

What Ring Size Should Be Used In Association With Vertical Gastric Bypass?

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Background: The placement of a ring circumferentially around the gastric pouch of a vertical gastric bypass has the advantage of permanently fixing the size of the gastric outlet and slowing the passage of food into the jejunum. Opinion remains divided about the use of rings, and the optimal size.

Methods: Since 1990, we have consistently placed a ring at the time of gastric bypass surgery and have an experience with three ring sizes (circumference); 5.5 cm, 6.0 cm and 6.5 cm. Patient data has been recorded prospectively in a computerized database. We have reviewed the outcomes of all patients with at least 12 months follow-up with respect to quality of eating, the need for subsequent ring removal and weight loss.

Results: Quality of eating was better in those with the larger rings. Ring removal was undertaken in 7 (14%) of those with a 5.5-cm ring, in 11 (5.1%) with a 6.0 cm ring and in 3 (2%) with a 6.5-cm ring ($P < 0.05$). Ring removal led to a median recorded weight gain of 6.8 kg (-4.13 kg to 32.2 kg). When only those 415 patients in whom the ring was still *in situ* and there was no known staple-line disruption were considered (5.5 cm – 50, 6 cm – 215, 6.5 cm -150), there was no difference in the weight loss achieved and maintained out to 5 years, although there was a trend for this to be better in those with the larger rings.

Conclusion: We conclude that the inclusion of a ring placed around the gastric pouch of a vertical gastric bypass is beneficial for maintenance of weight loss, and a ring size of 6.5-cm circumference should be recommended.

Key words: Morbid obesity, gastric bypass, silastic ring, weight loss, quality of eating

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Introduction

Gastric bypass is widely regarded as the gold-standard operation for severe obesity. Fobi and others have championed the use of a silastic ring in association with vertical Roux-en-Y gastric bypass (RYGBP) to slow the rate of emptying from the gastric pouch and to prevent the outlet from enlarging with the passage of time.¹⁻³ There is, however, no agreement regarding the need to place a ring around the gastric pouch, and those who do so are in the minority. Some evidence is emerging to indicate that weight loss is better maintained in those patients in whom a ring has been used.⁴ The principal argument against the use of a ring relates to the belief that rings are susceptible to erosion and are too restrictive. These beliefs stem from the experience of silastic rings and bands placed in association with vertical banded gastroplasty when a ring/band circumference of 4.5-5.0 cm was most commonly used.⁵ The initial recommendation by Fobi for a ring size of 5.5-cm circumference in vertical RYGBP led, in our experience, to a ring removal rate approaching 20%, and we recommended increasing the ring size to 6.0- or 6.5-cm circumference.⁶ With rings of this size, ring erosion has very seldom been seen. Furthermore, in our experience, the need for ring removal because of unacceptable restriction to eating has been unusual when these larger rings have been used. Therefore, ring use comes down to a question of finding the balance between maintenance of weight loss and quality of eating. Review of our experience with three different ring sizes has helped clarify for us the optimum ring size for use in vertical RYGBP. We report in this paper our analysis of this experience.

Methods

A total of 452 patients underwent an open RYGBP at Wakefield Hospital between June 1990 and August 2004 as their first bariatric operation for severe obesity. In general terms, patients had a BMI of >35 , although a few patients with lesser levels of obesity were accepted for surgery. All surgery was performed by a single surgeon (RSS), and a detailed prospective, computerized database has been maintained on all patients. The operation performed was either a silastic ring gastric bypass (SRGBP) ($n=175$, June 1990 – September 1999) or a Fobi pouch operation ($n=277$, August 1997 – August 2004). The operations are shown diagrammatically in Figure 1 and have been described in detail by our group in previous publications.^{3,7} They were based on procedures described by Fobi.^{2,8} The operation included placement of an 8-Fr silastic ring 1–2 cm proximal to the gastrojejunostomy anastomosis in 448 patients. Over the period, three different ring sizes have been used. In the first 66 patients (all SRGBP), a 5.5-cm circumference 8-Fr silastic ring as originally described by Fobi² was placed. Subsequently, the ring size was increased to 6.0 cm (age <50 years) or 6.5 cm (age >50 years). This was based on our need to remove a significant number of rings in our first cohort of 64 patients because of unacceptable difficulty with eating.⁶ The change to the Fobi pouch operation was based on the increasing awareness of staple-line disruption as a reason for technical failure. From May 2004, a 6.5-cm circumference 8-Fr silastic ring has been placed in all patients.

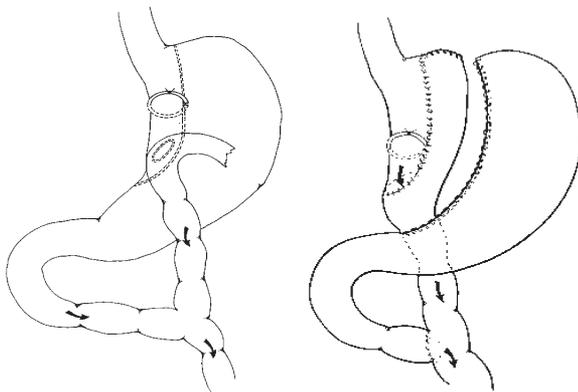


Figure 1. Diagrammatic representation of the RYGBP operations performed. Left: Silastic ring undivided Roux-Y gastric bypass (SRGBP). Right: Fobi pouch (transected, plus silastic ring).

The prospective, computerized database used at the Wakefield Gastroenterology Centre includes all relevant preoperative parameters of weight and comorbidities, operative details, complications of surgery and subsequent outcome. Follow-up data is obtained at 3-monthly intervals for the first year, 6-monthly intervals for the second year and annually thereafter. The majority of patients are seen personally at these follow-up times, but when this is not possible, a questionnaire is completed at the appropriate time in lieu of personal attendance in the Clinic. Follow-up data recorded includes information concerning weight, need for revision surgery including ring removal, and information concerning quality of eating. In this regard the following excerpt from the database is relevant:

quality of eating: *almost normal, minor restriction, major restriction*
 regurgitation: ≤ 3 times per week, >3 times per week
 meat intake: *regular, infrequent, never*
 vegetable intake: *no problems, some problem, puree only*
 fruit intake: *good range, restricted range*
 constipation: *yes, no*

For the purposes of this study, these parameters are reported for the 12-month follow-up period (if patients were not seen at 12 months, the data recorded for 9 months or 18 months was used). Ring removal was offered to (although not necessarily taken up by) those who were struggling with a major restriction in the range of food able to be taken, and in whom regurgitation was occurring on a regular daily basis. The follow-up for this study was closed on December 1, 2005.

Data Analysis

Weight has been expressed as actual weight (mean \pm sd, range) and BMI (mean \pm sd, range). BMI upper limit of normal has been taken as 25 kg/m^2 for the purposes of calculating percentage of excess BMI loss.⁹ Differences in this outcome for the three ring sizes were subjected to statistical analysis using unpaired students *t*-tests for data at 2 and 5 years. Differences between parameters of quality of eating for the three ring sizes were analyzed using the Chi-square test. A *P*-value of <0.05 has been taken to indicate statistical significance.

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Results

Staple-line disruptions occurred in 33 of the 173 patients (19%) who underwent SRGBP. Sixteen of these occurred in the 66 patients (24%) with a 5.5-cm ring. The other 17 occurred in 107 SRGBP patients (16%) with a larger ring size ($P=0.17$). No gastro-gastric fistulas have been recognized in the Fobi transected pouch patients. These 33 patients have been excluded from the analysis in this study, because of the confounding effects that staple-line disruption or gastro-gastric fistula would have on the outcomes in question. This leaves 415 patients to be considered in detail in this report.

The preoperative characteristics of these 415 patients are shown in Table 1. There were 89 males and 326 females aged between 15 and 68 years at the time of surgery (median 43 years). Of these, 140 (34%) had a SRGBP and 275 (66%) had a Fobi pouch operation. Mean preoperative weight was 131.0 ± 30.1 (72-248 kg), and mean preoperative BMI was 46.2 ± 9.0 (28-99). The median follow-up period is 51 months (0-177); 265 patients (64%) have more than 2 years of follow-up, and 136 patients (33%) have more than 5 years of follow-up. Eight people were lost to follow-up within the first 12 months.

There was excellent maintenance of weight loss out to 5 years as shown for the three patient groups in Figures 2-4. There was no statistical difference between the weight loss achieved in the three patient groups at either the 2- or 5-year follow-up mark. The mean \pm sd % excess BMI loss (%EBMIL) at 12, 24 and 60 months for the three groups is shown in Table 2.

Table 1. Patient characteristics before gastric bypass surgery (Figures represent mean \pm sd or median and range)

	5.5-cm ring	6.0-cm ring	6.5-cm ring
Number	50	215	150
Age (years)	40 (23-60)	40 (15-66)	52 (28-68)
Sex	41 F 9 M	178 F 37 M	107 F 43 M
Pre-op weight (kg)	129 (89-201)	132 (83-248)	130 (72-232)
Pre-op BMI (kg/m ²)	46 (36-65)	47 (32-99)	46 (28-72)
Operation			
SRGBP	50	73	17
Fobi pouch	0	142	133

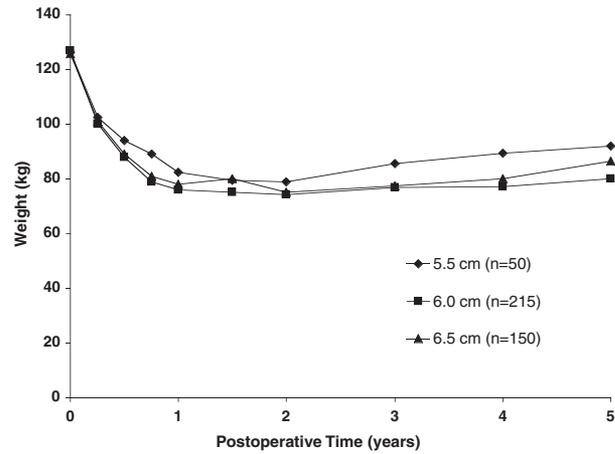


Figure 2. Median weight loss seen after RYGBP according to size of ring used.

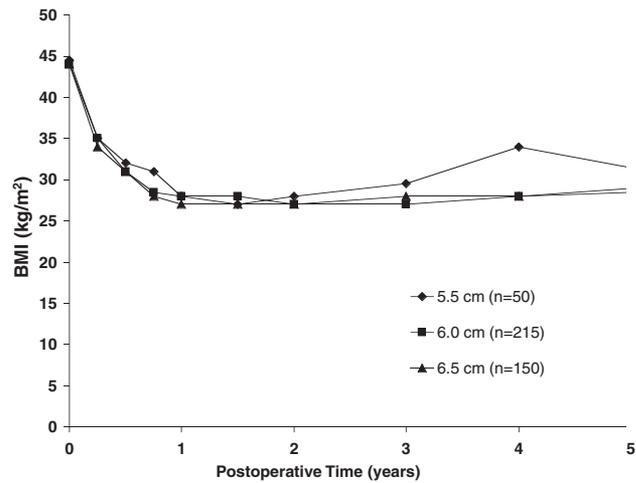


Figure 3. Median BMI after RYGBP according to ring size used.

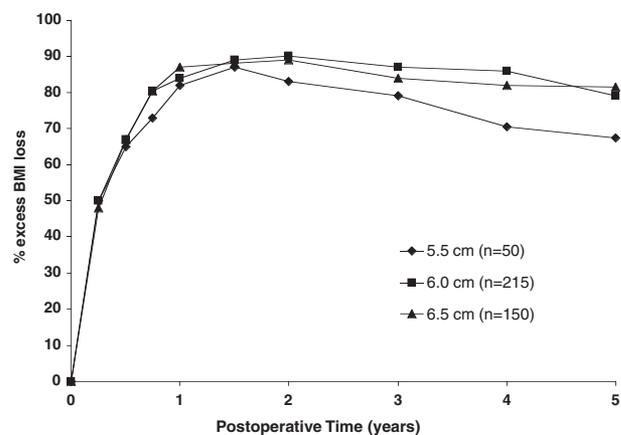


Figure 4. Median percentage excess BMI loss after RYGBP according to ring size used.

Table 2. Patient outcomes with respect to weight parameters (mean \pm sd) and need for ring removal

	5.5-cm ring n=50	6.0-cm ring n=215	6.5-cm ring n=150
Weight			
12 months	81.1 \pm 12.3	81.3 \pm 19.9	82.7 \pm 21.6
24 months	81.6 \pm 17.0	79.7 \pm 18.5	81.1 \pm 20.9
60 months	88.4 \pm 17.5	83.4 \pm 18.2	88.0 \pm 21.6
BMI			
12 months	29.5 \pm 4.3	28.9 \pm 6.3	28.8 \pm 6.1
24 months	29.6 \pm 5.6	28.2 \pm 5.8	27.6 \pm 6.9
60 months	30.6 \pm 4.2	29.5 \pm 6.9	29.5 \pm 5.5
%EBMIL*			
12 months	81.7 \pm 14.4	90.7 \pm 28.4	87.9 \pm 22.4
24 months	82.4 \pm 23.4	91.4 \pm 22.9	90.2 \pm 23.5
60 months	73.1 \pm 19.7	80.7 \pm 23.8	83.6 \pm 18.3
Ring removal	7 (14%)	11 (5.1%)	3 (2%)

*%EBMIL = % excess BMI loss

Information about quality of eating at or around the 12-month follow-up point was not available for 17 patients (5 – 5.5-cm ring, 7 – 6.0-cm ring, 5 – 6.5-cm ring). The details relating to quality of eating in 398 patients are shown in Table 3. Overall, 270 (68%) described the range of food eaten as *almost normal* and 31 (8%) described a *major restriction*. There was a significant difference between quality of eating and variety of food able to be consumed for those with 5.5- and 6.0-cm rings ($P<0.05$) and 5.5- and 6.5-cm rings ($P<0.05$) but not between 6.0- and 6.5-cm rings. Across all three groups, 325 (82%) reported episodes of regurgitation ≤ 3 times per week, and 73 (18%) reported these occurring >3 times per week. A significant difference was found for the frequency of regurgitation between those with 5.5- and 6.5-cm rings (29% vs 14%, $P<0.05$). Fewer patients with the larger rings reported problems with constipation ($P<0.05$).

Removal of the silastic ring was undertaken in 21 of the 415 patients (5%) because of unacceptable problems with quality of eating. The need for this to be done was almost always apparent within the first 12 months, although the decision to remove the ring was often not made until some time later. The procedure was generally achieved laparoscopically and was undertaken a median of 29 months after the operation (range 6 to 74 months). There were significantly fewer

Table 3. Quality of eating for 398 patients at or around 12 months after surgery

	5.5-cm ring n=45	6.0-cm ring n=208	6.5-cm ring n=145
Quality of eating			
almost normal	42%	69%	74%
minor restriction	40%	23%	22%
major restriction	18%	8%	4%
Regurgitation			
≤ 3 x per week	71%	81%	86%
> 3 x per week	29%	19%	14%
Constipation			
yes	29%	12%	16%
no	71%	88%	84%
Meat intake			
regular	36%	57%	59%
infrequent	47%	35%	34%
nil	18%	8%	7%
Vegetables			
no problems	71%	81%	86%
some problem	18%	14%	13%
puree only	11%	5%	1%
Fruit			
good range	44%	74%	81%
restricted range	56%	26%	19%
Bread			
yes	51%	79%	81%
no	49%	21%	19%

rings removed for those with larger rings as shown in Table 3. In all instances, the major restriction to eating was remedied by removal of the ring, but some weight regain was also almost universal. At last follow-up, the median weight regain was 6.8 kg with a range from a loss of 4.13 kg to a gain of 32.2 kg.

Ring erosion has been documented in only two patients during the period of this study. In both the ring erosion occurred in association with staple-line disruption and marginal ulceration. The ring erosion *per se* was not a cause for problems. Ring erosion has never been seen in any patient with a *de novo* Fobi pouch.

Discussion

Although RYGBP is widely held to be the gold-standard operation for severe obesity,¹⁰ because of the reliability and extent of the weight loss it

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achieves, there remain significant differences between the RYGBP operation performed by different surgeons. Some of these differences may be important for the durability of the weight loss after RYGBP. Much has been learned over the years since the early gastric bypass operations of the 1960s that has contributed to the reliability of the operation. The principal sources of disappointment from the earlier (and present) operations relate to (a) enlargement of the gastric pouch, (b) staple-line disruption and (c) enlargement of the gastric outlet. The incidence of the former has been reduced by the now universal adoption of a vertical pouch based on the lesser curve, rather than the horizontal pouch based on the greater curve. The configuration of this vertical pouch should be long and narrow in order to diminish the prospect of pouch dilatation and in order to obtain maximum benefit of the slow rate of gastric motility (vs esophageal and jejunal). Staple-line disruption has largely been eliminated by gastric transection,^{3,11,12} although gastro-gastric fistula is still a possibility where jejunal or omental interposition is not undertaken with rates as high as 8.5% having been reported.¹² Enlargement of the gastric outlet remains a potential reason for disappointment in the longer term unless a ring around the gastric pouch, as recommended by Fobi and others,¹³ is employed. Most surgeons who perform RYGBP, however, do not place a ring, probably because of the historical experience of ring/band erosion and severe eating restriction with frequent regurgitation which had occurred following the vertical banded gastroplasty (VBG).^{14,15} In addition, the widespread taking up of the laparoscopic gastric bypass has probably contributed to the general non-usage of rings in association with gastric bypass. This remains an important potential weakness of the gastric bypass operation performed by most surgeons.

Our own experience indicates excellent long-term maintenance of weight loss for up to 14 years when a ring has been used,³ and significant weight regain in most individuals in whom the ring is removed. This experience suggests that placement of a ring may be important. Indeed, reports are beginning to emerge of direct comparisons being made between patients with and without a ring. Awad et al⁴ from Chile, recently reported their experience of vertical RYGBP with and without placement of a ring at the First Latin-American Symposium of IFSO. They

noted an equivalent weight loss over the first 12 months, but a significantly diminished weight loss for those without a ring by 18 months (29.7% vs 38.5% BMI reduction) and 24 months (26% vs 43% BMI reduction) respectively ($P < 0.05$).⁴ Such reports highlight the importance of medium to long-term follow-up being available before meaningful conclusions can be drawn in this respect.

Those surgeons who argue against the use of a ring generally do so, on the basis of the experience seen with VBG, in which rings/bands led to erosion for some and harsh restriction with excessive regurgitation for many.¹⁴ However, this was in the setting of 4.5-cm or 5.0-cm circumference rings. Those using rings in the context of vertical RYGBP have generally reported use of larger ring sizes – 5.5 cm, 6.0 cm and 6.5 cm, and ring erosion is very seldom seen.^{3,12,16} We have only seen it on two occasions, each in association with staple-line disruption and marginal ulceration. This scenario has largely been overcome by the use of gastric transection, as used by us in the Fobi pouch operation. Fobi's reported experience is not dissimilar, with an incidence of ring erosion of 0.9% in 2,386 primary RYGBP operations and 5% in 563 revision surgical procedures.¹⁶

Our initial experience⁷ was that while a 5.5-cm ring led to excellent maintenance of weight loss, it was rather too restrictive for many individuals. As a result, both we and Fobi (personal communication) moved to the use of larger rings. It is evident from the results reported in this study that the quality of eating is superior in those with larger rings than in those with smaller rings, yet weight loss is not appreciably different. Thus, 74% of those with a 6.5-cm ring reported being able to eat an almost normal range of food, compared to 42% with the 5.5-cm ring and 69% with the 6.0-cm ring. Episodes of regurgitation were correspondingly fewer in those with the larger rings than the smaller rings. Our practice of using a 6.0-cm or 6.5-cm circumference ring, depending on the patient's age, was predicated on the belief that the motility of the esophagus and gastric pouch above the ring might be less vigorous with aging, and therefore may make a bigger ring desirable. When applied around a narrow gastric pouch, such rings are very loose and not at all constricting. Adoption of this policy led to a dramatic reduction in the number of rings which needed to be removed as reported in this study.

Conclusion

While the RYGBP is undoubtedly a very good operation for severe obesity, it is important to recognize the subtleties of the operation which will ensure that the most effective and durable weight loss is achieved. The operation should include a long narrow lesser curve pouch, with gastric transection, and placement of a silastic ring around the pouch to permanently limit the size of the outlet. Our experience suggests a 6.5-cm circumference ring achieves an acceptable and possibly optimum balance between quality of eating, weight loss and likelihood of ring removal being required.

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