ORIGINAL ARTICLE

Quality of life and alteration in comorbidity following laparoscopic adjustable gastric banding

M Titi, J T Jenkins, P Modak, D J Galloway

Postgrad Med J 2007;**83**:487–491. doi: 10.1136/pgmj.2006.055558

See end of article for authors' affiliations

Correspondence to:
Dr David J Galloway,
Department of Surgical
Gastroenterology, Gartnavel
General Hospital, 1057
Great Western Road,
Glasgow G12 0YN, UK;
david.galloway@
northglasgow.scot.nhs.uk

Received 18 November 2006
Accepted 29 January 2007

Objectives: Obesity is an increasing problem in the UK and bariatric surgery is likely to increase in volume in the future. While substantial weight loss is the primary outcome following bariatric surgery, the effect on obesity-related morbidity, mortality and quality of life (QOL) is equally important. This study reports on weight loss, QOL, and health outcomes following laparoscopic adjustable gastric banding (LAGB) in a low volume bariatric centre (<20 cases/year) and presents the first assessment of factors relating to the QOL which has been produced from a UK based surgical practice.

Study design: Questionnaire based study of patients who had LAGB. Each patients' initial body mass index (BMI), QOL, and comorbidities were recorded. Change in these parameters was measured including excess weight loss, and output from both the Moorehead-Ardelt QOL questionnaire, and the Bariatric Analysis and Reporting Outcome System (BAROS).

Results: Eighty-one patients (14 males, 67 females) answered the questionnaire. More than 50% excess weight loss was recorded in 52/81 patients (64%). Sixty-four patients (79%) reported improvement in their QOL including self-esteem, physical activity, social involvement, and ability to work. Seventy-one patients had initial obesity related comorbidity. In 61 of these patients (86%) their comorbidities resolved or improved. Minor port site related complications were recorded in nine patients while two patients had removal of the band because of infection.

Conclusion: LAGB is a safe method of bariatric surgery. It can achieve satisfactory weight loss with significant improvement in QOL and comorbidity.

Laparoscopic adjustable gastric banding (LAGB) is a minimally invasive bariatric procedure that has been widely used since its introduction in 1993.¹ Its popularity is in part due to the relative safety of the technique compared to other bariatric procedures. It involves minimal dissection around the gastro-oesophageal junction without the need for any surgical reconfiguration of normal anatomy.^{2,3} Furthermore, as a restrictive bariatric procedure it avoids the risks of malabsorption and can be adjusted according to the progress of the patient.⁴

Reduction in weight is the most commonly reported outcome measure following a bariatric procedure.⁵ However, the effect of weight loss on obesity-related morbidity, mortality and quality of life (QOL) following the bariatric procedure are all important measures to report.^{6,7} Oria and Moorehead addressed these outcome measures when they introduced the Bariatric Analysis and Reporting Outcome System (BAROS) in 1998⁶ that has been used and validated in subsequent trials.^{7,8} These measures are the primary goal of obesity treatment, and therefore the most relevant health outcomes for assessing treatment effects.

Previous studies that reported on these measures were usually from specialised high volume bariatric centres.^{7,9} This may explain the limited number of reports from the UK where bariatric surgery is usually integrated into surgical practice within relatively smaller volume centres. However, with the increasing demand on bariatric surgery, reports from such low volume centres are of crucial importance as they may provide guidance on whether to emphasise the low volume bariatric surgical practice or to move forward towards a larger scale and more specialised centres of bariatric excellence.

This study reports on the outcome of morbidly obese patients who had LAGB in a low volume bariatric centre (<20 cases/year) in terms of QOL, change in comorbidities and weight loss. It also allows definition of the relationship between the

quantity of weight lost and the degree of improvement in health outcomes.

METHODS

Patients

One hundred and four consecutive patients were identified from a prospective database of morbidly obese patients who were referred to a single low volume bariatric surgical unit between January 2000 and April 2005. All patients had undergone an LAGB procedure at least 1 year before commencing this study. The database recorded the patient's gender, age at time of operation, preoperative body weight and body mass index (BMI), preoperative comorbidity, operative complications, hospital stay detail with respect to re-admissions, and follow up.

Preoperative assessment

The inclusion criterion for LAGB was a BMI >40 kg/m² or >35 kg/m² with significant weight related comorbidity. All patients had been unsuccessful with conservative measures to lose weight. A multidisciplinary team approach was adopted for all patients. All patients were seen by an endocrinologist with special interest in morbid obesity, to exclude any underlying metabolic abnormality, and were referred for formal psychological assessment when indicated to exclude those with eating disorders. Standard exclusion criteria for LAGB were used.^{2,3}

Abbreviations: BAROS, Bariatric Analysis and Reporting Outcome System; BMI, body mass index; EWL, excess weight lost; GI, gastrointestinal; IQR, interquartile range; LAGB, laparoscopic adjustable gastric banding; QOL, quality of life

Operative technique

All of the LAGB operations were done by a single gastro-intestinal (GI) surgeon (DJG) and in one institution (Gartnavel General Hospital). The procedure involved four or five trocars placed in the upper abdomen. The adjustable gastric band (LapBand, INAMED Health, Santa Barbara, California, USA) was placed just below the gastro-oesophageal junction via a retrogastric tunnel created using the pars flaccida approach. The patients were started on oral liquids on the first post-operative day and resumed a soft diet on their second day. Soft diet was maintained for 6–8 weeks before returning to solid foods.

Postoperative follow up

The first visit was at 6 weeks postoperatively when the initial filling of the band was performed with 3–4 ml of water soluble contrast medium. Further visits were arranged every 2 months during the first year, every 3 months during the second year, and every 6 months thereafter. During the visits, actual weight and GI symptoms were assessed.

LAGB outcome assessment

Assessment of LAGB outcome was based on BAROS.⁶ This system consists of a scoring table that includes three columns with the main areas of analysis: weight loss, improvement of medical conditions, and QOL. Points are added or subtracted according to changes in these domains. A maximum of 3 points is given to each domain to evaluate changes after the intervention. Points are deducted for complications or reoperations. The total number of points defines five outcome groups from “failure” to “excellent”. The different domains of BAROS are explained below.

Reduction in weight

Weight reduction is expressed as percentage of excess weight lost (EWL) after LAGB: $\%EWL = [(initial\ weight - follow\ up\ weight)/initial\ weight - ideal\ weight] \times 100$. A full point is deducted from the total BAROS score in patients whose final weight is higher than before treatment, and no points are scored if the excess weight loss is between 0–24%. One point is assigned for a percentage of excess weight loss between 25–49%, 2 points if the weight loss reached 50–74% of the excess, and 3 points for a final percentage excess weight loss of 75–100%.⁶

Quality of life

The Moorehead–Ardelt QOL questionnaire was used. This questionnaire was initially introduced as an integrated part of BAROS⁶ and was validated in succeeding studies.^{9,10} Five aspects of life quality were evaluated including self-esteem and confidence, physical activity, social involvement, ability to work, and interest in sex. In each aspect, if patients reported no changes they scored no points. Points are added for positive responses while negative responses deducted points from the total score. The overall post LAGB QOL was classified into five classes according to the total points scored. These five classes and their scores include: great improvement (+2.25–3.0), improvement (0.75–2.0), minimal to no change (0±0.5), diminished (–0.75 to –2.0), and greatly diminished (–2.25 to –3.0).

Response of comorbidity to weight loss

A questionnaire was designed based on BAROS criteria for obesity related comorbidity. Patients were asked to report their current weight and their perception of changes in their comorbidity following surgery. The current medications of the patients as prescribed by their general practitioner were

checked and compared to those of the preoperative period. Resolution of comorbidity was considered when treatment was no longer needed and was stopped; resolution of hypertension was considered when it became controlled with diet with or without the use of diuretics. Improvement of comorbidity was considered when treatment was still needed but in a reduced dose or combination of medications.⁶ No points are scored if the medical problems were unchanged, whereas 1 point is deducted if they were aggravated after LAGB. From 1 to 3 points are assigned for positive changes: medical conditions improved (1 point); one major comorbidity resolved and the others improved (2 points), and all major problems resolved and the others improved (3 points). Modified scoring system was used in patients with no initial comorbidity.⁶

Operative complications

Early and late operative complications and reoperation were recorded. Minor complications deducted 0.2 points while major complications or reoperation deducted one point from the total BAROS score.⁶

The final BAROS score was calculated by adding the subtotal scores from the above described domains. This final score is used to classify five outcome groups: more than 7 points represents an excellent result, >5 to 7 points a very good result, >3 to 5 points a good result, and >1 to 3 points a fair result. A final score of one point or less signifies a failure of the treatment.

Statistical analysis

Data were recorded in a prospective database. Statistical analysis was performed using SPSS (V 13.0, SPSS Inc, Chicago, Illinois, USA). Continuous data are expressed as medians with interquartile ranges (IQR).

RESULTS

Eighty-one patients (78%) answered the study questionnaires (14 males, 67 females). The median age of these patients at time of operation was 43 years (35–48), with a median preoperative body weight of 133 kg (IQR 118–147 kg), and a BMI of 49 kg/m² (44–53 kg/m²). Seventy-one patients had one or more of the obesity related comorbidities summarised in table 1. Median postoperative follow up duration was 30 months (20–52 months).

Postoperative weight loss

Twenty-seven patients lost more than 75% of excess body weight, 25 patients lost 50–75 EWL%, 23 patients lost 25–49 EWL%, while five patients lost less than 25 EWL% and one patient gained weight. There was a significant correlation between follow up duration and %EWL in patients who had no operative complications ($r = 0.304$, $p = 0.01$).

Table 1 Preoperative obesity related comorbidity

	Number of patients
Major comorbidity	
Hypertension	32
Heart disease	10
Dyslipidaemia	29
Diabetes mellitus	21
Sleep apnoea	23
Osteoarthritis	36
Minor comorbidity	
Gastric reflux	44
Venous stasis	22
Stress incontinence	26

Table 2 Postoperative change in quality of life, Moorhead–Ardelt questionnaire

Quality of life	Much better	Better	Same	Worse	Much worse
Self-esteem	52*	16	7	2	4
Physical activity	41	26	8	3	3
Social involvement	35	30	10	4	2
Ability to work	31	25	20	3	2
Interest in sex†	17	26	27	3	7

*Number of patients.

†One patient did not answer this section.

Postoperative quality of life

According to the Moorhead–Ardelt QOL score, the overall QOL following LAGB was greatly improved in 41 patients (patients had a QOL score of 2.25 to 3.0), improved in 23 patients (QOL score 0.75–2.0), minimally changed in 11 patients (QOL score 0 ± 0.5), diminished in one patient (QOL score -0.75 to -2.0) and greatly diminished in four patients (-2.25 to -3.0). Data were incomplete to determine the final QOL outcome in one patient. This patient reported much better self confidence, physical activity, ability to work, and had better social involvement; however, the patient did not report the change in the sex interest following LAGB. The responses of patients in regard to the different aspects of QOL are summarised in table 2.

Response of obesity related comorbidity

Of the 71 patients with one or more obesity related comorbidity, 29 patients were found to have resolution of all major comorbidities. In 21 patients resolution of one major condition with improvement in other conditions was observed. Eleven patients had general improvement in their major obesity related comorbidities and no measurable change was noted in seven patients. Three patients reported aggravation of their major comorbidities following LAGB (table 3). Gastro-oesophageal reflux was the most common symptom to be aggravated following surgery; eight patients reported that their reflux symptoms were worse following LAGB.

Operative complications and hospital stay

The median (IQR) duration of hospital stay was 2 days (2–6 days). Seventy patients had their LAGB operation with no complications while nine patients had minor and two patients had major complications post-LAGB. The nine patients with minor complications had port site related problems: port malposition in four patients, infection at the port site in three patients, and disconnection of the port from the band system in two patients. Six out of these nine patients with minor complications needed small operations at the port site. The two patients with major complications had band infection that needed reoperation and removal.

Outcome of LAGB

Using the BAROS scoring system, 24 patients (29.6%) had an excellent outcome (scored >7 points), 29 patients (35.8%) had very good outcome (>5 to 7 points), 15 patients (18.5%) had good outcome (>3 to 5 points), five patients (6.2%) had fair results (>1 to 3 points), and seven patients (8.7%) had failure (<1 point). Data were incomplete to determine the final outcome following LAGB in one patient (1.2%) as scores from the QOL were incomplete. This patient had excess weight loss of 50%, and had only one medical condition which was hypercholesterolaemia and this became more controlled following LAGB.

Table 3 Change in obesity related comorbidity after laparoscopic adjustable gastric banding

Comorbidity (number of patients)	Resolved	Improved	The same	Aggravated
Hypertension (32)	15	11	6	0
Heart disease (10)	3	5	2	0
Dyslipidaemia (29)	9	16	3	1
Diabetes mellitus (21)	9	10	1	1
Sleep apnoea (23)	12	7	3	1
Osteoarthritis (36)	7	15	14	0
Gastric reflux (44)	21	8	7	8
Venous stasis (22)	5	6	10	1
Stress incontinence (26)	8	9	9	0

DISCUSSION

This study presents the first assessment of factors relating to QOL which has been produced from a UK based surgical practice. The results show a considerable improvement in QOL following LAGB and weight loss. Around 80% of the patients reported improvement in their self-esteem, physical activities and social involvement. Improvements in their ability to work and interest in sex were less prominent with 70% and 54% of patients reporting improvement in these aspects, respectively.

The impact of bariatric surgery on QOL has been shown to be equally important to weight loss.^{5–6} Several studies have evaluated QOL following LAGB using different methods of assessment including the Rand SF-36 QOL index^{11–12} or Moorhead–Ardelt QOL index.^{9–10} Almost all reported significant and sustained improvement. However, there are clearly some negative results from this procedure. Some subjects experience difficulty with the necessary change in diet (slow eating of small quantities). In a study by Kinzl *et al*, 13% of patients experienced significant vomiting.¹³ This may explain why some patients report diminished QOL following LAGB even if they achieved a reasonable weight loss. Furthermore, reported effects on psychological status following bariatric surgery and weight loss are variable. While some studies showed an improvement in the depression status of patients following surgery;¹⁴ others found that there was no such improvement and patients remained liable to depression and anxiety following surgery unless they also received psychotherapy.¹⁵

The beneficial effect of weight loss following LAGB on cardiovascular risk factors has been clearly demonstrated in the current study. In the patients who had such comorbidity, at least two thirds of them claimed a complete resolution or an improvement in their status following LAGB and weight loss. This supports the work from other centres.^{11–14–16–17} Improvement was also evident in other obesity related comorbidity such as sleep apnoea, osteoarthritis and a variety of minor comorbidities. Although these results are based on patients' response, they were consistent with changes in the medical treatment offered to the patients by their general practitioners. Furthermore, improvement in patient's well-being or perceived health gain is an important measure that might be as important to the affected individual as the objective reduction in comorbidity.¹⁸

Although two thirds of the 44 patients with gastro-oesophageal reflux had improvement in their symptoms, eight patients reported that their symptoms became progressively worse after the operation. The incidence of reflux symptoms following LAGB has been an issue for debate. Some studies suggested that the band would act as an anti-reflux mechanism.¹⁹ However, others have reported a rising long term incidence of reflux symptoms following LAGB which contributes to the reduced oesophageal clearance through the inflated band; this can lead to intraluminal stasis of food,

What is already known on the subject

- Large series studies in specialised centres showed laparoscopic adjustable gastric banding (LAGB):
 - is a safe bariatric procedure
 - can achieve substantial weight loss
 - can achieve significant improvement in comorbidity
- Long term outcome of LAGB is still not fully understood.
- Efficacy of LAGB in small volume centres is still unknown as most of the studies are from highly specialised large volume centres.
- Limited studies on LAGB from UK.
- With increasing demand on bariatric surgery in the UK it is important to consider whether this type of surgery should only be considered in specialised centres or whether it can be safely and effectively integrated into other centres.

triggering acid reflux with increasing rates of heartburn, regurgitation, and dysphagia.^{20 21}

Weight loss remains the primary outcome measure for bariatric surgery and it is the most commonly reported measure in the literature. In the current study two thirds of the patients lost more than 50% of their excess weight. Weight loss steadily increased with time following the operation. In a previous larger study on patients who had LAGB in the same hospital, including those in the current study, the reported mean EWL was 58% and 74%, respectively, at 3 and 5 years of follow up.²² This was slightly better than the results reported by an Australian meta-analysis that anticipated a mean of 58% and 56% EWL after the same periods of follow up.²³

The increase in bariatric surgical activity has been modest in the UK as compared with other European countries and this study is based on a low volume bariatric practice. Despite that, there is good evidence that successful outcomes can be attained. In low volume bariatric centres the surgeons who are involved in this type of surgery are expected to have other fields of surgical interests, and in the current study bariatric surgery represents only a fraction of the surgical cases undertaken by the GI surgeon who performed LAGB. This is in contrast to the high volume bariatric centres where only specialised bariatric surgeons are involved in performing such operations. This may suggest that, given appropriate training and support, surgeons with diverse interests may become involved in this type of surgery.

What this study adds

- This study presents the first assessment of factors relating to the quality of life which has been produced from a UK based surgical practice.
- This study shows good results of LAGB safety and efficacy in a low volume bariatric practice. This provides evidence that surgeons with diverse interests may become involved in this type of surgery and that given appropriate training and support, LAGB results can be comparable to those in large volume specialised centres.

Complications in this study were minimal and mainly were minor port site related complications, while two patients required band removal. Selection bias may have been introduced because those patients who were not followed up or did not respond to the questionnaire may have possessed very different characteristics to those who participated in the study. In particular, there is concern that they may have been less satisfied with the outcome of the surgery due to slower weight loss or complications. However, we have previously reported our complication rates with LAGB in a larger study that included all of our current study initial population of 104 patients.²² Port site related problems were identified as the main complications with a reoperation rate of 12.2%, and band removal in 4.7% of patients. These are lower rates compared to the existing literature and this has been attributed to the use of the pars flaccida approach for the band placement, which may reduce complications related to band slippage and the need for reoperation.²⁴

Based on BAROS, the outcome of LAGB was favourable in 84% of patients. Seven patients had a failed outcome following the procedure (8.7%); these patients failed to lose more than 20% of their excess weight although one patient had EWL of 43%. All of these patients reported a severe deterioration of their QOL, reflecting the importance of psychiatric assessment and support. Failure to lose weight owing to band removal occurred in two patients while another four patients had band intolerance requiring deflation. Investigations of these patients did not reveal any band related complication to be the underlying cause for their symptoms.

This study shows that LAGB after multidisciplinary team assessment is a safe and efficient technique that can achieve a satisfactory weight loss, with a significant improvement in QOL and obesity related comorbidities.

Authors' affiliations

M Titi, J T Jenkins, P Modak, D J Galloway, Gartnavel General Hospital, Glasgow, UK

Competing interests: None

REFERENCES

- 1 Belachew M, Legrand MJ, Defechereux TH, et al. Laparoscopic adjustable silicone gastric banding in the treatment of morbid obesity: a preliminary report. *Surg Endosc* 1994;8:1354–6.
- 2 Bakr AA, Fahim T. Laparoscopic adjustable gastric banding is a safe and effective treatment for morbid obesity. *J Soc Laparoendosc Surg* 1998;2:57–61.
- 3 Dargent J. Laparoscopic adjustable gastric banding: lessons from the first 500 patients in a single institution. *Obes Surg* 1999;9:446–52.
- 4 Fielding GA, Rhodes M, Nathanson LK. Laparoscopic gastric banding for morbid obesity. Surgical outcome in 335 cases. *Surg Endosc* 1999;13:550–4.
- 5 Brolin RE. Critical analysis of results: weight loss and quality of data. *Am J Clin Nutr* 1992;55:5775–81.
- 6 Oria HE, Moorehead MK. Bariatric analysis and reporting outcome system (BAROS). *Obes Surg* 1999;9:288.
- 7 Favretti F, Cadiere GB, Segato G, et al. Bariatric analysis and reporting outcome system (BAROS) applied to laparoscopic gastric banding patients. *Obes Surg* 1998;8:500–4.
- 8 Wolf AM, Falcone AR, Kortner B, et al. BAROS: an effective system to evaluate the results of patients after bariatric surgery. *Obes Surg* 2000;10:445–50.
- 9 Tolonen P, Victorzon M. Quality of life following laparoscopic adjustable gastric banding – the Swedish band and the Moorehead-Ardelt questionnaire. *Obes Surg* 2003;13:424–6.
- 10 Hell E, Miller KA, Moorehead MK, et al. Evaluation of health status and quality of life after bariatric surgery: comparison of standard Roux-en-Y gastric bypass, vertical banded gastroplasty and laparoscopic adjustable silicone gastric banding. *Obes Surg* 2000;10:214–9.
- 11 Larsen JK, Geenen R, van Ramshorst B, et al. Psychosocial functioning before and after laparoscopic adjustable gastric banding: a cross-sectional study. *Obes Surg* 2003;13:629–36.
- 12 O'Brien PE, Dixon JB. Lap-band: outcomes and results. *J Laparoendosc Adv Surg Tech A* 2003;13:265–70.
- 13 Kinzl JF, Traweger C, Trefalt E, et al. Psychosocial consequences of weight loss following gastric banding for morbid obesity. *Obes Surg* 2003;13:105–10.
- 14 O'Brien PE, Dixon JB, Brown W, et al. The laparoscopic adjustable gastric band (Lap-Band): a prospective study of medium-term effects on weight, health and quality of life. *Obes Surg* 2002;12:652–60.

- 15 **Nicolai A**, Ippoliti C, Petrelli MD. Laparoscopic adjustable gastric banding: essential role of psychological support. *Obes Surg* 2002;**12**:857–63.
- 16 **Ceelen W**, Walder J, Cardon A, *et al*. Surgical treatment of severe obesity with a low-pressure adjustable gastric band: experimental data and clinical results in 625 patients. *Ann Surg* 2003;**237**:10–16.
- 17 **Fielding GA**, Ren CJ. Laparoscopic adjustable gastric band. *Surg Clin North Am* 2005;**85**:129–40.
- 18 **Ryden A**, Torgerson JS. The Swedish Obese Subjects Study—what has been accomplished to date? *Surg Obes Relat Dis* 2006;**2**:549–60.
- 19 **de Jong JR**, van Ramshorst B, Timmer R, *et al*. The influence of laparoscopic adjustable gastric banding on gastroesophageal reflux. *Obes Surg* 2004;**14**:399–406.
- 20 **Morino M**, Toppino M, Garrone C. Disappointing long term results of laparoscopic adjustable gastric banding. *Br J Surg* 1997;**184**:868–9.
- 21 **Gutschow CA**, Collet P, Prenzel K, *et al*. Long-term results and gastroesophageal reflux in a series of laparoscopic adjustable gastric banding. *J Gastrointest Surg* 2005;**9**:941–8.
- 22 **Jenkins JT**, Modak P, Galloway DJ. Prospective study of laparoscopic adjustable gastric banding in the West of Scotland. *Scott Med J* 2006;**51**:37–41.
- 23 **Chapman AE**, Kiroff G, Game P, *et al*. Laparoscopic adjustable gastric banding in the treatment of obesity: a systematic literature review. *Surgery* 2004;**135**:326–51.
- 24 **Greenslade J**, Kow L, Toouli J. Surgical management of obesity using a soft adjustable gastric band. *ANZ J Surg* 2004;**74**:195–9.

BNF for Children 2006, second annual edition

In a single resource:

- guidance on drug management of common childhood conditions
- hands-on information on prescribing, monitoring and administering medicines to children
- comprehensive guidance covering neonates to adolescents

For more information please go to **bnfc.org**