

Laparoscopic Gastric Plication - One Year of Bariatric Surgery in the Emergency County Hospital of Baia Mare

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Rezumat

Plicatura gastrică laparoscopică – un an de chirurgie bariatrică la Spitalul Județean de Urgență Baia Mare

Plicatura gastrică laparoscopică are ca și principale avantaje, față de celelalte tehnici din chirurgia obezității, cele mai puține complicații postoperatorii și costurile cele mai reduse. Prezentăm în acest studiu rezultatele primului an de experiență cu această operație în Spitalul Județean de Urgență Baia Mare. *Metodă:* Au fost analizate retrospectiv primele 14 operații de plicatură gastrică laparoscopică (PGL) efectuate în cursul anului 2014: au fost 13 femei și un bărbat cu vârsta între 25 și 60 de ani, cu indicele de masă corporală (IMC) între 35,7 și 59,8. Postoperator evoluția pacienților a fost evaluată la 9 zile, o lună, 3 luni, 6 luni, 1 an și înainte de a scie această lucrare, urmărindu-se procentul pierderii excesului ponderal și evoluția comorbidităților.

Rezultate: Scăderea ponderală medie a fost de 21,42 Kg, iar procentul scăderii excesului ponderal a fost de 36,52%. Nu s-au înregistrat complicații postoperatorii care să necesite reintervenția chirurgicală.

Concluzii: Rezultatele foarte bune, costurile reușite și rata scăzută a complicațiilor postoperatorii, recomandă efectuarea acestei operații în orice spital echipat pentru chirurgia laparoscopică.

Cuvinte cheie: chirurgie bariatrică, plicatura gastrică laparoscopică, pierderea în greutate, obezitatea

Abstract

The main advantages of the laparoscopic gastric plication, in comparison to other bariatric surgery techniques, are the lowest costs and the fewest postoperative complications. This study shows our first year experience with this procedure in the Emergency County Hospital of Baia Mare.

Methods: The first 14 laparoscopic gastric plications performed in 2014 were studied retrospectively: there were 13 women and one man, with age ranging from 25 to 60 years old and a body mass index (BMI) from 35,7 to 59,8. Postoperative, the patients' evolution was evaluated 9 days, 1 month, 3 months, 6 months, 1 year after the surgery and before writing this paper, taking into account excess weight loss percentage and comorbidities' progress.

Results: The average weight loss was 21,42 kg and the weight loss percentage was 36,52%. There were no postoperative complications in need of surgical reintervention.

Conclusions: The results were very good, the costs were low and the postoperative complications had a low rate. Therefore, there is a recommendation on performing this surgery in every hospital equipped for laparoscopic surgery.

Key words: bariatric surgery, laparoscopic gastric plication, weight loss, obesity

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Introduction

According to WHO, in 2008, in Romania, 48,6% of adults over 20 years old were overweight and 17,7 % were obese (1). The data continue to get worse: according to the National

Institute of Public Health, in 2013, 26,75% of primary school children were overweight and 11,64 % were obese (2). These patients, after trying all kinds of diets without the expected outcome, resort to surgery as the only way to provide safe and stable results.

Depending on the weight loss mechanism, bariatric surgery techniques are divided into 3 categories:

- restrictive: it limits food intake;
- malabsorptive: food intake stays the same, while the food absorption surface is reduced among the digestive system;
- mixed: techniques that reduce food contact surface among the digestive system and also limit food intake.

Even though the surgeon and the patient's desires are the most important things when choosing a technique, BMI, age, obesity type, associated diseases and surgical risks should also be taken into account. The recommendation for the younger patients who have few comorbidities and a good prognosis is to undertake a restrictive method, while other patients with multiple diseases and bad prognosis are referred to irreversible procedures: malabsorptive or mixed techniques (3).

Based on weight-reduction mechanism, these are the most frequently performed techniques in the minimally invasive bariatric surgery:

- Gastric banding - restrictive procedure in which an adjustable silicone band is placed in the upper part of the stomach, creating a pouch that can hold only a limited amount of food (Fig. 1). Advantages: there is no cutting-off of the digestive system, the hospitalization period is short, it is adjustable and reversible. Disadvantages: the band is a foreign body that can move and cause erosions, it needs diet and postoperative follow-ups, weight loss is slow and reduced, and the reintervention rate is the highest.
- Gastric sleeve - another restrictive procedure in which 80 % of the stomach is cut-off by sectioning along the lesser curvature (Fig. 2). Advantages: it induces a rapid and important weight loss, short hospitalization period and it causes hormonal changes that reduce hunger, suppress the appetite and increase satiety. Disadvantages: it is an irreversible procedure; it can cause vitamin deficiencies in time and has a relative high immediate postoperative complication rate, due to the long section and suture.
- Bilio-pancreatic diversion: it is a mixed procedure involving a longitudinal gastric resection, similar to gastric sleeve, an anastomosis between the remaining stomach and the ileum, in a way that three quarters of the small intestine is taken out of the digestive circuit (Fig. 3). Advantages: rapid and important weight loss, the patients can eat almost normally, it modifies the intestinal hormones, reducing hunger and suppressing appetite, having the best effect on diabetes treatment. Disadvantages: the highest complication and mortality percentage in bariatric surgery, long hospitalization period, protein, vitamin and microelement deficiencies that are hard to control, regular follow-ups in order to prescribe vitamin and mineral supplements.

Figure 1. Gastric banding

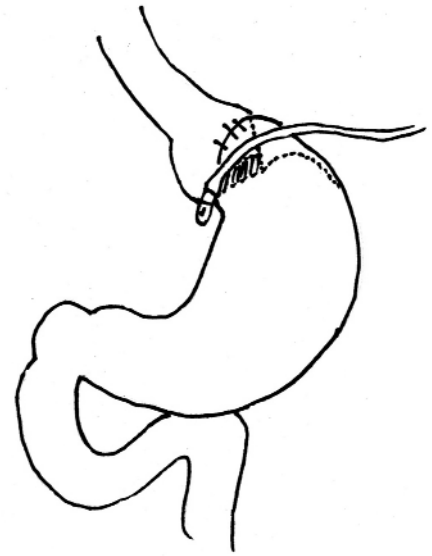
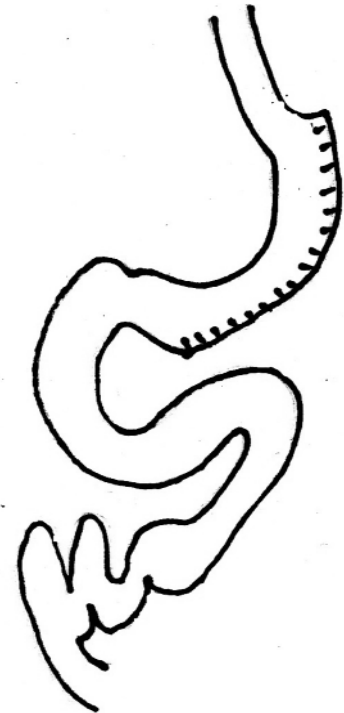


Figure 2. Gastric sleeve



- Gastric bypass - is the golden standard, mixed procedure in bariatric surgery: the stomach is divided into a smaller upper subcardial pouch and a larger bottom section. The pouch is then connected to a Roux-en-Y jejunal limb obtained by sectioning the jejunum in its superior part (Fig. 4).
- Gastric plication - restrictive procedure that is still undergoing investigations, consisting of suturing the stomach in one, two or three layers (Fig. 5) and folding it into itself, so that the remaining functional volume is reduced to roughly 50 ml (5). Advantages: there is no

Figure 3. Bilio-pancreatic diversion

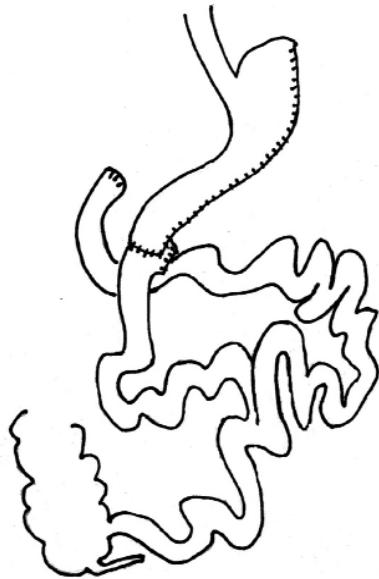
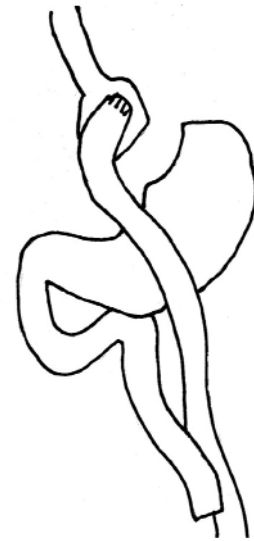


Figure 4. Gastric bypass



need of cutting-off the digestive system - the simple suture of the stomach is enough, without using any staplers or implanting any devices, the postoperative complications are almost non-existent, the procedure can be reversed by taking out the sutures in case of food intolerance, a short hospitalization period and the lowest cost in comparison to other procedures, but with similar effects on weight loss. Disadvantages: the patients must avoid sweets, greasy food and alimentary paste and undergo a regular physical activity.

The obvious superior advantages of the gastric plication among other bariatric surgery procedures determined us to use this technique on Emergency County Baia Mare Hospital's obese patients.

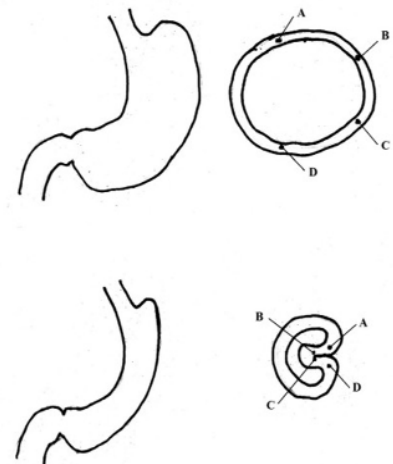
Materials and Methods

This paper is a retrospective study of the first double layer laparoscopic gastric plications of the greater curvature performed at Emergency County Hospital of Baia Mare, from January to December 2014.

Patients

There were 13 women and a man, with age ranging from 25 to 60 years old, BMI from 35,7 to 59,8 and weight from 99 to 165 kg (the weight is limited to 170 kg due to surgical table technical specifications). The associated diseases were high blood pressure in 7 cases, type 1 diabetes in 1 patient, type 2 diabetes in 3 patients, joint pain and lower back pain in 5 patients, chronic ischemic cardiac disease in 1 patient, hypercholesterolemia in 8 patients and hypertriglyceridemia in 9 cases. The patients were evaluated pre-operative by a complex team: nutritionist, cardiologist, gastroenterologist and psychologist. The *Helicobacter pylori* infection was routinely investigated and treated preoperative, but gastroscopy

Figure 5. Gastric plication



was performed only in cases presenting gastritis symptoms. The surgical indications were the ones that are generally accepted in bariatric surgery: BMI > 40kg/m² or BMI > 35 kg/m², if important comorbidities are associated and at least 5 years of persistent weight excess and ineffective diets are documented.

Preoperative preparation

One hour before the surgery, the patients received one dose of low molecular weight heparin (4000 UI) and the anticoagulation was continued 15 days after the surgery. The french position was used: the patients were placed supine, with arms extended on the arm holders and the legs spread and wrapped in elastic bandage until the next day when the patients started walking. At the beginning of the operation, the patients received one dose cephalosporin and one dose proton-pump inhibitor. At the end, each patient was given Ondasetron.

Surgical procedure

Port placement was named "egyptian" because it was best described by El-Geidi (7): One 10-mm port for the camera was placed 20 cm below the xiphoid process and slightly to the left of the midline and another 10-mm port at left midclavicular line, above the camera, for the surgeon's right hand. For the surgeon's left hand, a 5-mm port was placed at right midclavicular line and slightly above the camera. Just under the xiphoid process, a 10-mm port was used to retract the liver. The last port (5 mm) is used by the assistant, placed at the left anterior axillary line, just below the costal margin and also used for drainage (Fig. 6). The greater curvature was dissected using Ligasure Valleylab Vessel Sealing System, starting from the gastric angle, going proximally until 2 cm above Hiss angle and distally 3-4 cm from the pylorus. After the anaesthesiologist inserted into the stomach a 36-Fr bougie, the first layer was sutured with 2x0 absorbable interrupted stitches at 2-3 cm a part, while for the second layer a continuous suture was performed with 2x0 polypropylene. In 5 cases, we used a V-Loc 2x0 suture from Covidien for the second layer, shortening the surgery's duration due to its plastic memory and ability to anchor on its own. The gastric wall integrity was tested with methylene blue solution and a drainage tube was placed behind the stomach and maintained there 24-48 hours.

Postoperative care

The patients were mobilized the first day after the surgery. Clear liquids were given while sitting or standing (water, tea, soup), depending on food tolerance, without exceeding 25 ml, 15 min a part. The proton-pump inhibitor and the antiemetic were given 2 times per day during hospitalization. Discharge criteria were more restrictive due to the fact that many patients came from cities that are hundreds of kilometers away (no vomiting, the presence of intestinal transit, a safe trip home).

The data were gathered from the patients' charts, during the 9 days, one month, 3 months, 6 months, one year postoperative follow-ups and before writing this study: age, weight, BMI, associated diseases, surgery and hospitalization period, postoperative complications, weight loss and hospitalization costs. The ideal weight was calculated using Lorentz's modified formula:

- female: $\text{weight (kg)} = \text{height (cm)} - 100 - [(\text{height (cm)} -$



Figure 6. Port position, the left subcostal one with the drainage tube

$150)/2,5] + [(age-20)/6];$

- male: $\text{weight (kg)} = \text{height (cm)} - 100 - [(\text{height (cm)} - 150)/4] + [(age-20)/4].$

The weight loss was calculated using this formula:

$\% \text{ excess weight loss} = ((\text{weight at baseline} - \text{weight at each visit}) / (\text{weight at baseline} - \text{ideal body weight})) \times 100.$

The surgical procedure was explained to the patients, with its advantages and disadvantages, along with the postoperative recommendations: diet and physical activity. The patients gave their informed consent and before applying this procedure in our hospital we received the ethics committee approval.

Results

The patients undergoing laparoscopic gastric plication had a mean age of 43 years, being highly motivated to lose weight. Before the surgery, they agreed to control their food intake and to start a regular physical activity after the surgery. Their motivation was enhanced by the weight lost in the first 9 days after the surgery (between 5 and 11 kg). The average weight was 128 kg, the BMI 45,77 and the ideal weight 63,8 kg (Table 1). Except for the first patient, who came back to her original weight after one year, all the other patients followed an ascending curve of weight loss (Fig. 7), losing an average of 21,42 kg, with a mean excess weight loss of 36,52 %.

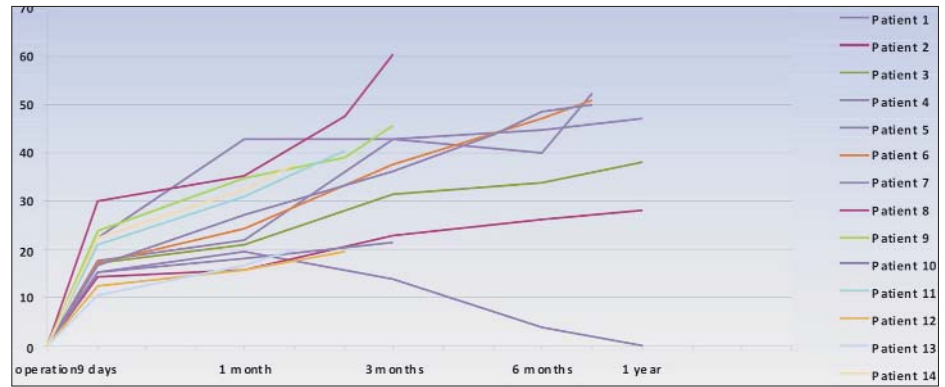
Some obesity-related diseases were also influenced by the

Table 1. Age and weight indicators of the patients operated with gastric plication

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Mean
Age	45	46	32	39	26	53	38	25	60	36	57	58	45	41	42,9
BMI	50,7	43,2	38,9	48,8	36,7	59,8	46,1	35,7	38,6	47,8	41,5	57,1	56,7	39,2	45,77
Weight															
Kgs	133	122	111	128	100	140	130	102	117	155	120	165	160	99	128
Ideal weight Kgs	61,3	65,1	63,4	60,3	60	57,3	63,8	62,2	71	76,5	68,1	68,3	57	59	63,8
Weight loss Kgs	0	16	18	32	21	42	33	24	21	17	21	19	21	15	21,42
Loss PE %	0	28,1	37,8	47,2	52,5	50,7	49,8	60,3	45,6	21,6	40,4	19,6	20,3	37,5	36,52

PE – ponderal excess

Figure 7. Dynamics of excess weight loss after laparoscopic gastric plication



surgery. Only 3 patients remained with high blood pressure, but the medication needed to control it was significantly reduced. The type I diabetic patient needed only 2 out of 4 insulin doses, while the type II diabetic patients could control their sugar levels only through diet, without taking any drugs. The patient with chronic ischemic cardiac disease had her medication changed and reduced and the cholesterol and triglyceride levels became normal in all patients (Table 2).

Just after discharge, the drugs were given subcutaneously (insulin, anticoagulant), sublingually (Captopril for high blood pressure), as syrup (vitamin and calcium supplements), as powder dissolved in water (proton-pump inhibitors) or as suppositories.

The only postoperative complication was vomiting. While for the most patients it stopped 2 or 3 days after surgery, there was a case in which it lasted until the 10th day after the surgery and another one until the 14th day after the surgery. These two cases needed each 2 times day hospitalization for hydro-electrolytic and acid-base re-equilibration. In time, liquid intake exceeded 1500 ml/day and the intravenous administration stopped.

The time of operation diminished progressively, proportionally to the experience gained by the surgeon while doing intracorporeal sutures and using the V-Loc suture (with unidirectional, shallow barbs with circumferential distribution which prevent it from slipping). The mean time of operation was 193 minutes (Table 3).

The average hospitalization time was 5 and a half days, varying from 3 to 9 days, depending on the persistence of vomiting, the travel distance and the motivation to return to work (a patient was discharged just after 2 days because she was a teacher at a private school). The hospitalization costs were between 1575 and 3723 RON, with an average of 2560 RON, about 580 euros or 665 dollars.

Table 2. Associated diseases of the patients with laparoscopic gastric plication

Associated diseases	Preoperative	Postoperative
Hypertension	7	3
T1DM	1	1
T2DM	3	0
Back or knee pain	5	0
Ischemic heart disease	1	1
Cholesterol ↑	8	0
Triglyceride ↑	9	0

Discussions

The number of obese people is constantly increasing in Romania and about 300.000 of them have surgical indications (9). Few surgical centers are able to take care of this pathology, even though applying a gastric banding or making a laparoscopic gastric plication is a relatively simple and cheap technique. The latter is a newly introduced method (5,6,7,10) with results still under investigation. It is becoming more and more popular among patients and surgeons because it is not a malabsorptive method capable of producing hard to correct nutritional imbalances, it doesn't involve removing part of the stomach or applying foreign objects, it is reversible, it can be readjusted and the plication can be redone if the stomach distends in time (5,10). Among these advantages there are the costs that are very low in comparison to other methods and the fact that it can be done on children and teenagers, since it is a friendly procedure with immediate and late postoperative evolution (5,10,11).

In Romania, the first laparoscopic gastric plication was done in 2010 (12) and is currently performed in just a few of the country's hospitals. The main reasons for choosing this procedure for our patients is the excellent postoperative evolution, with very few complications, rapid weight loss and

Table 3. Time of operation, hospitalization time, and cost of the laparoscopic gastric plication

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Mean
Time of operation (min)	250	200	210	200	240	180	220	200	180	180	190	130	155	165	192,85
Hospitalization time (days)	6	4	3	4	6	9	4	6	8	7	4	5	6	4	5,42
Hospitalization cost (RON)	2279	1906,3	1574,6	1913,6	2552,7	3723,1	1995,5	2889,2	3410,7	3050,8	2642,7	3388,1	2753,5	1754,5	2559,59

materials' low price. After seeing the Surgical Clinic II of Timisoara's presentation at the 2013 IASGO Congress (13) and the results obtained on large series of patients available in the literature, we decided to perform this procedure.

The preoperative preparation included a mandatory psychological evaluation (questions about diet, self-esteem, depression and determination), nutritional evaluation and the treatment of *Helicobacter pylori* when found positive. Cardiologic exam, gastroscopy and other investigation were done only when the clinical evaluation showed pathological changes. There was no gastroscopy or X-ray examination with contrast agent after the surgery to verify the gastric wall integrity because there were no clinical signs of perforation. The postoperative vomiting was the only postoperative complication, but after its disappearance, the nourishment was reestablished by liquid intake (about 25 ml every 15 min). During the first week, the liquid volume increased, reaching up to 50 ml. This amount was recommended for the first 6 months after the surgery, along with fat, sweets and alimentary paste avoidance. Dietary restrictions were accompanied by physical activity indications that should have increased until reaching one hour of walk daily.

The average weight loss was 18,24% 9 days after surgery, 25,35% after one month, 35,46% after 3 months and 34,8% after 6 months, the weight reaching a standstill the second postoperative year. These results are close to the ones published in literature (5,7,8,9). The associated diseases had a predictable evolution, just like the results published by other authors (5,7-13): the lower back and joint pain disappeared (one of the patient received the indication for bariatric surgery from a neurosurgeon), the triglyceride and the cholesterol reached a normal value and the type II diabetic patients didn't need their medication anymore. The type I diabetic patients had a significant decrease in insulin doses, needing a more careful surveillance; they had persistent postoperative vomiting which subsided as soon as the diabetes was balanced. The high blood pressure became normal in 4 cases, while the other ones had their drugs reduced, just like the patient with chronic ischemic cardiac disease.

The time of operation was pretty long at the beginning, becoming shorter with gaining experience. Even though the time is still bigger than the one published by other authors, it is on the right track as far as the learning curve and especially the intracorporeal sutures go. The time of hospitalization is short, but it doesn't necessarily show the advantages of the laparoscopic technique: the patients were discharged on Mondays, even though the vomiting subsided and the intestinal transit was regained on Saturday or Sunday. They were able to go home only when they had an available means of transportation, especially the patients that lived far away from the hospital. Even so, the average costs of the intervention were under 600 euros or 700 dollars, being the lowest price among the ones stated in literature.

Another advantage of the laparoscopic gastric plication is the patients' psychological comfort: there is no need of other procedure to remove a device and there are no repercussions in time. Along with the rapid postoperative weight loss, these advantages give the patients the impulse needed to have a

healthy lifestyle, a requirement in order to have the desired outcome. At the preoperative psychological evaluation there were two female patients that had a high risk of being unable to follow these recommendations; therefore, they weren't accepted for this procedure.

Conclusions

The laparoscopic gastric plication is a safe procedure for obesity treatment, with stable and very good immediate results. It has the fewest postoperative complications in bariatric surgery, strongly motivating the patients to adopt a healthy lifestyle. Obesity related diseases had a good progress after the procedure: some of the type II diabetes and high blood pressures disappeared. The surgery and hospitalization costs are the lowest in bariatric surgery and there is no need of any special devices (endostaplers, gastric banding, surgical mesh and so on). Therefore, this procedure is a feasible technique for every hospital equipped for laparoscopic surgery.

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