

Overview of Surgical Method of Laparoscopic Adjustable Gastric Banding (LAGB)

Ahmed Mohammed Mashdali, Emad Mohammed Mashdali

Abstract: Our main goal of this review study was to evaluate the safety and efficiency, and discuss the surgical techniques of Laparoscopic adjustable gastric banding (LAGB), through reviewing the most recent base evidence trials which were concerned with this type of surgical intervention. We conducted a comprehensive review of literature for relevant studies reporting Laparoscopic adjustable gastric banding (LAGB) surgical procedures and safety and effectiveness of this procedure, this search was performed using several medical and science databases; MEDLINE, AMED, CINAHL and Cochrane Database. Search method was done using MESH terms, focusing on studies published up to December, 2016 with English language and human subject. Laparoscopic gastric banding remains a reliable method for the therapy of dark weight troubles in addition to is an advised in addition to primary alternative for various centres, the information offered in the three HTA documents, it turns up that LAGB was much more secure compared with, or at least as safe as, open RYGB or open VBG in relation to short-term (about five years) death as well as morbidity. Laparoscopic adjustable gastric banding with the Laparoscopic Band system provides a risk-free and effective medical therapy choice for morbid obesity. The development of the surgical method has actually improved results in regards to satisfactory brief- as well as long-lasting outcomes and also lower difficulty rates.

Keywords: Surgical Techniques of Laparoscopic Adjustable Gastric Banding (LAGB).

1. INTRODUCTION

Laparoscopic adjustable gastric banding (LAGB) is an approved as well as usual procedure for somber obesity. However, erosion of gastric wall is an identified difficulty. In a methodical evaluation by Egberts et al. ⁽¹⁾, the general occurrence was 1.46% at mean follow up of 3.7 years. Upon discovery of gastric band disintegration, their instant removal is extremely supported as their delay is connected with substantial mortality and also morbidity. Several techniques for band removal have been explained. These include overall endoscopic (endoluminal), laparoscopic, mixed laparoscopic and endoscopic method, and also open surgery in complex situations. Among them, the endoluminal technique is the least intrusive of all; however, this may not be appropriate and also possible in many cases. When the former wall surface of the stomach is largely frightened and there are some attachments, as well as earlier strategies have actually failed to dominate, laparoscopic transgastric might be an efficient method if band cannot be securely gotten rid of ⁽²⁾. It entails placement of a silicone band around the top stomach simply below the gastro-esophageal junction. Saline can be injected right into a reservoir to change the band as preferred ⁽³⁾. This procedure induces early satiation and also long term satiation after consumption of a tiny meal ⁽⁴⁾. Recently, lasting results have actually revealed a high difficulty rate associated with LAGB, requiring numerous surgeons to shun the procedure ⁽⁵⁾. Reoperation rates vary from 16% to 60% and have actually been revealed to boost proportionally with time ⁽⁶⁾. Reported difficulties include band prolapse, erosion, unbending queasiness as well as throwing up, dysphagia, inadequate weight reduction, port breakdown, and the requirement for a provisional weight-loss treatment after failure ⁽⁷⁾. Regardless of released difficulties, researches as recent as 2012 continuously sustain LAGB as the initial operation in patients with severe complicated obesity ⁽⁸⁾.

Objective:

Our main goal of this review study was to evaluate the safety and efficiency, and discuss the surgical techniques of Laparoscopic adjustable gastric banding (LAGB), through reviewing the most recent base evidence trials which were concerned with this type of surgical intervention.

2. METHODOLOGY

We conducted a comprehensive review of literature for relevant studies reporting Laparoscopic adjustable gastric banding (LAGB) surgical procedures and safety and effectiveness of this procedure, this search was performed using several medical and science databases; MEDLINE, AMED, CINAHL and Cochrane Database. Search method was done using MESH terms, focusing on studies published up to December, 2016 with English language and human subject. Terms were as following: “gastric band”, “gastric banding”, “laparoscopic adjustable gastric band”, and “LAGB”. The reference lists of these included studies were also searched for more relevant research papers.

3. RESULTS

○ General review:

Quick uptake and evolution of the LAGB medical method has actually outstripped physiological understanding. LAGB has developed from the creation of a small-meal-sized pouch to positioning of the prosthesis within 1 cm of the esophageal gastric joint. The existing, unique anatomical modification recommends a novel device of activity⁽⁹⁾. **(Figure 1)** highlights the evolution of LAGB surgical technique. Retention of a tiny meal above the LAGB (a restrictive procedure) has actually traditionally been the setting of action associated with the LAGB, although this does not fit with typical patterns of gastric draining (GE) seen postoperatively. In enhancement, the dimension of the gastric pouch over the LAGB does not appear huge enough to suit also the smallest of meals⁽¹⁰⁾.

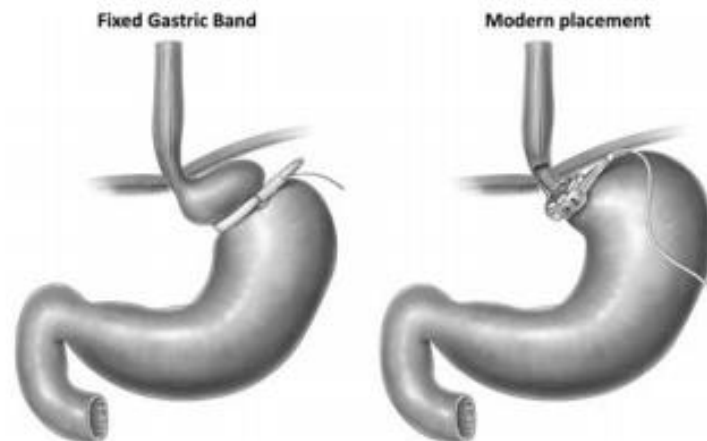


Figure1: Comparison of restrictive fixed gastric banding and current placement of adjustable gastric band.

Operative Technique:

The procedure included laparoscopic placement of a gastric band LAGB developing a proximal 15-mL bag at the cardia. The band, which had an expandable balloon, was connected to a port safely sutured subcutaneously on the left rectus abdominis muscular tissue^(11,12). Later on, under radiologic advice, the port was infused with fluid to ensure that the balloon was blown up, adjusting the internal size of the ring. This allowed individualized regulated emptying of the bag⁽¹³⁾. A regular laparoscopic flexible gastric banding (LAGB) procedure may proceed, 14 after facility of pneumoperitoneum and insertion of the trocars, dissection begins at the higher curvature of the stomach by opening up the peritoneal reflection from the fundus to the diaphragm **(Figure 2)**⁽¹⁴⁾. The placement for the band may be established by utilizing a calibration tube inserted right into the stomach by the anesthetist. The balloon on the end of the tube is loaded with 15 ml of saline as well as is drawn up against the gastroesophageal joint. The first dissection point goes to the equator of the balloon making a little bag above the band and also to maintain the band above the peritoneal representation of the minimal cavity (although some procedures in fact penetrate the minimal sac). A tunnel is then made through the retrogastric add-ons, starting from the lower curvature dissection. A long atraumatic tool is passed through this passage. The band is introduced, attached to completion of this tool, which is after that withdrawn through the passage. The band is placed making use of the exact same calibration tube as previously, and also is after that closed. The former as well as lateral surface areas of the stomach are then sutured over the band to prevent band migration (any kind of passage via the retrogastric accessories likewise aids in this process). To avoid any kind of vomiting in the initial postoperative duration, the majority of surgeons currently defer band change till the very first testimonial goes to. If the stoma is as well large, after that fat burning will certainly suffer, yet if it is too limited, there is the risk of postoperative

food intolerance⁽¹³⁾. The injection reservoir, which will certainly permit modifications of the band, is filled with saline and also affixed by tubing to the band. It is after that implanted on the anterior rectus sheath as well as fixed with sutures⁽¹¹⁾. (Figures 3 & 4 & 5) discuss the steps of LAGB in three actions⁽¹⁴⁾.

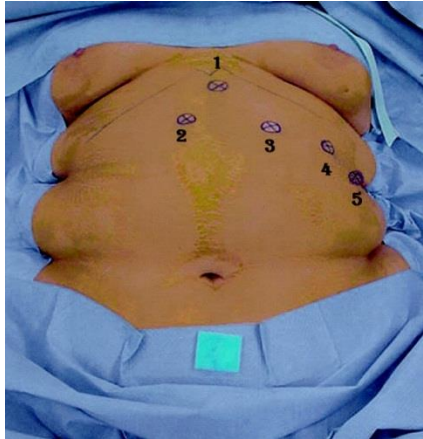


Figure 2: Position of the cannulas.

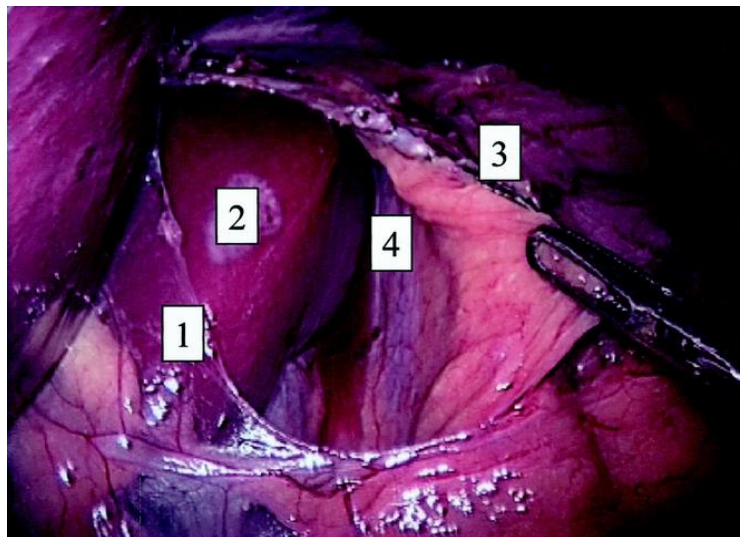


Figure 3. First step of the LAGB approach: opening of the lesser omentum. 1, lesser omentum; 2, liver; 3, lesser curvature of the stomach; 4, right crus.

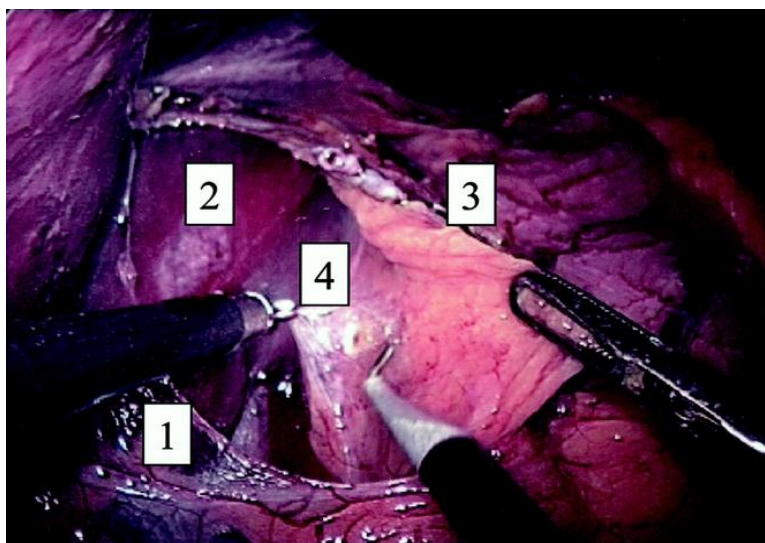


Figure 4: dissection of the right crus. 1, lesser omentum; 2, liver; 3, lesser curvature of the stomach; 4, right crus.

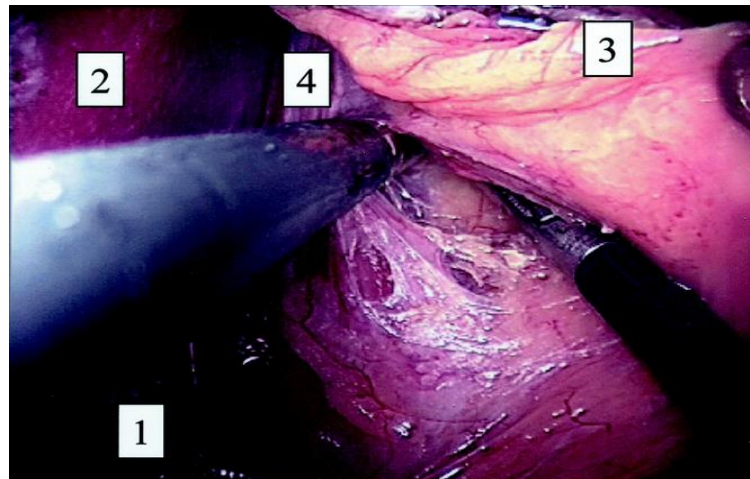


Figure 5: Third step of the: retrogastric channel. 1, Pars flaccida of the lesser omentum; 2, liver; 3, lesser curvature of the stomach; 4, right crus.

○ **Advantage of weight loss with LAGB:**

The setting of fat burning with LAGB is lowered complete power consumption, as a result of significantly changed eating habits⁽¹⁵⁾. A shift to softer foods, with a decrease in the consumption of solids is likewise noted⁽¹⁶⁾. Longitudinal studies have actually reported an extra restrained eating pattern and reduced susceptibility to cravings complying with LAGB^(17,18,19). It has actually been shown that with LAGB, lots of foods of a coarser structure are unable to be eaten, as they will not transportation past the LAGB. Also secure, effective patients do at times spew foods of an unsuitable bolus uniformity⁽²⁰⁾. Although these mechanical truths are enforced by the LAGB, whether they are central to the behavior adaptations, as well as subsequent weight management remains vague. On the basis of the end results of various other weight-loss treatments, it seems unlikely that pure mechanical factors are able to prevent the control processes that strictly protect body weight. Potentially an additional mechanism is responsible for the observed end results^(18,20). Lowering consumption via induction of satiety Clinical monitorings that lots of LAGB patients report greatly lowered appetite, as well as disinterest in food postoperatively has actually caused the theory that the LAGB works primarily by inducing satiety⁽²⁰⁾. Extended suppression of cravings consequently minimizes total food intake⁽²¹⁾. Removing or adding saline from the system (to change the dimension of the lumen of the band) appears to be able to fine-tune these experiences or return them to normal if LAGB is completely cleared⁽²¹⁾. In a details physical examination of the mechanism of action of LAGB in human beings, checked morning meal examinations were conducted on a cohort of effective LAGB patients. Hormone modifications and also reported satiety were measured over a 6-h period under standard problems^(20,21). Both fasting as well as postprandial sensations of satiety were substantially boosted at optimal LAGB quantity compared with 2 days of decreased quantity. A marked satiating effect adhering to the dish was observed at optimal volume⁽²¹⁾.

4. THE EFFICIENCY OF LAGB IN REDUCING WEIGHT COMPLAINING TO OTHER PROCEDURES

As long as follow-up of any big associate of patients with laparoscopic gastric banding remains under 4 years, the choice requirements for surgical treatment should not be customized. The significant indicator for surgery continues to be limited to medical factors; cosmetic considerations must never be considered, despite the fact that the treatment was evaluated to be safe and easy. It should be utilized just to treat somber obesity with lowered life expectancy (12).

Alternate bariatric operations of the limiting kind are those that induce malabsorption using a jejunioileal, biliopancreatic, or gastric bypass. Gastric bypasses that permit patients to "drop weight while eating" show the very best results, as well as excess weight loss was considerable: 55% and 70% at 1 as well as 5 years, respectively (22), however at the price of a vulnerable anastomosis and also potentially severe nutritional deficiencies. Roux-en-Y gastric bypass has recently been adapted to laparoscopy with an acceptably reduced rate of issues (3.3% major and 27% minor) as well as a superb weight loss of 77% at 30 months, however it remains a challenging treatment (23). In a series of 275 patients, an overall of 12 stomach leaks happened (4.4%), 3 of them with postoperative peritonitis, as well as 1 patient passed away of secondary jejunojunal obstruction. They think about these treatments hard, lengthy (two to three times longer compared to our

procedure), and extra dangerous⁽²³⁾. Of the limiting treatments, which cause slow-moving gastric emptying by creating a tiny pouch, Mason's gastroplasty stays the gold criterion. The vertical banded gastroplasty allows a 40% to 50% excess weight management at 1 year⁽²⁴⁾ with a maximum effectiveness at 12 to 18 months, declining rather afterwards however still reliable at 10 years. The gastric banding operation in one research study⁽¹⁴⁾ uses results similar to the stapling method. As a relatively easy to fix and also versatile procedure, it promises to be a good choice as long as its morbidity rate continues to be reduced, a minimum of much like the Mason's procedure. Prolonged follow-up should identify its effectiveness in lasting weight control. None of our 500 patients died and also 20% of them experienced issues, mostly minor. These results approach various other collection^(25,26). The last 300 patients of the mentioned⁽¹⁴⁾ collection had a reduced morbidity price than the initial 200, demonstrating technical progress and follow-up enhancement, particularly reducing slippage and also port disorder prices. In earlier collection, the band was put through the lower sac of the abdominal muscle⁽²⁷⁾. Successive modifications were consequently presented that aimed at lowering the pouch size (from 25- 15 cc),⁽¹³⁾ dealing with the band behind the tummy in case it got in the lower sac, and also covering it completely by anterior gastrogastic suturing. Subsequently, most writers suggest putting the band over the lower sac detailed by the short gastric vessels, via the coarse room under the mesoesophagus⁽²⁶⁾. The slippage rate was 8.5% in our research study, which was high compared to other collection (3 - 9%)^(25,26). Late band slippage remained the most usual issue for earlier patients. It resulted in gastric bag dilatation. Its start was delayed: 13 months in one study⁽¹⁴⁾, 6 to 12 months by others⁽²⁶⁾. It was probably related to too-loose stitching of the band on the former wall of the stomach and an early consumption of strong food. Dilatation of the gastric pouch generally creates an interruption in the weight management curve and is conveniently identified by Gastrografen or barium swallow. It demands timely deflation of the band. Ought to food intolerance persist, laparoscopic band elimination could be executed, specifically if excess weight loss was sufficient; otherwise the band should be promptly rearranged or changed^(25,26).

o **Safety and effectiveness of LAGB:**

The safety profiles of the three procedures (LAGB, VBG, RYGB/LRYGB) were compared in regards to mortality, conversion from laparoscopic to open up treatment, morbidity (peri- or postoperative problems), and/or re-operation prices. The reporting of these outcomes differed throughout the 3 HTA^(28,29,30) reports. The MSAC review⁽²⁸⁾ integrated results from primary relative research studies, or case series, or both. The security data reported in the McGill testimonial⁽²⁹⁾ were originated from the ASERNIP-S evaluation⁽³⁰⁾, primary studies on LAGB, one review of 3463 cases on LRYGB, as well as other extra research studies. The average death prices reported in the three reports ranged from 0.05% to 0.3% for LAGB, 1.7% for open RYGB and 0.23% for LRYGB, as well as 0.5% for open VBG. The death prices for LAGB derived from primary studies were comparable in the 3 reports, 0.1%⁽³¹⁾, 0.11% or 0.12% 50, as well as 0.3%⁽²⁸⁾. The McGill report noted a death price of 0.05%, which was extracted from the ASERNIP-S evaluation⁽³⁰⁾. Among the reasons for this disparity may be that these reviews included various primary researches and also they acquired general mortality prices in various ways. Based upon the available information from primary researches, the MSAC evaluation reported procedure-specific complication prices of 1.3% to 28% for LAGB, 1% to 20% for open RYGB, and 1.5% to 15.8% for open VBG. The MSAC evaluation report 49 found that LAGB went to least as secure as open RYGB as well as VBG. LAGB showed up to have reduced prices of mortality and also re-operation than open RYGB as well as VBG, however this could be associated with the shorter follow-up period offered for the LAGB patients. The McGill report⁽²⁹⁾ concluded that, at approximately 5 years of follow-up, the rates of mortality as well as morbidity related to LAGB were relatively equivalent to LRYGB. The BCBS record⁽³¹⁾ located that short-term (less than one year) problem rates were low complying with LAGB and also could be lower than those complying with RYGB. Longer term (over one year) issues took place much more regularly following LAGB and also these might include serious difficulties such as disintegration of the band through the gastric wall surface. No data were available to contrast longer-term difficulties of LAGB with open RYGB. Nutritional deficiency prices of 16% for open RYGB and also 24% for LRYGB were reported in the MSAC⁽²⁸⁾ and the BCBS reports⁽³¹⁾, respectively.

o **The challenge of achieving weight loss after LAGB:**

The law of energy equilibrium, body and hunger weight appears to be closely interrelated. These systems exactly control general body weight and fat stores, despite considerable variations in energy expense and consumption that happen on a day-to-day basis⁽³²⁾. The physiology of the body is readied to vigorously safeguard what it views as an ideal weight^(33,34). Momentary modifications to energy consumption are met a strenuous countervailing response that lowers the efficacy of treatments such as diet programs. When a treatment ceases, body weight quickly returns to its previous level. Bariatric surgical treatment, consisting of LAGB, includes fairly easy physiological modifications. They are able to prevent control

processes and induce continual fat burning over a duration of at the very least 5 - 10 years⁽³⁵⁾. In spite of the simplicity of the physiological adjustments, there is restricted understanding of the modifications to the mechanical physical processes. This especially connects to changes in intraluminal stress, patterns of transit as well as the setting of flow with the altered areas. Without specifying these procedures, understanding of the systems through which bariatric surgical procedure has the ability to sustain significant weight reduction is likely to stay limited^(33,34,35).

5. CONCLUSION

Laparoscopic gastric banding remains a reliable method for the therapy of dark weight troubles in addition to is an advised in addition to primary alternative for various centres, the information offered in the three HTA documents, it turns up that LAGB was much more secure compared with, or at least as safe as, open RYGB or open VBG in relation to short-term (about five years) death as well as morbidity. Laparoscopic adjustable gastric banding with the Laparoscopic Band system provides a risk-free and effective medical therapy choice for morbid obesity. The development of the surgical method has actually improved results in regards to satisfactory brief- as well as long-lasting outcomes and also lower difficulty rates.

REFERENCES

- [1] Egberts K, Brown WA, O'Brien PE. Systematic review of erosion after laparoscopic adjustable gastric banding. *Obes Surg* 2011;21:1272–9.
- [2] Liu D, Gonzalvo JP, Murr M. Laparoscopic transgastric removal of an eroded adjustable gastric band. *Surg Obes Related Disease* 2014;10:184–5.
- [3] Cherian PT, Goussous F, Ashori F, Sirgurdsson A. Band erosion after laparoscopic gastric banding: a retrospective analysis of 865 patients over 5 years. *Surg Endosc* 2010;24:2031–8.
- [4] Chousleb E, Szomstein S, Lomenzo E, Higa G, Podkameni D, Soto F, et al. Laparoscopic removal of gastric band after early gastric erosion: case report and review of the literature. *Surg Laparo Endosc Percutan Tech* 2005;15:24–7.
- [5] Himpens J, Cadière GB, Bazi M, et al. Long-term outcomes of laparoscopic adjustable gastric banding. *Arch Surg* 2011;146:802–807.
- [6] Singhal R, Super P. Role of laparoscopic adjustable gastric banding in the treatment of obesity and related disorders. *Br J Diabetes Vasc Dis*. 2009;9:131–133.
- [7] Naef M, Mouton W, Naef U, et al. Graft survival and complications after laparoscopic gastric banding for morbid obesity—lessons learned from a 12 year experience. *Obes Surg*. 2010;20:1206–1214.
- [8] Yildiz BD, Bostanoglu A, Sonisik M, et al. Long term efficacy of laparoscopic adjustable gastric banding—retrospective analysis. *Adv Clin Exp Med*. 2012;21:615–619.
- [9] O'Brien PE, Brown WA, Smith A, McMurrick PJ, Stephens M. Prospective study of a laparoscopically placed, adjustable gastric band in the treatment of morbid obesity. *Br J Surg* 1999; 86: 113–118.
- [10] O'Brien PE, Sawyer SM, Laurie C, Brown WA, Skinner S, Veit F et al. Laparoscopic adjustable gastric banding in severely obese adolescents: a randomized trial. *JAMA* 2010; 303: 519–526.
- [11] Belachew M, Legrand M, Vincent V, et al. L'approche coelioscopique dans le traitement chirurgical de l'obésité morbide. *Technique et résultats*. *Ann Chir* 1997; 51: 165–172.
- [12] National Institutes of Health Consensus Conference. Gastrointestinal surgery for severe obesity. *Am J Clin Nutr* 1992; 55: 487S–619S.
- [13] Cadière GB, Bruyns J, Himpens J, et al. Laparoscopic gastroplasty for morbid obesity. *Br J Surg* 1994; 81: 1524.
- [14] Zinzindohoue F, Chevallier J-M, Douard R, et al. Laparoscopic Gastric Banding: A Minimally Invasive Surgical Treatment for Morbid Obesity: Prospective Study of 500 Consecutive Patients. *Annals of Surgery*. 2003;237(1):1-9.
- [15] Busetto L, Valente P, Pisent C, Segato G, de Marchi F, Favretti F et al. Eating pattern in the first year following adjustable silicone gastric banding (ASGB) for morbid obesity. *Int J Obes Relat Metab Disord* 1996; 20: 539–546.

- [16] Busetto L, Segato G, De Marchi F, Foletto M, De Luca M, Favretti F et al. Postoperative management of laparoscopic gastric banding. *Obes Surg* 2003; 13: 121–127.
- [17] Schindler K, Prager G, Ballaban T, Kretschmer S, Riener R, Buranyi B et al. Impact of laparoscopic adjustable gastric banding on plasma ghrelin, eating behaviour and body weight. *Eur J Clin Invest* 2004; 34: 549–554.
- [18] Horchner R, Tuinebreijer W, Kelder H. Eating patterns in morbidly obese patients before and after a gastric restrictive operation. *Obes Surg* 2002; 12: 108–112.
- [19] Lang T, Hauser R, Buddeberg C, Klaghofer R. Impact of gastric banding on eating behavior and weight. *Obes Surg* 2002; 12: 100–107.
- [20] Burton PR, Brown W, Laurie C, Lee M, Korin A, Anderson M et al. Outcomes, satiety, and adverse upper gastrointestinal symptoms following laparoscopic adjustable gastric banding. *Obes Surg* 2011; 21: 574–581.
- [21] Dixon AF, Dixon JB, O'Brien PE. Laparoscopic adjustable gastric banding induces prolonged satiety: a randomized blind crossover study. *J Clin Endocrinol Metab* 2005; 90: 813–819.
- [22] Pories WJ. Who would have thought it? An operation proves to be the most effective therapy for adult-onset diabetes mellitus. *Ann Surg* 1995; 222: 339–352.
- [23] Schauer PR, Ikramuddin S, Gourash W, et al. Outcomes after laparoscopic Roux-en-Y gastric bypass for morbid obesity. *Ann Surg* 2000; 232: 515–529.
- [24] Nightengale ML, Sarr MG, Kelly KA, et al. Prospective evaluation of vertical banded gastroplasty as the primary operation for morbid obesity. *Mayo Clin Proc* 1991; 66: 773–782.
- [25] Dargent J. Coelochirurgie de l'obésité morbide: la gastroplastie par anneau modulable, 320 observations. *Ann Chir* 1999; 53: 467–471.
- [26] Zimmermann JM, Mashoyan PH, Michel G, et al. Laparoscopic adjustable silicone gastric banding: une étude préliminaire personnelle concernant 900 cas opérés entre Juillet 1995 et Décembre 1998. *Jour de Coelio-chir* 1999; 29: 25–31.
- [27] Belachew M, Legrand M, Vincent V, et al. L'approche coelioscopique dans le traitement chirurgical de l'obésité morbide. Technique et résultats. *Ann Chir* 1997; 51: 165–172.
- [28] Laparoscopic adjustable gastric banding for morbid obesity. Canberra: Medical Services Advisory Committee (MSAC); 2003. MSAC 14. Available: <http://www.health.gov.au/msac/pdfs/reports/msacref14.pdf>.
- [29] Chen J, McGregor M. The gastric banding procedure - An evaluation. A Technology assessment. Montreal: McGill University Health Centre, Technology Assessment Unit; 2004. Available: http://upload.mcgill.ca/tau/Gastric_Banding_FINAL_Apr27.pdf.
- [30] Chapman A, Game P, O'Brien P, Maddern G, Kiroff G, Foster B, et al. A systematic review of laparoscopic adjustable gastric banding for the treatment of obesity (update and re-appraisal). Adelaide, SA: Australian Safety and Efficacy Register of New Interventional Procedures - Surgical (ASERNIP-S); 2002:31.
- [31] Lefevre F, Aronson N. Newer techniques in bariatric surgery for morbid obesity. BlueCross BlueShield Association, editor. Chicago, IL: Blue Cross and Blue Shield Association; 2003;18:10.
- [32] Prentice A, Jebb S. Energy intake/physical activity interactions in the homeostasis of body weight regulation. *Nut Rev* 2004; 62: S98–S104.
- [33] Keesey RE. Physiological regulation of body weight and the issue of obesity. *Med Clin North Am* 1989; 73: 15–27.
- [34] Garrow JS. Energy balance in man. *Am J Clin Nutr* 1987; 45: 1114–1119.
- [35] O'Brien PE, McPhail T, Chaston TB, Dixon JB. Systematic review of medium-term weight loss after bariatric operations. *Obes Surg* 2006; 16: 1032–1040.