Treatment of obesity with laparoscopic adjustable gastric banding in Singapore: an initial experience

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ABSTRACT

Introduction: Laparoscopic adjustable gastric banding (LAGB) has been used for the treatment of obesity, being shown in western populations to be a safe and effective option. We present the results of our experience in the use of LAGB in the treatment of obesity.

Methods: A retrospective review of all patients who underwent LAGB from February 1999 to June 2004 was made from a prospectively collected database. Pre-operative comorbidities, height, weight and body mass index (BMI) were recorded and compared with post-operative results. Operative times, length of stay and complications were also noted.

Results: 38 consecutive patients underwent LAGB. The 16 male and 22 female patients had a mean age of 37.6 years (range 19 to 62 years) and a mean BMI of 42.7kg per square metre (range 28.8 to 78.4kg per square metre). Nine were done utilising the perigastric approach, and the other 29 with the pars flaccida approach. There were no open conversions. Overall peri-operative morbidity was encountered in two (5.3 percent) patients, with a minor liver laceration and a capsular splenic laceration in separate patients. There were no post-operative complications. One (2.7 percent) patient had the band removed at 29 months post-operatively on request. There were no mortalities. Mean follow-up period was 13 months (range one to 56 months). Mean BMI decreased to 40.7, 38.7, 37.4, 34.1 and 32.9kg per square metre, respectively, at one week, one, six, 12 and 18 months post-operatively.

Conclusion: LAGB is a feasible modality in the multifaceted approach to treatment of morbid obesity. The results from our follow-up are comparable to larger series in western populations, with a similar safety profile.

Keywords: bariatric surgery, gastric banding, laparoscopic adjustable gastric banding, laparoscopic surgery, obesity

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INTRODUCTION

Obesity has been on the rise in Singapore[1-3], with the accompanying morbidity. These accompanying risk factors, which also include diabetes mellitus, are seen at a lower body mass index (BMI) in Asians compared to western populations[4], and this has prompted suggestions to lower the BMI classification and treatment of obesity in Asians[5,6]. Laparoscopic adjustable gastric banding (LAGB) is one of several surgical options available for the treatment of obesity[7]. Conservative and medical options often give inconsistent and unsustained results[8]. LAGB offers a safer alternative to the conventional gastric bypass, with the advantages of minimal access. LAGB has been described and analysed in multiple studies on western populations, but there has been a paucity of similar studies in Asia. In this study, we describe our experience and results in the use of LAGB for the treatment of obesity in a predominantly Asian population.

METHODS

Between February 1999 and June 2004, 38 patients underwent LAGB. This was performed by a single consultant laparoscopic surgeon in Mount Elizabeth Medical Centre and Changi General Hospital. The medical records of these patients were reviewed, and details were recorded into a patient database. The age, gender and race of the patients were recorded, together with their heights and weights, from which the BMI were calculated.

Pre-operative assessment included a detailed history and physical examination. The patients were counseled regarding the operation and dietary restrictions thereafter. Referrals to the dieticians and pre-operative assessments by the cardiologist and otolaryngologist were made.Comorbidities which

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were taken into consideration in the data collection included diabetes mellitus, hypertension, dyslipidaemia, asthma, gastroesophageal reflux disease, obstructive sleep apnoea, knee pain and back pains.

The duration of diabetes mellitus, blood glucose and HbA1c levels were noted, together with the presence of insulin requirements. The fasting lipid profiles, which included the triglyceride (TG), total cholesterol (TC), high density lipoprotein (HDL) and low density lipoprotein (LDL) levels, were noted. Symptoms of obstructive sleep apnoea were confirmed using a sleep test wherever possible. Otherwise, the presence was recorded based on a history of habitual snoring or daytime somnolence. Knee and back pains were recorded as present with a documented history of osteoarthritis, or when not previously documented, as a significant history of mechanical pain associated with activity.

The operation dates were recorded, with a note on the operative approach and duration of surgery. The lengths of stay were also recorded. Complications were documented as occurring early (peri-operatively) or late (post-operatively). The operation consisted of the laparosopic placement of the gastric band (Lap-Band System, BioEnterics, Carpinteria, CA, USA) to create a proximal 15ml pouch at the cardia. The adjustable band was connected to an injectable port which is placed anterior to the rectus sheath in the epigastrium.

Patients were positioned in the Lloyd-Davis position with the surgeon standing between the legs. Pneumoperitoneum was created with a Veress needle, after which a 12mm optical guided trocar was inserted through a left epigastric incision. A 15mm port was inserted into the right epigastrium, with 5mm ports in the superior epigastrium, left hypochondrium and right hypochondrium. The left lobe of the liver was retracted to expose the subhepatic region and stomach. The calibration balloon was inflated to help identify the site of dissection for the cardia. The pars flaccida approach was utilised in the dissection behind the cardia, after which the band was introduced and threaded through. The earlier cases were done with the perigastric approach. The band was then locked and the anterior stomach oversewn to prevent slippage. The connecting tube was then threaded through the right epigastric port and connected to the injectable port which was then secured to the rectus sheath.

Post-operatively, the patient was monitored for any surgical or anaesthetic complications. A gastrograffin swallow was done on the first post-operative day to assess the band placement after which liquids were given. The patient was first seen in the respective outpatient clinics on the first week post-operatively, then subsequently at one month and thereafter, at three monthly intervals. All patients were reviewed by the surgeon to evaluate the need for band recalibration. Regular visits to the dietician were made, with regular reviews and reinforcement of dietary restrictions. Follow-up with a sports physician was also encouraged with regular exercise.

RESULTS

There were 13 patients treated at Changi General Hospital, and 25 patients at Mount Elizabeth Medical Centre, giving a total of 38 patients treated from February 26, 1999 and June 30, 2004. The patients seen had a mean age of 37.6 years (ranging 19 to 62 years). There were 16 (42.1%) male patients and 22 (57.9%) female patients. There were eight Caucasian, nine Chinese, 11 Indian, six Indonesian and four Malay patients. The mean height and weight of the patients were 167.7cm and 120.9kg, respectively. The resulting mean BMI was 42.7kg/m^2 (ranging 28.8 to 78.4kg/m^2).

Ten (26.3%) patients had a history of diabetes mellitus, two of which were newly diagnosed. The mean fasting venous blood glucose of the patients with diabetes mellitus was 9.18mmol/L, in comparison with 5.43mmol/L of those without. 12 (31.6%) patients had a history of hypertension. Five (13.2%) patients gave a history of dyslipidaemia. However, seven patients were newly diagnosed with a total cholesterol level of >6.2mmol/L, bringing the total number to 12 (31.6%). The mean total triglyceride, total cholesterol, LDL-cholesterol and HDL-cholesterol levels for these five patients were 2.49mmol/L, 5.94mmol/L, 3.67mmol/L and 1.14mmol/L, respectively. This is in comparison to 2.11mmol/L, 5.49mmol/L, 3.59mmol/L and 1.30mmol/L, respectively, in those without a prior history of hyperlipidaemia.

Five (13.2%) patients had a history of asthma. There were no patients with a history of gastroesophageal reflux. 16 (42.1%) of patients had a history of obstructive sleep apnoea. 16 (42.1%) and 12 (31.6%) of patients had a history of significant activity-related knee and back pains, respectively.

All the patients were operated on by the same surgeon. The initial nine operations in the series were done utilising the perigastric approach, with the other 29 using the pars flaccida approach. There were no open conversions. Five patients had additional procedures, of which two were adhesiolysis

procedures and two were repairs of hiatus herniae. The longest operation was for a patient who had LAGB with abdominoplasty and a repair of an incisional hernia. The mean operating time was 145 minutes (range 95 to 265 minutes) with the patients staying for a mean of four days (range two to six days). The operating times for the recent 20 patients from July 2003 to June 2004 registered a mean of 124 minutes (range 95 to 175 minutes), in comparison to 164 minutes (range 105 to 265 minutes) of the initial 18 patients. Intra-operative complications were encountered in two (5.3%) patients. There was a minor liver laceration in one patient, and a minor splenic capsular laceration in another. Both were successfully controlled laparoscopically without conversions. There were no post-operative complications. One patient had the gastric band removed at 29 months post-operatively on request.

The patients were followed-up for a mean period of 13 months (ranging one to 56 months). The mean BMI decreased from an initial 42.7kg/m^2 to 40.7kg/m^2, 38.7kg/m^2, 37.4kg/m^2, 34.1kg/m^2 and 32.9kg/m^2 at one week, one, six, 12, and 18 months, respectively (Table I). Mean weight decreased from an initial 120.9kg to 117.8kg, 109.4kg, 110.0kg, 101.9kg and 98.5kg at the same time frames (Table II), which correspond to mean weight losses of 4.9kg, 7.7kg, 14.0kg, 19.4kg and 16.5kg, respectively (Table III).

Table I. Changes in BMI (in kg/m^2).

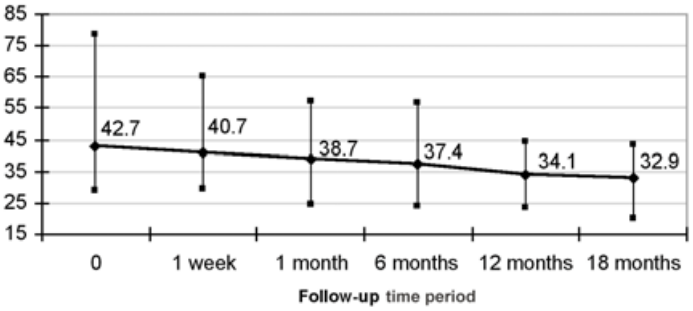


Table II. Changes in weight (in kg).

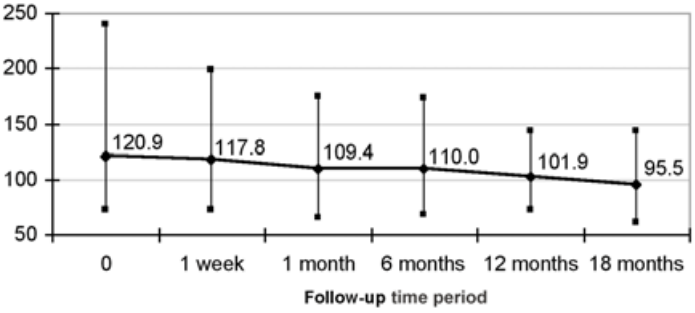
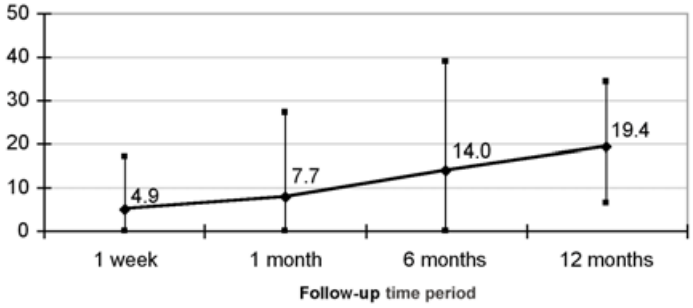


Table III. Weight lost (in kg).



DISCUSSION

Singapore has undergone rapid socioeconomic development over the past 40 years, and this has been accompanied by changes in disease patterns. Cardiovascular diseases are the leading causes of death among Singaporeans, along with cancer. An association of an affluent lifestyle has been drawn with the incidence of cardiovascular disease, of which obesity is a major accomplice.

Obesity has been defined by the World Health Organisation as a condition with excessive fat accumulation in the body to the extent that health and well-being are adversely affected[9]. In turn, BMI has been found to be highly correlated with body fat percentage, thus being a suitable surrogate parameter for defining obesity[10-12]. Environmental factors have often been implicated in causing obesity, but molecular research in the past decade has unveiled possible genetic origins[13].

Obesity has been recognised as an independent risk factor for cardiovascular disease, documented in long-term prospective studies[14], like the Manitoba Heart Study[15], the Nurses' Health Study[16] and the Framingham Study[17]. This has also been linked in turn to increased morbidity and mortality[9,14,18]. Increased mortality has been notably associated with obesity in a study of 750,000 by the American Cancer Society[18]. Hypertension, hypercholesterolaemia and diabetes have been associated with obesity[19,20], along with kidney stones and gallstones[21]. Socially and psychologically, the obese have also been shown to be less likely to get married, and completing fewer years of school[22]. Furthermore, it has been estimated that 275,000 to 325,000 people in America die each year from obesity-related diseases[23].

The problem of obesity has almost reached epidemic proportions in western populations, with an American National Health and Nutrition Survey in 1999 showing that 27% of adults are obese (BMI >30), reflecting an 80% increase over a 20-year period[24]. This epidemic is an enormous economical burden to both the individual and the health care system[25,26]. It has also been on the increase in many

places in southeast Asia and Asia[27,28]. In Singapore, obesity has also been on the rise[1-3]. The 1998 National Health Survey[29], based on the WHO criteria for obesity, showed that among adults aged 18 to 69 years, there were 24.4% who were overweight and 6.0% who were obese. This showed an increase in comparison with the 1992 National Health Survey[3], which showed lower rates of 21% and 5% who were overweight and obese, respectively. The 1998 survey also showed that there were more obese females than males, 6.7% versus 5.3%. The ethnic proportions of obesity were as follows: Malays 16.2%, Indians 12.2% and Chinese 3.8%. These ethnic proportions were more pronounced in females than in males. This ethnic prevalence was also previously reported in a random sample of 961 Singaporean men and women aged 30 to 69 years[30]. A rising trend has also been noted among Singaporean children[3], with obesity rates climbing from 2.6% in 1988 to 6.8% in 1991 among pre-school children. It has also increased from 2.3% in 1976 to 16.1% in 1993 among those aged 6 to 18 years. Malay children have also been noted to have more severe grades of obesity compared to Chinese and Indian children[31].

The prevalence of obesity, as defined by a BMI >30, is much lower in Singaporean adults than in Caucasian populations[32]. However, recent studies have shown that mortality from cardiovascular disease is comparable, being even higher than in other parts of Asia like Hong Kong and Japan[33]. Preliminary data from Asian countries like China, Hong Kong, India, Japan, Korea, Malaysia and Indonesia demonstrate that risk factors are manifested at lower levels of BMI[4], prompting the WHO to recognise that BMI cut-offs for obesity among Asians should be re-examined. It has been suggested that different ethnic groups have different relationships between BMI and percent bodyfat (BF%)[34-36]; it has been found that Asians in New York had a lower mean BMI for a higher BF% than Caucasians of the same age and sex[37]. Indonesians have also been found to have a BMI of 3 units lower than Dutch Caucasians for the same BF%[38]. In Singapore, it has been suggested from local data that BMI cut-offs for overweight and obese be revised from 25 and 30 to 23 and 27, respectively[5,6]. These revisions would translate into a prevalence of overweight from 24% to 32%, and obesity from 6 to 16%, closer to that of Caucasian populations[30], with important implications in health care policies. There have been similar calls for revisions from Hong Kong researchers and in joint Asia-Pacific Perspectives[39].

Treatment of obesity is a process fraught with much difficulty and frustration for both doctor and patient[40-42]. Dietary measures have inconsistent success and a high rate of weight regain[8]. It has been shown that a low calorie diet can reduce body weight by an average of 8%, and reduce abdominal fat content over a period of 6 months[43]. However, few can continue long-term, and conservative measures are often not fast enough to solve medical, physical and psychosocial problems. In the National Institute of Health consensus on gastrointestinal surgery for severe obesity in 1991, it was decided that surgery should be offered to morbidly obese patients who are unresponsive to non-surgical therapy for weight loss. This recommendation was made based on studies indicating that dietary weight reduction with or without behavioural modification or drug therapy had an unacceptably high incidence of weight regain in the morbidly obese within two years after maximal weight loss[44].

In the local experience, the National Healthy Lifestyle Programme was implemented in 1991, launching a multi-sectoral approach to encourage healthy living in Singapore. A National Health Survey then provided baseline data for subsequent evaluation of effectiveness of the programme. Six years on in 1998, a review of the programme showed that although there was a higher proportion of people who exercised at least three times a week, it was unsuccessful in reducing overall total blood cholesterol levels, or changing the prevalence of obesity[45]. Other governmental efforts of improving general health and reducing obesity include those targeted at school children like the Trim and Fit club[46].

Surgical intervention in the treatment of obesity has been known for half a century[47], with significant contributions especially in the past three decades[48]. Surgical methods could mostly be divided into two broad categories: those which were based on generating malabsorption by means of a bypass and those based on gastric volume reduction[7]. Bypass operations have better weight loss results, but with a higher rate of complications which are inherent to the presence of an anastomosis. The calibrated vertical banded gastroplasty and gastric banding procedures are examples of gastric volume restrictive procedures. Gastric banding surgery started in the 1980s with the open insertion of non-adjustable bands[49], being preceded by other procedures like the fundoplication and mesh wrapping procedures[50]. LAGB has been used for more than eight years in continental Europe and Australia prior to its introduction and approval by

the FDA in USA in June 2001[51]. LAGB is a technique which marries the advantages of minimal surgical access and cosmesis with the flexibility of an adjustable band.

The experience of LAGB series have been studied and described far more extensively in western than in Asian populations. There is a paucity of literature on experiences in a predominantly Asian population, even though the prevalence of obesity is rising. This initial series extends a span of five years with a total of 38 patients. The multinationality of our patient base is not representative of the general Singaporean population.

The incidences of diabetes mellitus, hypertension and dyslipidaemia in our series of 26.3%, 31.6% and 31.6%, respectively, are considerable higher than the reported incidences in the general Singaporean population of 9.0%, 27.3% and 25.4%, respectively, as reported in the 1998 National Health Survey[29]. The incidence of diabetes mellitus is considerably higher than the 13% reported by Zinzindohoue et al in a series of 500 patients[7]. However, the incidences of hypertension and dyslipidaemia are similar.

The mean operating time of 145 minutes is much higher than the mean of 105 minutes reported by Zinzindohoue et al[7] in the series of 500 patients. It is also considerably higher than the 82 minutes reported by Bende et al in his initial series of 54 patients[52]. However, it is noted that the mean operating time of the latter 20 patients of 124 minutes is considerably shorter than the 164 minutes of the earlier 18 patients.

LAGB is a comparatively safer operation with a lower rate of morbidity and mortality. In a series of 1,120 patients, O'Brien et al reported an overall peri-operative and late complication rate of 1.5%[53]. Complication rates as reported by other authors range from 3.9% in the series by Favretti et al[54] to 11.3% in the Italian Collaborative Study Group[55]. Peri-operative complications include band prolapse, gastric perforations and infection. Other complications reported include atelectasis and liver laceration. Late complications described include band prolapse, gastric erosions, tubing leaks and access port problems like displacement and disconnection[51,56]. Mortality is rare, being three out of a collective number of 5,827 patients in a literature review, amounting to 0.05%, which is ten times safer than gastric stapling procedures[51]. In this study, there were no mortalities, and the overall morbidity rate was 5.3%. These were the minor intra-operative liver and splenic lacerations in two separate patients. This is lower as compared to the 18.8% reported by Zinzindohoue et al[7], but is higher than that reported by O'Brien et al[53].

Gradual weight loss over the first two years post-operatively, followed by a stable level of about 50% excess weight loss at up to six years of follow-up is a feature of LAGB[51], with a study reporting 42.8%, 52% and 54.8% weight loss at one, two and three years[7]. These excess weight loss results are reportedly not different from gastric bypass procedures[51]. Major improvements in comorbid factors have also been reported in association with the LAGB. 64% of diabetic patients experience remission and 26% have major improvements in diabetic control[51,57-59]. Blood pressure control is easier, with 59% of patients being able to cease antihypertensive therapy[51,58-60]. Favourable changes are also seen in those with dyslipidaemia, asthma and sleep disordered breathing. 89% of patients with pre-existing gastroesophageal reflux disease had total resolution with 5% reporting improvements[51,61-63]. Studies have also demonstrated an improvement in the quality of life indicators after operation[64,65]. In this series, there is a gradual reduction of BMI in six-monthly intervals from an initial base of 42.7kg/m^2 (Table I). The mean BMI decreases to below 35kg/m^2 at 12 months post-operatively. This rate of reduction is not unlike that reported by other authors[53]. However, most studies show a gradual plateau after 36 months.

In conclusion, LAGB, in our initial experience, is a feasible modality in the multifaceted approach to treatment of morbid obesity. The results from our follow-up are comparable to larger series in western populations, with a similar safety profile. However, the results of this study would be made more significant with a larger size and longer follow-up.

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