

First report of One Anastomosis Gastric bypass performed in Twins

Key points:

- There is a complex interaction between genetic and environmental factors on weight loss following bariatric surgery.
- Twin studies provide a unique opportunity to study the role of genetics in the weight loss response to effect of bariatric surgery.
- Genetic factors affecting response to bariatric surgery include monogenic mutations, single nucleotide polymorphisms and epigenetic factors.
- In the future, genetic profiling may have a role in selecting patients who may benefit most from surgery.

Background:

One Anastomosis Gastric bypass / Mini Gastric Bypass (OAGB-MGB) is an established weight loss operation worldwide [1], which is gaining in popularity and now the third commonest performed bariatric procedure. It is safe and gives acceptable outcomes [2]. Both genetic and environmental factors affect body mass index (BMI), but little is known about the influence of hereditary factors following bariatric surgery. One previous study of four sets of monozygotic (MZ) twins showed that, although weight loss could be remarkably similar following Roux-en-Y gastric bypass (RYGB) or gastric banding, this effect could be lost if social and environmental factors varied significantly [3]. We are not aware of any case reports of weight loss response to OAGB-MGB in identical twins in the literature worldwide. We present our experience of this operation in twins.

The aim of this report is to determine whether there are any factors that affect the outcome of OAGB-MGB in twins and raise awareness amongst bariatric community to publish similar cases.

Case presentation:

The 28-year-old female twins had OAGB-MGB at our centre, 2 weeks apart. Patient and operation details are summarised in Table 1.

At presentation, twin A had a weight of 136.9 kilograms (kg) with a BMI of 48.4 kg/m². She was symptomatic with dyspepsia and intermittent knee pain. She had no comorbidities and was taking only calcium and vitamin D supplements as regular medication. Regarding social

history, she was single and employed full-time as a carer. She was an ex-smoker who had stopped smoking approximately a month before initial consultation. Preoperative esophagogastroduodenoscopy (OGD) as part of our routine preoperative work up showed a small hiatus hernia.

Table 1. Basic demographics and operation details

	Twin A	Twin B
Age at BS	28 years	28 years
Past medical history	None	None
Social history	Ex-smoker Works as a carer (full-time) Single	Ex-smoker Drinks alcohol socially Works as a carer (full time) Lives with partner and has 2 children
Reported symptoms	Mild dyspepsia Intermittent knee pain	None
Initial BMI	48.4 kg/m ²	45.1 kg/m ²
OGD	2 cm Hiatus Hernia	3 cm Hiatus Hernia
H. Pylori eradication therapy completed	Yes	Yes
Attended Bariatric Group Education Session	Yes	Yes
Post-operative Complications/Reoperation	None	None
Length of hospital stay	2 days	2 days

Twin B weighed 124.4 kg with BMI of 45.1kg/m² at initial presentation. She had no past medical history. She had tried orlistat in the past as prescribed by her general practitioner. She was married with 2 children and worked full-time as a carer in a care home. She had stopped smoking three months prior to initial assessment. She also underwent OGD as part of her preoperative work-up and was found to have a small hiatus hernia (3cm) and gastritis.

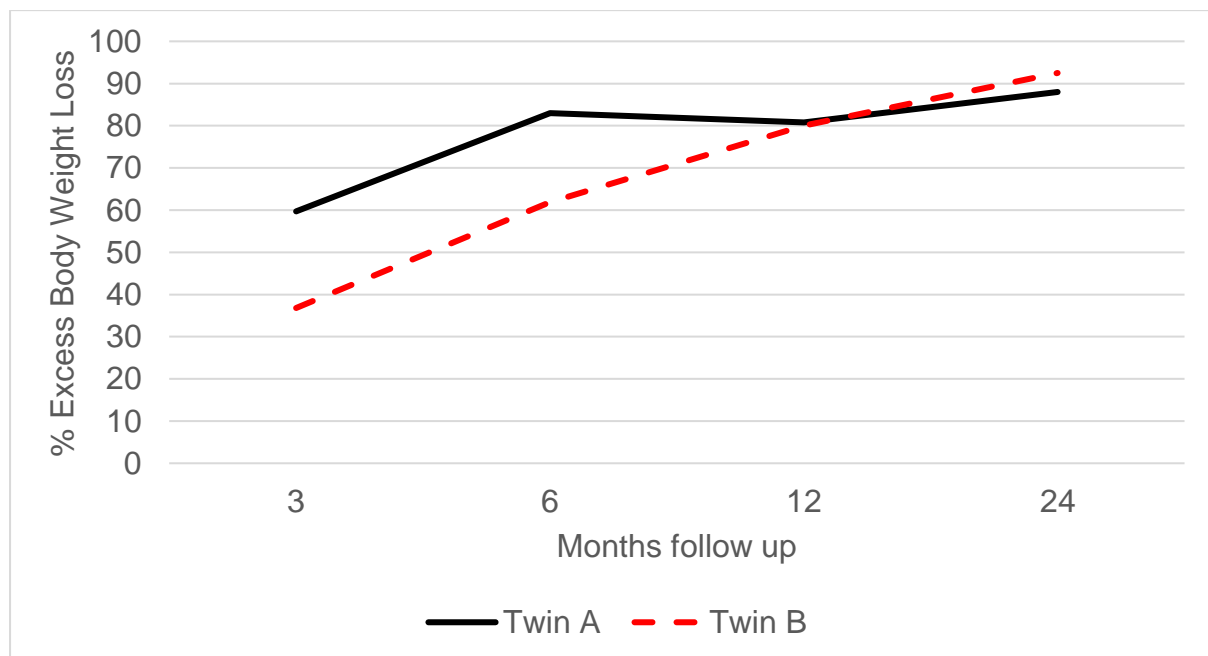
Both twins went through our structured bariatric pathway, including mandatory preoperative education. Both had two weeks of preoperative liver shrinkage diet. They underwent uneventful OAGB-MGB with biliary limb length of 150cm at our unit by a single surgeon. There were no perioperative complications and the length of hospital stay was 2 days for both patients.

They had their regular postoperative follow-up until 24 months as per our pathway protocol.

Weight Loss and other outcomes:

At 3, 6, 12 and 24 months the % excess weight loss (%EWL) was 59.7%, 83%, 80.8% and 88%, respectively, for twin A and 36.8%, 61.9%, 80% and 92.5% for twin B (Figure 1). The total weight loss (%TWL) at that follow up was 34.1%, 42.7%, 43.5% and 43.1% respectively for twin A. And that for Twin B was 24.2%, 32.3%, 37.6% and 41.3% respectively.

Figure 1: Weight loss outcomes after OAGB-MGB



Within the first 6 months twin A was more successful in her weight loss. However, by 12 months percentage estimated weight loss was identical and remained so until the end of follow-up (24 months). She also restarted smoking during the 24-month follow-up period.

Neither patient developed anaemia or any nutritional deficiency during follow up.

Discussion

There is only one article reporting bariatric surgery (BS) in twins [3]. That study included MZ twins who had undergone either RYGB or laparoscopic gastric band. To our knowledge, ours is the first report of OAGB-MGB in twins reported worldwide. We report remarkably similar % EWL at 12-24 months, despite social and environmental differences between the two sisters. Twin B admitted that in the initial period she was not able to concentrate on her diet due to family commitments and hence had slower weight loss.

Genetics are known to play a key role in determining body weight. However, studies examining the role of genetics in determining weight loss outcomes following BS have shown mixed results [4-6]. This is likely due to the complex interaction of genetic and environmental factors in weight maintenance and response to BS. Twin studies provide a valuable opportunity to study outcomes in patients with identical genetic material. Indeed, BMI is known to be strongly concordant between monozygotic twin pairs [7] and first-degree relatives achieve highly similar levels of weight loss, when compared to unrelated individuals [8]. Thus, genetic factors are likely to exert a significant effect on weight loss after BS.

Although genetic difference accounts for significant variation in BMI, environmental factors are also influential. In the developed world, it has been shown that higher socioeconomic status is inversely related to risk of childhood obesity [9]. It is likely that financial constraints on access to quality food and physical exercise, cultural attitudes to sedentary lifestyle and adherence to recommendations regarding health behaviours are significant socioeconomic factors.

This report aims to raise awareness among the medical fraternity and encourage reporting of such cases so that future studies can address these questions in a focussed manner, such as the investigation of hormonal and genetic profiles of patients undergoing BS.

Currently, routine genetic testing is not available. However, this is likely to change with the advent of pharmacotherapies that target specific genetic mutations e.g. setmelanotide, melanocortin-4 receptor agonist [10]. Should routine genetic testing become more widely available then, it would be useful to investigate some of the following:

- Monogenic mutations, such as those affecting the leptin-melanocortin pathway. The most widely studied of these are leptin, leptin receptor and melanocortin-4 receptor (*MC4R*) gene mutations.
- Single nucleotide polymorphisms (SNPs) of the fat mass and obesity associated (*FTO*) gene on chromosome 16, several of which have been shown to be major risk factors for obesity [11].
- Epigenetic obesity, such as that associated with haploinsufficiency of the *Trim28* gene, which has been shown to be associated with increased adiposity in both rodents and humans [12].

Genome-wide association studies (GWAS) have been instrumental in gaining understanding of biological pathways affecting obesity. One such study by Hatoum and colleagues [13] identified a single genetic locus on chromosome 15 that was reproducibly associated with weight loss after RYGB. These types of studies improve our understanding of the variability in weight loss after BS and help identify those who would benefit most from this type of surgery.

Conclusion:

This is the first reported case of OAGB-MGB in twins. The results are satisfactory with good weight loss outcomes at 2 years. Evidently, the weight loss journey after bariatric surgery is contributed to by both genetic and social factors. We hope that this letter highlights an under-resourced area and encourages surgeons to report such cases.

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Conflict of Interest: None of the authors have anything to declare

Legends:

Table 1: Table 1. Basic demographics and operation details

Figure 1: Weight loss outcomes after OAGB-MGB

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