients with a VAS above 3. At the end of the operation, the quality of anesthesia was graded by the surgeon [11] through surgeon satisfaction as follow: (3) perfect, (2) acceptable, (1) poor, (0) unsuccessful. Morbidity is considered if we got uncontrolled bleeding, admission to ICU and presence of sepsis. Pulmonary function tests in the form Of Forced Expiratory Volume in one second (FEV1) and Forced Vital Capacity (FVC)

and blood gases including arterial carbon dioxide tension (PaCO2) and arterial oxygen tension (PaO2) were followed before the first stage to six months after the second stage surgery.

Instruments

The mental health questionnaire was based on the Arabic validated version of the SCL 90-R questionnaire [12]. It is a self-reporting instrument intended to measure severity of psychiatric symptoms on a number of different subscales. It contains 90 symptoms of distress rated on a 5-steps Likert scale (0 being 'not at all' and 4 being 'extreme'). Patients were instructed to indicate the amount they were bothered by each of the symptoms during the preceding week and relevant dimension scores were summed. The positive dimension was considered when relevant scores were 61 or more. It is designed to provide an overview of symptoms and their intensity at a specific time. The test helps in measuring nine primary symptom dimensions and three global indices of distress. The primary symptom dimension includes Somatization (the process by which psychological needs are expressed in physical symptoms), Obsessive-Compulsive (a form of personality marked by obsessions and compulsions), Interpersonal Sensitivity (relating to a conflict in the relations and social exchanges between people), Depression (a mental state of depressed mood characterized by feelings of sadness, despair and discouragement), Anxiety (the unpleasant emotional state consisting of psycho physiological responses to anticipation of unreal danger), Hostility (tendency to feel anger toward and to seek to inflict harm upon a person or group), Phobic Anxiety (fear that is recognized as being excessive or unreasonable by the individual himself), Paranoid Ideation (persistent delusions of persecution or delusional jealousy and behavior such as suspiciousness, mistrust and combativeness), and Psychoticism (a person will exhibit some qualities commonly found among psychotics such as disregard for common sense) [13]. The three global indices are Global Severity Index (GSI) is designed to measure overall psychological distress, Positive Symptom Distress Index (PSDI) is designed to measure the intensity of symptoms and Positive Symptom Total (PST) which reports the number of self-reported symptoms [12].

Statistical Analysis

Data analysis was carried out using the SPSS (Version 13, Chicago, Illinois, USA). Quantitative variables were tested for normal distributions by the Kolmogorov-Smirnov test. The variables were presented as means ± standard deviations, number and percentage. Significant differences in the mean and Standard Deviation (SD) were assessed through Paired Sample T-Test. Chi-Square test was used for comparison of qualitative variables. Statistical significance was set at the 5% level.

Results

Fifty two total bariatric patients were randomized into two stages bariatric surgery (Figure 1). The total of 12 patients did not continue due to temporary study facility unavailability in the hospital. Dropout rates were 10/40

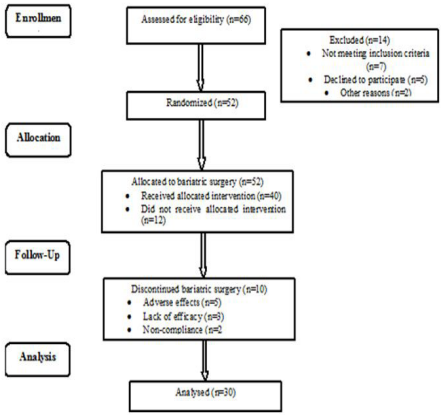


Figure1: Trial flow diagram demonstrating the disposition of all patients screened for the study.

The mean age was 35.1±9.3 years; the majority of our patient was females (90%), mean body weight 137.8±16.1 kg, mean BMI 49.1± 3.8 kg/m^2. In our study there was a significant weight loss (17.5±3.9kg versus 53.5±7.6kg), %EWL (70% versus 22.9%), and BMI (30.1±4.6 kg/m^2 versus 42.9±4.3 kg/m^2) one month following the first stage surgery compared to six months after the second stage surgery. [Table1] Pulmonary function tests (FEV1 and FVC) and blood gases ($PaCO_2$ and PaO_2) showed significant improvement in six months after the second stage surgery compared to the preoperative period of the first stage. [Table 1]

	Before the first stage	One month after first stage	Six months after first stage	Six months after second stage
Age (years)	35.1±9.3			
Gender (F/M)	27/3			
Weight (Kg)	137.8±16.1			
BMI (kg/m^2)	49.1±3.8	42.9±4.3	34.2±3.7**	30.1±4.6**
Wight loss (kg)		17.5±3.9	42.5±6.8 **	53.5±7.6 **
%EWL		22.90%	55.7% **	70% **
FEV1(Liters)	2.55±0.52	2.67±0.53	2.81±0.47*	2.86±0.48*
FVC(Liters)	3.06±0.64	3.21±0.69	3.37±0.56*	3.43±0.71*
PaO_2(mmHg)	81.4±11.6	86.9±10.7	89.2±9.9*	91.8±10.0*
$PaCO_2$(mmHg)	40.7±5.1	39.2±4.4	38.8±4.6	38.1±3.9*

** Significant (P≤0.01) when compared to one month level. *Significant when compared to preoperative level P≤0.05. BMI= body mass index. % EWL= percentage of excess weight loss. FEV1: Forced expiratory volume in one second, FVC: Forced vital capacity, PaO2: Arterial oxygen tension, PaCO2:Arterial carbon dioxide tension

Table 1: Patient characteristics, Pulmonary function tests and blood gases during the study period (Mean ± SD).

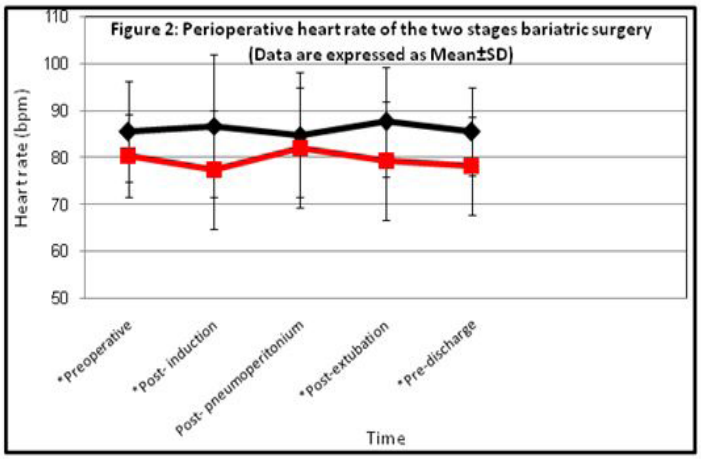
Regarding SCL-90-R clinical scale scores there was significant difference when we compared the preoperative (somatization, interpersonal sensitivity, anxiety, hostility, GSI, and PSDI) with six months after the first and second stage surgery [Table 2].

	Before the first stage	One month after first stage	Six months after first stage	Six months after second stage
Somatization	56.00±4.41	54.80±5.42	49.67±7.40**	47.30±6.72**
Obsessive Compulsive	49.00±6.4	49.90±6.14	51.23±6.16	49.60±6.61
Depression	49.07±6.29	50.03±3.68	50.00±7.39	50.50±4.21
Hostility	55.37±4.58	54.53±5.48	49.93±6.92**	47.10±6.09**
Phobic Anxiety	48.93±6.81	49.93±6.92	50.20±6.68	49.43±6.78
Paranoid Ideation	51.27±6.28	49.90±6.41	51.40±6.19	50.63±6.42
Psychoticism	50.20±5.89	49.50±5.76	50.67±5.85	49.77±5.13
GSI	54.77±4.29	54.37±5.42	47.83±6.39**	45.97±6.16**
PSDI	54.10±4.36	53.40±5.86	48.67±7.38**	46.07±6.19**
PST	49.30±5.56	50.10±4.16	49.20±4.93	50.53±3.99

*Significant when P≤0.05 **highly significant when P≤0.01 when compared to preoperative.
GSI= Global Severity Index, PSDI= Positive Symptom Distress Index, PST= Positive Symptom Total

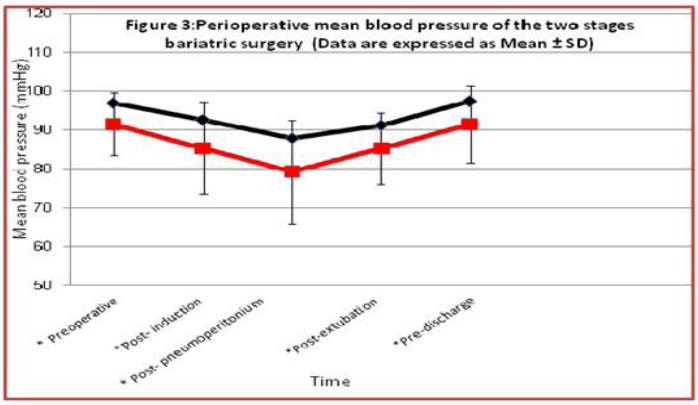
Table2: SCL-90-R clinical scale scores during the study period (Mean ± SD).

The percentage of co morbidity improvement for type 2 diabetes, hypertensive, and OSAS was 66.6%, 80% and 50% respectively. Also, the percentage of improvement for cholesterol level and gastro esophageal reflux was 90%, and 93.3% respectively. Mean blood pressure and heart rate displayed significant peri operative decrease at the second stage surgery compared to the first stage surgery [Figure 2& Figure 3].



*Indicate significant difference between the two stages. Significant when p value < 0.05.

Figure 2: Peri operative heart rate.



*Indicate significant difference between the two stages. Significant when p value < 0.05.

Figure 3: Peri operative mean blood pressure.

No intra operative life threatening hemodynamic or respiratory complications. For the first stage surgery there was one patient that had two attempts successful intubation, one patient suffered from transient partial airway obstruction at the PACU, which was relieved by oxygen, jaw thrust, chin lift and position. For the second stage surgery we got neither difficult intubation nor partial airway obstruction. There was neither radiological pulmonary aspiration nor mortality for both stages. Regarding surgeon satisfaction the first stage (2.24±0.45) surgery was significantly lower compared

to the second stage surgery (2.81±0.40). The length of stay in the PACU for the first stage ((97.81±37.42 min) was significantly prolonged compared to the second stage surgery (76.39±27.85 min)

Discussion

Propofol is the commonest intravenous anesthetic inducing agent for morbid obesity with short duration of action due to redistribution from plasma to peripheral tissue [14]. Propofol induction in morbidly obese subject based on lean body weight is associated with loss of consciousness with similar time to what is based on Total Body Weight (TBW) [15]. For continuous infusion of propofol in obese patient, the volume of distribution and clearance are increased so propofol infusion dose should depend on TBW [16].

Anesthesia for obese person is considered as a challenge regarding dose, monitoring, position, regional block, respiratory compromise, oxygen therapy, analgesia, infection, deep venous thrombosis and ambulation [17]. Our patients were devoid of critical intra operative respiratory and hemodynamic compromises. Difficult intubation, partial airway obstruction presented in first stage patients and not for those of second stage. Reduction of body weight in morbid obesity has a peri operative anesthetic morbidity reducing effect and reflected with more anesthetist satisfaction. There were no need for postoperative reintubation, absent clinical or radiological pulmonary aspiration and no mortality in our patients. In North America RYGB is the commonest bariatric surgical procedure and is associated with significant weight loss [18]. In our study there was a significant weight loss, % EWL, and reduction of BMI at the second stage surgery compared to one month following the first stage surgery. Weight reduction was also associated with more easy dissected tissues and hence with more surgeon satisfaction for the second stage compared to the first stage surgery. Also there were comorbidity improvement for type II diabetes, cholesterol level, hypertension, OSAS and gastro esophageal reflux. Furthermore, there was significant reduction of blood pressure and heart rate at the second stage compared to the first one. Our results were in accordance with others that reported improvement of co morbidities including DM, hypertension (both systolic and diastolic) and OSAS [19]. In bariatric surgery, the risk of morbidity is reduced in addition to 5-year mortality reduction by 89% [6,17].

Obesity is considered as serious health problem that disturb the relation between lungs, chest wall and diaphragm and so expected to have impact on pulmonary function. Significant weight loss is associated with improvement of lung function and gas exchange which favors the indications for bariatric surgery [20]. The present work displayed improvement of lung function tests and blood gases. Several mechanisms have been suggested as possible effects of obesity on lung function. Morbid obesity can lead to a restrictive syndrome by abdominal and thoracic adipose tissue decreasing lung volume and increased respiratory resistance. Morbid obesity also promotes ventilation/perfusion mismatch leading to hypoxemia at rest and in supine position due to the closure of small airways. Obesity is also associated with increased in and out air resistance due to narrowing of the airways [21]. Reduced intra operative and postoperative morbidity in our study may be related to patient care including optimal PEEP. In one study patients with PEEP of 10 cm H2O had better oxygenation both intra operative and postoperative in PACU, lower atelectasis score on chest Computed Tomography (CT) scan, and less postoperative pulmonary complications than the Zero End Expiratory Pressure and PEEP of 5 cmH2O [22].

Most researches for bariatric surgery examine the effect of surgery including complications, physical and mental health [23]. Several demographic variables have been identified as predictors of more positive outcome in terms of weight loss, such as lower BMI, female gender, white, and higher socioeconomic status [24]. However, little researches have been done for psychological evaluation to predict surgical outcome in terms of excess weight lost. Previously many psychological factors have been proposed as correlates of psychological predictors of bariatric surgery. These include depression, binge eating disorder [25], distress over obesity [26], hysteria, paranoia and health concerns [27]. In this study we used SCL-90-R which to assess an individual's current level of distress and results in nine clinical scales and three overall indices of distress and found that there was significant difference when we compared the preoperative (somatization, interpersonal sensitivity, anxiety, hostility, GSI, and PSDI) with six months after the first and second stage surgery. This confirms that a possible cause of interpersonal sensitivity, anxiety, hostility and somatization in obesity in the Arabian context rather than depression as found a recent Italian research showed that in patients undergoing bariatric surgery, depressive symptoms are more common preoperatively and normalize at follow-up [28]. In a similar study [29] the Symptom Checklist 90 (SCL-90) was administered to 42 patients prior to surgery and found that the patients who were most successful in approximating their ideal body weight post-surgically had a greater number of pre-surgical symptoms on the scales of Interpersonal Sensitivity, Anxiety and Depression. The researchers in this study suggest that, based on these data, success is associated with greater psychological disturbances attributed specifically to obesity. Moreover GSI which represents the mean of all items is the most commonly used score in therapy outcome research [30].

Limitations of the Study

We suggest a study to evaluate gender difference, and to design interventions for bariatric surgery patients that involve family members, psycho education about the need of lifestyle changes and family role in bariatric patients.

Conclusion

Obesity is a disease that brings not only physical but also psychological consequences and this makes treatment more difficult. This study d blood gases (PaCO2 and PaO2) showed significant improvement on the long term. This study showed that LRYGB is effective in improvement of (somatization, interpersonal sensitivity, anxiety, hostility, GSI, and PSDI) and it would be useful to examine the SCL-90-R as a predictor of outcome of gastric bypass surgery.

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