

Influence of bariatric surgery on weight reduction and control of chronic disease among obese patients in Malaysia

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ABSTRACT

Introduction: This study was designed to determine the influence of bariatric surgery on changes in the body mass index (BMI), and the control of diabetes, hypertension and dyslipidaemia among obese patients in Malaysia.

Materials And Methods: This was a retrospective cohort study undertaken at a public tertiary care centre in the state of Perak, Malaysia. Information of obese patients who underwent bariatric surgery was obtained from their medical records. The changes in the BMI, HbA1C, systolic and diastolic blood pressure (SBP and DBP), and lipid levels between three months before and after the surgery were assessed.

Results: The patients (n=106) were mostly Malay (66.0%), had at least one comorbidity (61.3%), and had a mean age of 40.38±11.75 years. Following surgery, the BMI of the patients was found to reduce by 9.78±5.82kg/m². For the patients who had diabetes (n=24) and hypertension (n=47), their mean HbA1C, SBP and DBP were also shown to reduce significantly by 2.02±2.13%, 17.19±16.97mmHg, and 11.45±12.63mmHg, respectively. Meanwhile, the mean total cholesterol, triglyceride and low-density lipoprotein levels of those who had dyslipidaemia (n=21) were, respectively, lowered by 0.91±1.18mmol/L, 0.69±1.11mmol/L and 0.47±0.52mmol/L.

Conclusion: The findings suggest that in addition to weight reduction, bariatric surgery is helpful in improving the diabetes, hypertension and dyslipidaemia control among obese patients. However, a large-scale trial with a control group is required to verify our findings.

KEY WORDS:

Bariatric surgery, hypertension, obesity, blood glucose, dyslipidemia

INTRODUCTION

Malaysia is currently one of the Asian countries with the highest prevalence of obesity, as approximately half of the Malaysians are either overweight or obese. Obesity is well

known to be strongly associated with diabetes, hypertension and dyslipidaemia, which could eventually result in a wide range of complications, such as coronary artery disease, stroke and chronic kidney disease. These obesity-related complications have significantly affected the health and quality of life of Malaysians and have increased the financial burden of the public health system.^{1,2}

Apart from medical therapy and lifestyle modification, bariatric surgery is one of the increasingly well-accepted treatment options for weight reduction. The recommended types of bariatric surgery include biliopancreatic diversion with duodenal switch, Roux-en-Y gastric bypass, laparoscopic sleeve gastrectomy (LSG), laparoscopic gastric banding (LGB) and adjustable gastric banding. In general, the usefulness of bariatric surgery has been well documented, as it was reported to lead to approximately 60% of excessive weight loss and significant improvement in diabetes, hypertension and lowering levels of lipids in 60 to 85% of obese patients.³ Furthermore, bariatric surgery was found to be more effective than the conventional treatment in weight and diabetes control. In a systematic review of 16 head-to-head studies, patients who underwent bariatric surgery were shown to have an additional 8.3 kg/m² of BMI loss (p<0.001) and 1.1% of HbA1C reduction (p<0.001). Meanwhile, bariatric surgery also led to the complete diabetes control in 63.5% of the patients, higher than the 15.6% achieved by the conventional treatment (p<0.001).⁴

However, to date, the information on the usefulness of bariatric surgery in Asian population is limited.⁵ As obesity and non-communicable diseases are increasingly prevalent in Malaysia, this study was designed to evaluate the influences of bariatric surgery on the weight reduction and the control of common chronic diseases, including diabetes, hypertension and dyslipidaemia in obese patients. The effectiveness of LSG and LGB, the two most commonly used bariatric surgery in Malaysia, were also compared.

MATERIALS AND METHODS

This was a retrospective cohort study undertaken at the Taiping Hospital, a public tertiary care centre in Malaysia.

This article was accepted: 28 February 2019

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The patients, who (i) were aged 20 years or above, (ii) had a body mass index (BMI) of 27.5kg/m² or above, and (iii) underwent bariatric surgery (LSG or LGB) between June 2008 and December 2016, were included. Their baseline and surgery-related information was obtained from their medical records. Changes in the targeted parameters, including body mass index (BMI), HbA1C, systolic and diastolic blood pressures (SBP and DBP), and lipid levels, between the three months before and after the surgery were assessed.

The data analysis was performed using the SPSS for Windows version 20.0 (IBM, New York). All the numerical data were expressed as means and standard deviations (SDs), and the categorical data as frequencies and percentages. The pre- and post-surgery mean differences, along with the mean differences between LSG and LGB in the changes of clinical parameters, were determined by using the paired t-tests. The level of statistical significance was fixed at p<0.05.

RESULTS

Of the 106 patients included in this study, majority were Malay (66.0%), and had at least one comorbidity (61.3%). Their mean age was 40.4±11.75 years (Table I). More than half (56.6%) of the patients underwent LSG, while the rest

underwent LGB. The changes of all the targeted parameters were significant (p<0.05) in three months following the surgery, except for the high-density lipoprotein (HDL). Weight reduction was found to occur in all the patients, with the mean BMI reduced by 9.78±5.82kg/m². Also, the mean HbA1C, SBP and DBP were shown to significantly reduced by 2.02±2.13%, 17.19±16.97mmHg, and 11.45±12.63mmHg, respectively. Furthermore, the mean total cholesterol, triglyceride (TG) and low-density lipoprotein (LDL) levels were, respectively, lowered by 0.91±1.18mmol/L, 0.69±1.11mmol/L and 0.47±0.52mmol/L (Table II).

Moreover, the majority (79.0%) of patients with diabetes were found to have improved glycaemic control, indicated by the HbA1C reduction, of 2.02%. Also, the percentage of patients with SBP and DBP above 140mmHg and 90mmHg was found to be reduced from 44.3% to 42.5% following surgery. Additionally, the reduction of LDL and TG, respectively, occurred in 76.0% and 65.0% of the patients with dyslipidaemia.

Apart from that, both the LSG (10.5kg/m²; p<0.001) and LGB (8.9kg/m²; p<0.001) were shown resulting in a pronounced reduction of BMI (10.5kg/m² vs. 8.9 kg/m²). However, there was no significant difference in the BMI reduction between

Table I: Baseline characteristics of patients (n=106)

Characteristics	Frequency	Percentage
Mean Age, years (SD)	40.4	11.75
Ethnicity		
Malay	70	66.0
Chinese	5	4.7
Indian	31	29.2
Co-morbidities		
Hypertension	47	44.3
Diabetes	24	22.6
Dyslipidaemia	21	19.8

SD, standard deviation

Table II: Changes in clinical parameters following the bariatric surgery

Outcome	N (number of subjects)	Mean values				p-value
		Pre mean	Post mean	Mean difference	Std. Deviation	
BMI (kg/m ²)	106	46.58	36.79	9.78	5.82	<0.001
SBP (mmHg)	47	150.60	133.40	17.19	16.97	<0.001
DBP (mmHg)	47	93.45	82.00	11.45	12.63	<0.001
TC (mmol/L)	21	5.55	4.64	0.91	1.18	0.002
LDL (mmol/L)	21	3.65	2.96	0.69	1.11	0.010
HDL# (mmol/L)	20	1.17	1.21	-0.04	0.31	0.555
TG (mmol/L)	21	1.52	1.05	0.47	0.52	<0.001
FBS* (mmol/L)	22	8.38	5.78	2.60	3.37	0.002
Hba1c* (%)	19	8.58	6.56	2.02	2.13	0.001

Abbreviations: BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; TC, total cholesterol; LDL, low density lipoprotein; HDL, high density lipoprotein; TG, triglycerides; FBS, fasting blood sugar.

*5 unrecorded Hba1c and 2 unrecorded FBS. Total patients with diabetes (n=24)

1 unrecorded HDL. Total patients with dyslipidemia (n=21)

Table III: Comparisons of effects between laparoscopic sleeve gastrectomy (LSG) and laparoscopic gastric banding (LGB) in body mass index (BMI) change and the control of diabetes, hypertension and dyslipidemia

Type of surgery	BMI		Hba1c (n=19)		SBP (n=47)		DBP (n=47)		Total cholesterol (n=21)		LDL (n=21)		HDL (n=21)		TG (n=21)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
LSG	49.87 (11.19)	39.38 (9.68)	8.37 (3.00)	5.95 (1.11)	153.00 (23.26)	140.50 (16.16)	96.00 (11.11)	86.73 (8.87)	5.75 (0.99)	5.08 (0.99)	3.78 (1.02)	3.32 (0.86)	1.17 (0.17)	1.29 (0.25)	1.57 (0.55)	1.08 (0.22)
LGB	42.28 (7.57)	33.41 (7.90)	8.68 (2.72)	6.84 (1.39)	148.48 (15.04)	127.16 (11.88)	91.20 (13.14)	77.84 (7.97)	5.38 (1.25)	4.25 (0.86)	3.54 (1.19)	2.64 (0.89)	1.16 (0.26)	1.14 (0.33)	1.48 (0.44)	1.02 (0.23)
p-value	<0.001	0.001	0.826	0.183	0.428	0.002	0.186	0.001	0.464	0.054	0.621	0.091	0.905	0.265	0.699	0.520

the LGB and LSG groups ($p=0.157$). LGB was shown to lead to a higher reduction in SBP (21.3mmHg vs 12.5mmHg; $p=0.002$) and DBP (13.4mmHg vs 9.3 mmHg; $p=0.001$). Otherwise, the two surgical procedures did not differ in the control of chronic diseases (Table III).

DISCUSSION

In this study other than weight reduction, almost all the clinical parameters assessed, including fasting blood sugar, HbA1C, total cholesterol, HDL, LDL, triglycerides and blood pressure, recorded significant improvement in patients after the bariatric surgery. The findings support the use of bariatric surgery as one of the strategies to manage obesity in Malaysia.

The impact of the bariatric surgery on weight reduction was demonstrated through a significant drop in the mean BMI ($9.78\pm 5.82\text{kg/m}^2$, $p<0.001$) of the obese patients. Nevertheless, the magnitude of the BMI reduction shown in this study was found to be slightly lower than those recorded in the previous studies. This is likely attributable to the relatively short follow-up period of this study, as the BMI reduction has been demonstrated to be more pronounced over time.⁶

The findings also show a significant BMI reduction for both the LSG (10.5kg/m^2) and LGB (8.9kg/m^2) in three months following the surgery. Nevertheless, these two methods showed no significant difference in the magnitude of BMI reduction. As a recent meta-analysis found that LGB may have a better effect on BMI reduction than LSG,⁷ the similar efficacy between the two modalities shown in this study was most likely due to a population with different genetic predisposition compared with the previous studies.⁷ Nevertheless, a large-scale study is needed to confirm the postulation.

Consistent with the previous studies, our findings suggest a better efficacy of LGB over LSG in the control of chronic diseases.⁷ While a reduction of SBP and DBP by 10 and 5mmHg is associated with a lower incidence of cardiovascular diseases,^{8,9} the patients who underwent LGB had a better control of both SBP ($p<0.002$) and DBP ($p<0.001$) than those who underwent LSG in this study. They also demonstrated a trend of having a more pronounced reduction of cholesterol ($p=0.054$) and LDL ($p=0.091$) levels, even though the results were not statistically significant.

Also, similar to the findings of a systematic review,⁶ this study reports a reduction in HbA1C by approximately 2% and in fasting glucose level by 2.60mmol/L following the bariatric surgery. As a reduction of HbA1C of more than 1% has been shown to have cardiovascular benefits,¹⁰ bariatric surgeries can potentially be used as a strategy to improve the glycaemic control of type 2 diabetes in obese patients,⁶ and thereby to reduce the diabetes-related complications and mortality.¹¹

There are several limitations in this study. First, this is a single-centre study, and therefore the findings cannot be generalised to other health settings in Malaysia, especially

those that have used different types of bariatric surgery. Besides, not all the patients were involved in the comparisons for the changes in certain clinical parameters, as the baseline values were not recorded in their medical records. Furthermore, the outcomes of the surgery were only observed for three months, and a longer follow-up period is warranted to confirm the sustainability of the effects of bariatric surgery. Moreover, the effectiveness of laparoscopic roux-en-y (RYGB), which has been shown to be an effective surgical method for obesity, was not evaluated as it was not routinely performed at the study site.¹²⁻¹⁴

CONCLUSION

This study suggests that in addition to weight reduction, bariatric surgery is helpful in improving the diabetes, hypertension and dyslipidaemia management in obese patients. However, a study design with a longer follow-up period is required to verify our findings.

ACKNOWLEDGEMENTS

We wish to thank the Director General of Health, Malaysia, for his permission to publish the findings from this study.

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