

# Laparoscopic Placement of Non-Adjustable Silicone Ring for Weight Regain After Roux-en-Y Gastric Bypass

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## Abstract

**Background** Roux-en-Y gastric bypass (RYGBP) is presently one of the most popular surgical procedures for obesity. One of the possible long-term problems is weight regain, usually after a period of successful weight loss. Weight regain after RYGBP can be due to new eating habits, like sweet-eating or grazing, or volume eating because of impaired restriction. This paper reports our experience in patients who presented weight regain after laparoscopic RYGBP, because of new appearance of volume eating or hyperphagia, treated by the laparoscopic placement of a non-adjustable silicone ring around the gastric pouch.

**Methods** From July 2004 to November 2007, six patients affected by weight regain due to hyperphagic behavior, benefited from revision of RYGBP consisting of the placement of a non-adjustable silicone ring loosely encircling the stomach part. Mean weight and body mass index (BMI) at the time of RYGBP were  $105.0 \text{ kg} \pm 12.3$  and  $36.3 \pm 3.0 \text{ kg/m}^2$ , respectively, and all patients suffered from obesity-related co-morbidities. After a mean time from RYGBP of  $26.0 \pm 14.2$  months, patients presented a weight regain of  $4.7 \pm 3.4 \text{ kg}$  compared with their minimal weight, with a final mean weight, BMI, and percentage of excess weight loss (%EWL) at the time of the silicone ring of  $86.0 \pm 13.1 \text{ kg}$ ,  $29.5 \pm 3.9 \text{ kg/m}^2$ , and  $47.0 \pm 24.7\%$ , respectively. Preopera-

tive evaluation for each patient included history and physical examination, nutritional and psychiatric evaluation, laboratory tests, and barium swallow check. Outcome measures included evaluation of the Roux-en-Y construction, operative time, postoperative morbidity and mortality, and weight loss in terms of absolute weight loss, BMI, and %EWL.

**Results** Any modification of the digestive circuit was evidenced. Mean operative time was  $82.5 \pm 18.3 \text{ min}$ . No operative mortality and no conversion to open surgery were achieved. No postoperative complications were achieved. Mean hospital stay was  $2.6 \pm 1.5$  days. After a mean follow-up of  $14.0 \pm 9.2$  months, the six patients presented a mean weight loss of  $9.1 \pm 2.4 \text{ kg}$ , with a final mean weight, BMI, and %EWL of  $76.8 \pm 13.7 \text{ kg}$ ,  $26.4 \pm 4.2 \text{ kg/m}^2$ , and  $70.4 \pm 30.4\%$ , respectively. Difference in term of %EWL before and after revision ( $23.4 \pm 5.7$ ) is statistically significant ( $p < 0.05$ ). There have been no erosions or slippage of the ring during this follow-up.

**Conclusion** One of the possible causes of weight regain after RYGBP is the new eating behavior of the patient, one of which is hyperphagia. Treatment of this condition can be the placement of a non-adjustable silicone ring loosely fitted around the gastric pouch which contributes to improved weight loss.

**Keywords** Weight regain · Gastric bypass · Failure · Revision · Eating behavior

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## Introduction

Since its description in open surgery in 1966 [1] and by laparoscopy in 1994 [2], Roux-en-Y gastric bypass (RYGBP) has become one of the most popular surgical procedures for obesity [3]. In the literature, reports on long-

term results (over 10 years) are relatively rare [4–6]. One of the possible long-term complications is the problem of weight regain, usually after a period of successful weight loss.

Weight regain after RYGBP can be due to increased volume intake from gastric pouch dilation, gastro-jejunosomy dilation, or presence of gastro-gastric fistula. It can also be caused by inadequate length of the alimentary limb resulting in reduced malabsorption, and by changes in eating behavior (sweet-eating, grazing or polyphagia, and volume eating or hyperphagia).

Dilation of the gastric pouch and of the gastro-jejunosomy can actually be treated by the application of the endoluminal devices, such as StomaphyX (Endogastric Solutions, Redmond, WA, USA) [7, 8], Endocinch (C.R. BARD, Murray Hill, NJ, USA) [9], Spiderman (Ethicon Endosurgery, Cincinnati, OH, USA) [10], and g-prox (USGI Medical) [11, 12]. Also attempts to close gastro-gastric fistulas by endoluminal means was tried, but it remained essentially unsuccessful with remaining open fistula in 75% of the cases after 1 year [13]. Finally lengthening of the alimentary limb by conversion to distal RYGBP seems to result in unacceptable malnutrition [14, 15].

Change of the patient's alimentary behavior remains an extremely difficult aspect in the case of weight regain after laparoscopic RYGBP. Some patients bypass the intention of the procedure by eating sweets because they are no longer affected by the dumping syndrome and others by eating too frequently, becoming grazers (polyphagia). Due to these dietary flaws, patients can increase their caloric uptake and consequently gain weight.

In the case of weight regain caused by volume eating or hyperphagia, a possible treatment can be offered by surgical revision aiming at restoring restriction, hence a non-adjustable silicone ring can be loosely fitted around the gastric pouch, as reported for more than 17 years by Dr. Mal Fobi in the procedure of banded RYGBP [16].

This paper reports our experience in patients submitted to RYGBP, presenting weight regain due to hyperphagia. Treatment was the laparoscopic placement of a non-adjustable silicone ring around the gastric pouch.

## Material and Methods

From July 2004 to November 2007, six patients (all females) underwent consecutively revision of RYGBP consisting of placement of the non-adjustable silicone ring (Bariatric Solution, Kaltbach, Switzerland) around the gastric pouch. The indication was new hyperphagic behavior with resulting weight regain.

The mean age at the time of the revision was  $37.8 \pm 11.2$  years. Mean weight and body mass index (BMI) at the time of RYGBP were  $105.0 \pm 12.3$  kg and  $36.3 \pm 3.0$  kg/m<sup>2</sup>

respectively, and all patients suffered from obesity-related co-morbidities (six HTA, one degenerative joint disease). RYGBP had been performed in three of patients as conversion from a previous adjustable gastric banding (AGB) (two) or vertical banded gastroplasty (one).

After a mean time from RYGBP of  $26.0 \pm 14.2$  months, all six patients achieved a weight regain of  $4.7 \pm 3.4$  kg compared to their lowest weight, with a final mean weight, BMI, and percentage of excess weight loss (%EWL) at the time of silicone ring of  $86.0 \pm 13.1$  kg,  $29.5 \pm 3.9$  kg/m<sup>2</sup>, and  $47.0 \pm 24.7\%$ , respectively.

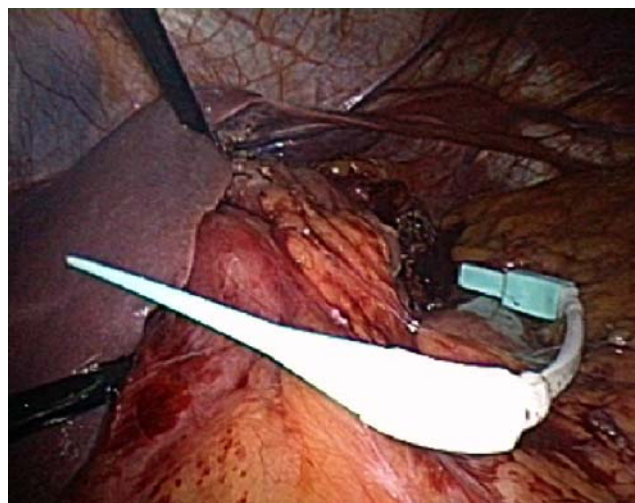
Preoperative evaluation for each patient included history and physical examination, nutritional and psychiatric evaluation, laboratory tests, and barium swallow check. Surgeon discussed the surgical options with each patient, mentioning the limited literature data regarding the use of a non-adjustable silicone ring or AGB as treatment for weight regain after RYGBP.

Outcome measures included evaluation of the Roux-en-Y construction, operative time, postoperative morbidity and mortality, weight loss in terms of absolute weight loss, BMI, and %EWL.

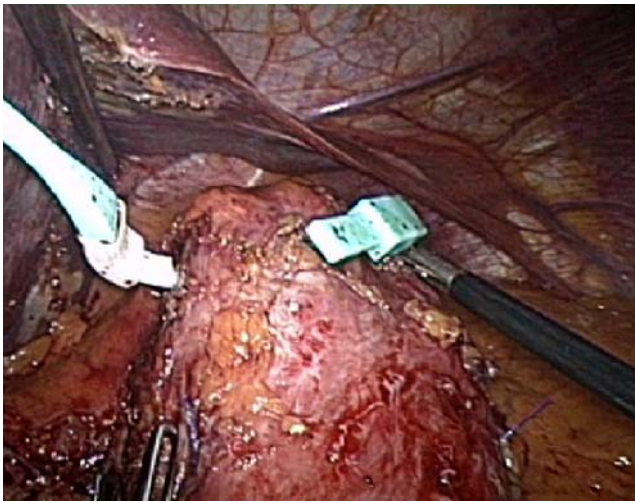
Statistical analysis was mainly descriptive; observed distributions are reported using summary parameters: mean and standard deviation for each variable analyzed (all variables being continuous). Distributions of %EWL were compared before and after the ring's insertion using exact Wilcoxon signed-ranks test.

## Surgical Technique

Abdominal insufflation pressure was set at 15 mmHg. Five trocars were used and placed as follows: a 10-mm trocar 20 cm below the xyphoid process for the 30° angled laparoscope, a 5-mm trocar on the left anterior axillary line,



**Fig. 1** Non-adjustable silicone ring



**Fig. 2** Placement of the non-adjustable silicone ring around the gastric pouch

a 12-mm trocar on the left mid-clavicular line between the first and the second trocars, a 5-mm trocar on the right mid-clavicular line, and a 5-mm trocar below the xyphoid process.

Adhesiolysis between the liver, gastric pouch, and gastrojejunostomy was performed with the hook electrocautery, until clear identification of these structures was obtained. The anatomy of the RYGBP and the alimentary loop length were checked. The gastrojejunostomy was located, and carefully freed from the gastric remnant avoiding any devascularization. The vertical part of the gastric pouch was separated from the gastric remnant and from the greater omentum and freed from the left crus. A tunnel was fashioned from medially to laterally through the lesser sac dorsal to the gastric pouch, just cranial to the gastrojejunostomy level. The circumference of the gastric pouch at the level of the tunnel was measured and a silicone non-stretchable radiopaque ring was



**Fig. 3** Final view of the procedure



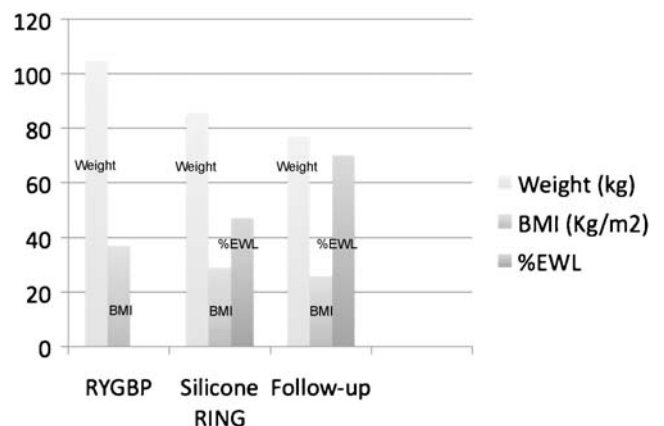
**Fig. 4** Upper gastrointestinal gastrografin swallow on first postoperative day

selected. The ring was introduced into the abdomen through the 12-mm trocar (Fig. 1) and passed through the tunnel, thus cranial to the level of the gastrojejunostomy (Fig. 2). The protective latch covers of the ring were retrieved and the ring was gently auto-locked. Finally, the ring was fixed to the gastric pouch by resorbable sutures (Vicryl 2/0) (Figs. 3 and 4).

## Results

Barium swallow did not evidence any gastric pouch dilation. RYGBP had been performed, in six patients, with an antecolic antegastric construction, and in one with a retrocolic antegastric technique; in all cases, the alimentary limb appeared to measure 150 cm.

A silicone ring of 6.5 cm was elected in two patients and of 7 cm in the remaining four.



**Fig. 5** A comparison of weight loss, BMI, and %EWL after the ring revision



Mean operative time was  $82.5 \pm 18.3$  min. There were no operative mortality and conversion to open surgery. No postoperative complications were achieved. Mean hospital stay was  $2.6 \pm 1.5$  days.

After a mean follow-up of  $14.0 \pm 9.2$  months, the six patients presented a mean weight loss of  $9.1 \pm 2.4$  kg, with a final mean weight, BMI, and %EWL of  $76.8 \pm 13.7$  kg,  $26.4 \pm 4.2$  kg/m<sup>2</sup>, and  $70.4 \pm 30.4\%$ , respectively (Fig. 5). Difference in term of %EWL before and after the ring's insertion ( $23.4 \pm 5.7$ ) is statistically significant ( $p=0.03$ ). No erosions or slippage of the silicone ring has been observed during this follow-up.

## Discussion

Different causes can contribute to weight regain after RYGBP. One of them is new eating behavior, characterized by volume eating or hyperphagia. Nutritional counseling can be advised in order to reduce weight with a prescribed diet [17], but more often than not will fail in the classically poorly compliant bariatric patient.

In some patients, restriction fades with time, which allows the patients to consume larger meals, becoming hyperphagic. Trying to obtain a new restriction with a ring around the gastric pouch seems a reasonable option. The idea of the placement of a non-adjustable silicone ring in patients already submitted to RYGBP, stems from the Fobi technique in banded RYGBP [16, 18]. Superior results of the banded RYGBP versus standard RYGBP, in terms of % EWL at 3 years,  $73.4\%$  versus  $57.7\%$  [19], can support the option to band a RYGBP as a second procedure in the case of insufficient weight loss or weight regain.

Banding can be achieved by placement of an AGB around the gastric pouch by laparoscopy [20, 21] or by open access [22]. As Bessler et al. recently presented, 22 patients submitted to AGB after RYGBP, had a mean %EWL at 1, 2, 3, 4, and 5 years respectively of 29%, 43.5%, 51%, 33%, and 34% [23]. Gobble et al., using a similar technique, reported a mean %EWL of  $20.8 \pm 16.9\%$  after a mean of  $13.2 \pm 10.3$  months in 11 patients [21]. Chin et al. confirmed a mean %EWL of 24.3% at 1 year in 8 patients and 48.7% at 2 years in 5 patients [22]. These encouraging results are similar to ours during a similar follow-up period.

In our series, however, the band we used was not adjustable. We believe this constitutes a significant difference. The circumference of the silicone ring which we placed was chosen between 6.5 and 7.0 cm, in order to surround the gastric pouch in a loose manner. Whereas the AGB is supposed to be adjusted until 'optimal restriction' is achieved [20–23], the non-adjustable silicone ring does not constrict the pouch, but rather reduces the compliance of the latter, interrupting the propulsive wave aiming for

evacuating the food bolus. The diameter of the band that we used varied between 2.7 and 2.9 cm. Since the ring was placed in a strictly perigastric position, it is likely to be less restrictive than an even non-inflated AGB, because the latter is placed around substantially more tissue with the pars flaccida technique [24] (inner diameter in a non-inflated low pressure band is  $\sim 2.9$  cm). The loose non-adjustable silicone band causes slower emptying of the pouch into the alimentary loop. Proof for this can be found in patients who suffer from symptomatic postprandial hypoglycemia and who significantly benefit from placement of a silicone ring through slower gastric emptying [25].

Possible complications related to the use of AGB or non-adjustable silicone ring are erosion and slippage of the device, as reported with the standard procedure of AGB [26] or banded RYGBP [27]. In our series and in others' [20–23], there was no evidence of either of these complications. The suture-fixation of the ring to the pouch, as described here, could contribute to reducing the incidence of the slippage.

Despite the small size of our patient sample and the short follow-up, our results seem to demonstrate the safety and efficacy of placement of a non-adjustable silicone ring as a rescue operation for weight regain in patients who experience volume increase after laparoscopic RYGBP.

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