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CLINICAL RESEARCH

Barbed Versus Usual Suture for Closure of the Gastrojejunal Anastomosis in Laparoscopic Gastric Bypass: a Comparative Trial

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Abstract
Background Laparoscopic Roux-en-Y gastric bypass is one of the main bariatric procedures that require safe and reproducible anastomosis. The objective of this study is to compare the risk of leaks and stenosis of a mechanical gastric pouch jejunal anastomosis between the usual interrupted sutures and a continuous barbed suture for gastrojejunotomy, in order to reduce procedure time and costs.
Methods A comparative trial of 100 consecutive patients undergoing laparoscopic Roux-en-Y gastric bypass was performed between October 2010 and July 2011. The population was divided into two groups of 50 consecutive patients. In the first group, gastrojejunotomy was sutured with resorbable interrupted sutures and the second with continuous barbed suture. Diabetes, body mass index and the American Society of Anaesthesiology score were compared. The time required for suturing and the incidence of anastomotic leaks and stricture were also compared after 6 months.
Results No fistulas or anastomotic stenoses had occurred at post-operative month 6 in either group. Gastrojejunotomy suture time was significantly shorter in the barbed suture group (11 versus 8.22 min; $p<0.01$). Total costs of material to complete the reconstruction were significantly lower in the barbed suture group (€26.69 versus €18.33; $p<0.001$).
Conclusions The use of barbed suture is as safe as usual sutures and allows easier and faster suture in the closure of gastrojejunotomy. This suture could be incorporated in the standard laparoscopic Roux-en-Y gastric bypass technique.

Keywords Barbed suture · Bariatric surgery · Gastric bypass · Laparoscopy

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Introduction

Obesity-related health problems reduce quality of life and life expectancy and place a considerable burden on health-care resources [1–3]. Bariatric surgery is considered the only effective long-term treatment for morbid obesity. Laparoscopic Roux-en-Y gastric bypass (LRYGB) is one of the best surgical procedures, because it achieves excellent long-term weight loss results with a low rate of post-operative complications and metabolic disorders [4–6]. Even though the procedure is quite standardized, there are two different techniques for the construction of the gastric pouch–jejunal anastomosis (GPJA): mechanical (circular or linear stapler) or hand-sewn GPJA [7]. Latero-lateral GPJA using a linear stapler requires closure of the enterotomies with sutures in narrow and restricted spaces. Barbed suture is a new kind of easy-to-perform continuous suture [8–14]. In laparoscopic general surgery, the V-Loc® suture (Covidien, Mansfield, USA) is used to close mesentery or abdominal walls, but there are few reports of its use for intestinal suture [15]. The aim of this study is to establish the safety and efficacy of barbed suture versus usual sutures to close the GPJA in patients undergoing LRYGB.

Materials and Methods

Between October 2010 to July 2011, 100 consecutive patients undergoing retrocolic and retrogastric LRYGB with a latero-lateral GPJA were divided into two groups of 50 consecutive patients. In the first period, the intestinal opening was closed using the usual technique (8–10 stitches of 3/0 Vicryl®, Ethicon, Cincinnati, USA); in the second period, it was closed with a running suture of one layer of V-loc® 15 cm (Covidien, Mansfield, USA). Pre-, intra-, and post-operative parameters were assessed for all the patients.

Intervention

All the procedures were performed by two expert laparoscopic surgeons and a resident in a standardized manner. The proximal jejunum was divided 50 cm beyond the ligament of Treitz to construct the biliopancreatic limb. The jejuno-jejunal anastomosis was created with a Roux limb measuring 120 to 150 cm, in a side-to-side fashion with a 60-mm linear cutter, 3.5-mm stapler (Echelon® 60 mm: Ethicon endoSurgery, Cincinnati, OH), and the resulting enterotomy opening was closed with the same linear stapler. The gastric pouch was created along the lesser curvature and measured approximately 15 ml in volume. The Roux limb was positioned using the retrocolic retrogastric route. The 2.8-cm GPJA was created in a side-to-side fashion with a single application of the Echelon® linear cutter 3.5 mm stapler. The resulting GJ was closed by 8 to 10 interrupted 3/0 Vicryl® sutures (Ethicon, Cincinnati, USA) for the first 50 patients and by a running suture of one layer of V-Loc® 15 mm for the second 50 patients. The transverse mesocolon and mesenteric defects were closed with a continuous non-resorbable suture. Oral intake was progressively increased, and the patient was usually discharged on post-operative day 3 without systematic contrast oral radiography. All of the patients were monitored at post-operative months (POM)1, 3 and 6.

Patient and Operative Data

The following data were recorded: age, sex, body mass index (BMI), American Society of Anaesthesiology (ASA) score, diabetes, operative time, time of closure of GPJA, length of hospital stay and complications (mainly gastric fistula or anastomotic stenosis).

Statistical Analysis

Collected data were analysed with STATA MP 11 statistical software, with a two-sided significance level set at $p<0.05$. Continuous variables (age, BMI, time of hospitalisation, time of suture) were compared using Student's t test. Categorical variables (sex, diabetes, leaks and anastomotic strictures at POM 6, ASA) were compared using the chi-squared test.

Results

Both groups were similar with regard to the experience of the surgeon (10 patients of the first group were operated on by the resident and 12 in the second), age, body mass index (BMI), gender distribution, diabetes and ASA scores (Table 1). There was no mortality or conversion to laparotomy.

In the standard group, 8 Vicryl® were used in 18 patients, 9 in 24 and 10 in 8 patients. In the V-Loc group, one V-Loc® alone was used in 43 patients, one V-Loc® and two Vicryl® in 3 patients and one V-Loc® and one Vicryl® in 4 patients. Vicryl wires in the barbed suture group were used only to fix the side-to-side GPJA in order to reduce anastomotic tension.

The mean time for the GPJA suture was significantly lower in the V-Loc® group (11 versus 8.22 min; $p<0.01$), but there was no significant difference for the overall procedure time (125.06 versus 119.28 min; $p=0.11$) (Table 2). There were no fistulas or strictures in any of the 100 patients at POM 6 (Table 2). The length of hospital stay was the same in both groups (3.1 versus 3.2 days; $p=0.09$) (Table 2). There was a significant reduction in learning time associated with the use of barbed suture (Figs. 1 and 2). The total costs of materials to complete the reconstruction were significantly lower in the barbed suture group (€26.69 versus €18.326; $p<0.001$).

Discussion

Since 1991, the National Institutes of Health consensus panel has recommended the use of surgery to manage the growing problem of obesity [16]. To this end, LRYGB has good long-term results but is a technically demanding

Table 1 Comparison of preoperative characteristics by anastomosis suture type

	Usual (Vicryl®) ($N=50$)	Barbed (V-Loc®) ($N=50$)	p value
Age (SD)	42.4 (10.6)	43.7 (12.1)	0.28
BMI (SD)	44.7 (7.6)	44.0 (4.5)	0.29
Diabetes	17	19	0.665
ASA I	5	2	0.339
ASA II	26	32	
ASA III	19	16	

SD standard derivation, *BMI* body mass index, *ASA* American Society of Anaesthesiology score

Table 2 Operative and outcome data

	Usual (Vicryl®) (*N*=50)	Barbed (V-Loc®) (*N*=50)	*p* value
Anastomosis suture time: min (SD)	11 (1.55)	8.22 (2.1)	0.001
Total operation time: min (SD)	125.06 (20.32)	119.28 (26.29)	0.11
Leaks and stenosis at 6 months	0	0	
Length of hospital stay: days (SD)	3.1 (0.3)	3.2 (0.45)	0.09
Average cost: euros (SD)	26.69 (2.722)	18.326 (1.646)	0.001

SD standard derivation

procedure that requires significant experience in laparoscopic surgery [17–19]. Standardization of this procedure aims to reduce complications and to make it easier to teach it to young surgeons. One of the most challenging steps during this procedure is the construction of the GPJA. The use of mechanical or hand-sewn techniques varies from team to team [20–25]. Latero-lateral mechanical GPJA requires a suture to close the intestinal opening, but laparoscopic intracorporeal suturing and knot tying are considered one of the most difficult laparoscopic skills. The barbed suture has been proposed to facilitate laparoscopic suturing. To date, the efficacy and suitability of barbed sutures have been reported in gynaecologic [14, 26, 27], plastic [8, 28], urology [9–11, 29] and orthopaedic surgery [30], but no large study in general surgery has proved its safety in terms of anastomotic leaks or stenosis. The first report of barbed sutures in gastric or bowel anastomosis included a very small number of patients and the data analysis was limited [15].

The present study showed that the use of barbed sutures does not increase incidence of anastomotic leaks or other complications. This short-term safety was confirmed 6 months later, as no stenosis occurred in this period.

By the way, separated and running sutures are both suitable for closing intestinal openings. Running suture is usually faster than separated ones, but its downside is the loss of tension on the suture line. This was the reason why separated sutures were our preferred technique in usual practice. The aim of this study was to prove the safety of barbed suture, as it seems to associate the advantages of both sutures, in terms of time and tension. In the present study, the gain of time and cost is partially due to the use of running suture compared to interrupted suture. Nevertheless, the use of barbed suture made the running suture technique easier to perform and to teach, as no knots and no constant traction are required. The gain in time is real but has no major impact in long procedures like retrocolic retrogastric bypass. The concept of the study with two consecutive groups induced a bias, as the usual group was implied in the learning curve for the procedures in the barbed group, but the advantages of barbed suture were also evident for the expert surgeons. The cost of materials to complete the GPJA was lower using the barbed suture, and it is likely that the increasing use of barbed suture will lead to even lower costs as more companies produce them. From these results, the usual procedure was changed to a standardized LRYGB with barbed suture for GPJA in our team.

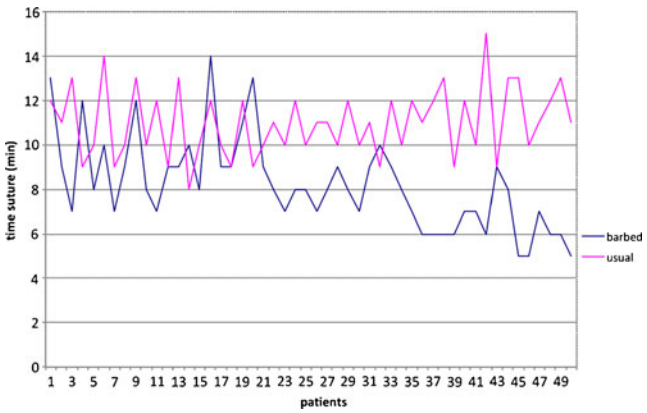

Fig. 1 Time of suture of gastrojejunal anastomosis in the barbed and usual groups

Conclusion

The use of barbed suture is as safe as usual sutures for the closure of the gastric pouch jejunal anastomosis during laparoscopic Roux-en-Y gastric bypass in terms of leaks and stenosis. The anastomotic time is shorter but does not significantly reduce the total operative time. Although this study compared retrospectively two consecutive groups without randomization and two different techniques, barbed sutures seem to be easier to perform and to teach. The cost was lower, and the mean closure time was shorter even

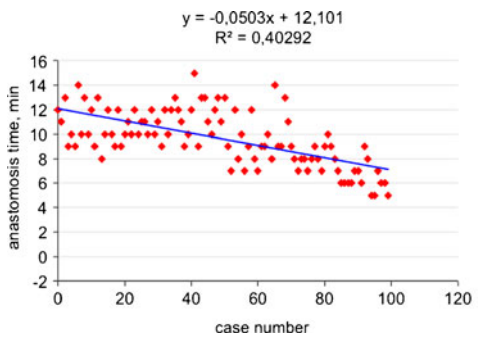

Fig. 2 Learning curve

though this had no clinically significant impact. This suture could be included in the standard LRYGB technique and could help attending surgeons train residents in GPJA.

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Conflict of Interest V. De Blasi, O. Facy, M. Goergen, V. Poulain, L. De Magistris and J.S. Azagra have no conflict of interest to declare.

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