

# Petersen's space hernia after gastric bypass

## *Hernia del espacio de Petersen en paciente intervenido de bypass gástrico*

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### Abstract

Petersen's space hernia is the most frequent location of internal hernia after a laparoscopic gastric bypass. The diagnosis or a high suspicion of internal herniation is indications for urgent surgery. We present the case of a patient who required an exploratory laparoscopy. He had a computed tomography compatible with internal herniation. We found a Petersen's space hernia and a jejunojejunostomy defect. We reduced the protruded loops and we closed both mesenteric defects. The closure of mesenteric defects in primary surgery is a controversial matter. Overall, it is recommended to close them.

**Keywords:** Laparoscopic gastric bypass. Bariatric surgery. Petersen's space hernia. Internal hernia.

### Resumen

Las hernias del espacio de Petersen son la localización más frecuente de las hernias internas tras un bypass gástrico laparoscópico. Su diagnóstico, e incluso su sospecha, son indicación de cirugía urgente. Presentamos el caso de un paciente que requirió una laparotomía exploradora en la que se halló una hernia del espacio de Petersen tras presentar en la tomografía computarizada el signo del «remolino». Se realizó la reducción de las asas intestinales herniadas junto al cierre del defecto mesentérico de dicho espacio. El cierre de los defectos mesentéricos en la cirugía primaria continúa generando controversia, pero como norma general se recomienda su cierre.

**Palabras clave:** Bypass gástrico laparoscópico. Cirugía bariátrica. Hernia del espacio de Petersen. Hernia interna.

### Introduction

Obesity is a chronic disease associated with comorbidity, the treatment of which is difficult<sup>1</sup>. Surgery is currently considered the best approach for achieving long-term weight loss, and within surgical procedures, laparoscopic gastric bypass (LGB) remains for many authors the gold standard in bariatric surgery<sup>2</sup>.

Internal hernias are the most common cause of bowel obstruction in these patients on long-term follow-up<sup>3</sup>. They are caused by intestinal loops protrusion through mesenteric defects generated by Roux-en-Y reconstruction during gastric bypass<sup>2</sup>. Their incidence when the laparoscopic technique is used ranges from 0.5% to 11%<sup>4</sup>. Clinical presentation is usually nonspecific, which can entail significant morbidity and even mortality. It can occur at any time

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postoperatively, but it is more common between the 1<sup>st</sup> and 2<sup>nd</sup> year after surgery<sup>5</sup>, since this is the period with the largest weight loss and mesenteric fat rapid decrease<sup>6</sup>.

With the antecolic Roux-en-Y technique, two mesenteric defects can be generated that involve locations of risk for the development of internal hernia<sup>5</sup>. The first one corresponds to a defect originated after the interruption of the mesentery at the jejuno-jejunal anastomosis site, and the second is known as Petersen's space and is delimited by the mesentery of the alimentary loop and the transverse mesocolon<sup>7</sup>. Closure of these defects during surgery as a preventive measure for internal hernia continues to be a subject of debate, but a lower incidence is suggested in cases of mesenteric defects primary closure<sup>2</sup>.

The purpose of this work is to present the case of a Petersen's space hernia after LGB with satisfactory surgical resolution.

## Clinical case

Forty-five-year-old male presented with a history of high blood pressure, insulin resistance, severe obstructive sleep apnea syndrome on treatment with continuous positive airway pressure at home and on follow-up for depression. He had previously undergone surgery for a herniated disc twice (L5-S1 arthrodesis) and for right knee meniscal tear. He had undergone antecolic LGB 11 months earlier (initial body mass index [BMI] of 44.3), with closure of mesenteric defects generated during surgery. After a post-operative period with good evolution and loss of 55 kg (BMI of 25.7), he attended the emergency department due to recurrent and diffuse abdominal pain with several hours' evolution, which started at the mesogastrium and increased in intensity, accompanied by vasovagal reaction. He had experienced an episode of vomiting on previous day.

On physical examination, the patient was in antalgic posture, with abdominal tenderness to palpation at the level of the mesogastrium, without distension or signs of peritoneal irritation. Blood tests showed neutrophilia (78.5%) without leukocytosis or other abnormalities. Abdominal-pelvic computed tomography (CT) scan with intravenous contrast showed, at the level of the root of the loop, an angulation, and a decrease in caliber of a small bowel segment at left hypochondrium was identified (Fig. 1), together with indirect signs of internal hernia, such as mesenteric vessels "swirl" (Fig. 2). An urgent exploratory laparoscopy was

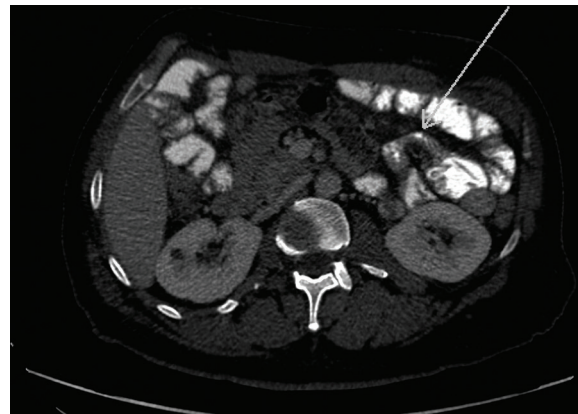


**Figure 1.** Abdominal-pelvic computed tomography with intravenous contrast (axial section) in which an angulation and a decrease in the caliber of a small bowel segment at left hypochondrium is observed at the level of the root of the loop.



**Figure 2.** Abdominal-pelvic computed tomography with intravenous contrast (coronal section) in which counterclockwise rotation of the mesenteric vessels is observed, which together with the findings shown in figure 1 suggests the existence of an internal hernia.

practiced, in which a herniation of almost the entire alimentary loop was found through Petersen's mesenteric space (Fig. 3) and a medium-sized mesenteric orifice of the root of the loop (Fig. 4). Reduction of the herniated loop segment and closure of the orifice with 2/0 polypropylene barbed suture, and closure of the root of the loop mesenteric orifice with the same suture were carried out.

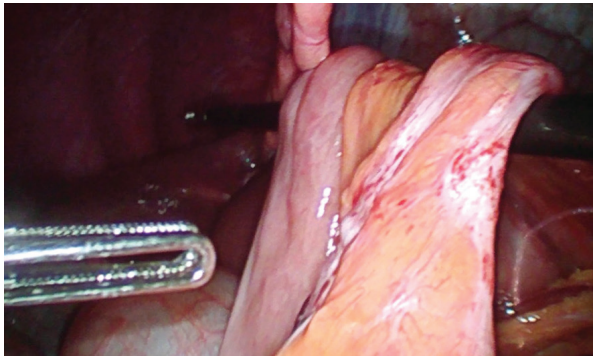


**Figure 3.** Petersen's mesenteric space once intestinal loops herniation has been reduced.

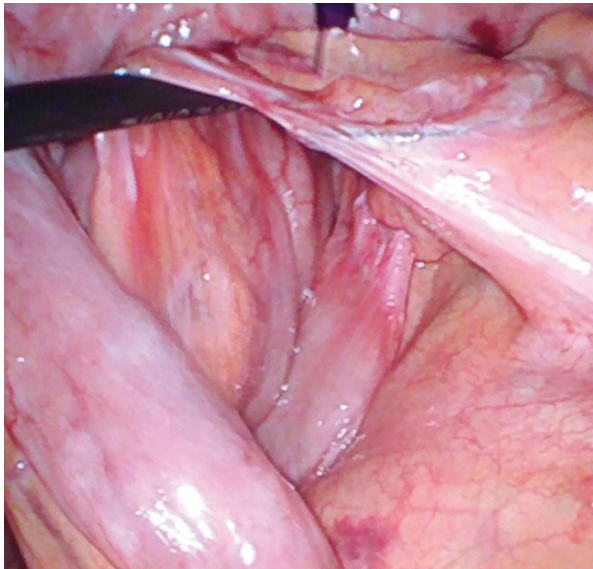


**Figure 4.** Mesenteric defect at the level of jejunum-jejunal anastomosis.

After the intervention, the patient had a favorable evolution, with good oral tolerance since the second postoperative day, and was discharged from hospital on 3<sup>rd</sup> day after the surgical procedure.

## Discussion

Despite the advantages of laparoscopic surgery, in LGB with Roux-en-Y reconstruction, a higher incidence of internal hernias is observed in comparison with open surgery, due to lower formation of adhesions<sup>2</sup>. This favors intestinal loops free mobility and the possibility of their displacement through the hernia orifices originated by surgery<sup>3</sup>. Other factors related to its occurrence include weight loss, thinning of the small bowel mesentery and the mesocolon, and lack of closure of the created defects<sup>1</sup>.

Regarding the spaces generated with risk of internal hernia occurrence, Petersen's space is the most common location<sup>2</sup>. This space was described by German surgeon Walther Petersen in 1900 during the first surgical procedures for peptic ulcer, but currently it has regained interest due to the boom of LGB. The space is created between the ascending alimentary loop and the transverse mesocolon during antecolic Roux-en-Y reconstruction. When intestinal loops pass through the defect, a type of internal hernia is produced, known as Petersen hernia. Evidence has shown that closure of this space does not guarantee that the occurrence of an internal hernia will be avoided, but it appears to decrease its incidence<sup>8</sup>.

Clinical presentation is entirely nonspecific, which is why it is often diagnosed based on its complications (intestinal obstruction or peritonitis). Thus, a high degree of suspicion about its presence is necessary to avoid a late diagnosis that may result in intestinal necrosis<sup>8</sup>, as in the case described by Reiss and Garg<sup>9</sup> of a 36-year-old female patient who had a LGB practiced 4 years prior.

Acute presentation occurs as diffuse or localized abdominal pain (especially in the mesogastrium and left hemiabdomen), constant or intermittent, associated or not with vomiting and other symptoms<sup>10</sup>. In addition, it can occur as a chronic condition of recurrent postprandial pain or entero-gastroesophageal reflux<sup>2</sup>. Pain is usually severe and self-limiting, but in our opinion, in a patient who underwent LGB and has recurrent episodes of abdominal pain, Petersen's hernia should be always included in differential diagnosis, even with negative radiological findings.

In this context, once other ailments such as cholelithiasis, acute pancreatitis, and ulcer of the anastomosis mouth have been ruled out, radiological investigations (contrast-enhanced abdominal CT) should be carried out<sup>3</sup>. Typical radiological signs of internal hernia include mesenteric vessels and mesenteric root fat whirl, mesenteric vessels engorgement, small bowel arrangement behind superior mesenteric artery, presence of jejunum-jejunal anastomosis to the right of the alimentary loop, and ligament of Treitz anterior and right displacement<sup>11</sup>. In our case, CT showed mesenteric vessels counterclockwise rotation.

Whenever internal hernia is suspected, even if complementary examinations are inconclusive, an exploratory laparoscopy is indicated with the purpose to identify mesenteric gaps, reduce herniated intestine evaluating its vitality and close mesenteric defects

with non-resorbable suture<sup>8</sup>. All these steps were carried out on the patient herein presented.

Closure of hernia defects is a subject of controversy in the literature, but closure with non-resorbable sutures is recommended to create the necessary adhesions for proper mesenteric closure when the patient loses weight<sup>1</sup>. Thus, in a randomized clinical trial carried out by Stenberg et al.<sup>12</sup> with 2507 patients undergoing LGB, an incidence of internal hernia of 2.2% was found in those who had undergone closure of the mesenteric spaces and 7.2% in those without closure. However, in the study carried out by Turchi et al.<sup>2</sup>, there was no evidence of a higher incidence of internal hernias after failure to primarily close mesenteric defects. In our case, mesenteric defects closure with non-resorbable suture (3/0 silk) was insufficient for preventing the reappearance of hernia orifices. Probably, a thicker polypropylene suture would have provided better protection.

## Conclusions

In patients who previously underwent gastric bypass who present with non-specific abdominal pain, it is necessary for the possibility of an internal hernia to be considered. It is a surgical emergency, and thus, if there is a high index of suspicion, even if complementary examinations are not conclusive, an exploratory laparoscopy would be indicated during which herniated intestinal loops would be reduced and mesenteric defects would be closed.

Although there are studies in which a higher incidence of internal hernias has not been observed in patients without mesenteric orifices primary closure, continuous suture with non-resorbable material is recommended for the possibility of them occurring to be reduced.

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## Conflicts of interest

The authors declare the non-existence of a conflict of interests.

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## Ethical disclosures

**Protection of human and animal subjects.** The authors declare that no experiments were performed on humans or animals for this research.

**Confidentiality of data.** The authors declare that they have followed the protocols of their work center on the publication of patient data.

**Right to privacy and informed consent.** The authors have obtained informed consent from the patients and/or subjects referred to in the article. This document is in the possession of the corresponding author.

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