



Petersen's Hernia. Is it a Calculated Risk?

Jiménez Bonola Yamileth

General Surgeon, Surgical Department at "Dr. Rubén Leñero" General Hospital Secretary of Health of Mexico City, National Autonomous University of Mexico, México City, México.

García Sánchez Morelos Adolfo

Colonic and Rectal Surgeon and General Surgeon, Surgical Department at "Dr. Rubén Leñero" General Hospital Secretary of Health of Mexico City, National Autonomous University of Mexico, México City.

De La Fuente González Mireya

General Surgeon, Surgical Department at "Dr. Gaudencio González Garza" General Hospital Specialized Medical Unit, "La Raza", National Medical Center, Mexican Social Security Institute, National Autonomous University of Mexico, México City, México.

Estrada Rodríguez María Isabel

Podiatrist Pediatrician Department. Regional General Hospital No. 251, Metepec. Mexican Social Security Institute. National Autonomous University of Mexico. México State, México.

Flores Pazos Mauricio Israel

General Surgeon, Surgical Department at "Dr. Rubén Leñero" General Hospital Secretary of Health of Mexico City, National Autonomous University of Mexico, México City, México.

García Díaz Edson Antonio

General Surgeon, Surgical Department at "Dr. Rubén Leñero" General Hospital Secretary of Health of Mexico City, National Autonomous University of Mexico, México City, México.

Shafler Tenorio Enrique

General Surgeon, Surgical Department at "Dr. Rubén Leñero" General Hospital Secretary of Health of Mexico City, National Autonomous University of Mexico, México City, México.

De Luna Berrones Antonio

General Surgeon, Surgical Department at "Dr. Rubén Leñero" General Hospital Secretary of Health of Mexico City, National Autonomous University of Mexico, México City, México.

Hernández Medina Myrna Sofía

General Surgeon, Surgical Department at "Dr. Rubén Leñero" General Hospital Secretary of Health of Mexico City, National Autonomous University of Mexico, México City, México.

Abstract

Hernias as a pathological entity in Surgery are very frequent; while Petersen's hernia is a complication acquired after abdominal surgery independently in any type of digestive anastomosis. The objective is to report a case and carry out a

review of the literature. A 47-year-old female with G III obesity, 4 years ago justified bariatric surgery of the Roux-en-Y gastric bypass by laparoscopy, with data of intestinal occlusion and acute abdomen. An emergency exploratory laparotomy was performed, finding Petersen's internal hernia, with reduction without complications with a satisfactory evolution. Petersen's hernia as a practically exclusive complication of Bariatric Surgery has been increasing exponentially in terms of its incidence in recent years, due to the reintroduction of the laparoscopic approach. The difficulty of an early diagnosis causes catastrophic complications, so a delay in the diagnosis, decision and surgical management, has devastating consequences. In terms of surgery, it is a challenge for the medical professional that requires exquisite preparation, character, iron and strict discipline. That is why an omission, an error, a bad decision has catastrophic consequences. And an example of this is Petersen's hernia, as an acquired pathology secondary to a calculated omission or error by the surgeon in the surgical technique, more than costing financial, human resources or the patient's life itself.

Keywords: Hernia. Petersen's hernia. Obesity. Bariatric Surgery.

INTRODUCTION

Hernias as a pathological entity in Surgery are very frequent and intestinal occlusion is one of the most common complications thereof; this is not the case with internal hernias, which have an incidence of less than 3% and their clinical manifestations are extremely rare, which is why preoperative diagnosis is extremely difficult, which puts the expertise of clinicians and surgeons to the test. [1] Petersen's hernia (PH) is a complication acquired after abdominal surgery independently in any type of digestive anastomosis, but more frequent in any gastrojejunostomy with an incidence of less than 0.6%, and which was first described by Bunde in 1897. This space was later reaffirmed by the German surgeon Walther Petersen in 1900. [2]

OBJECTIVE

Report of a case and analysis of the literature.

CASE REPORTS

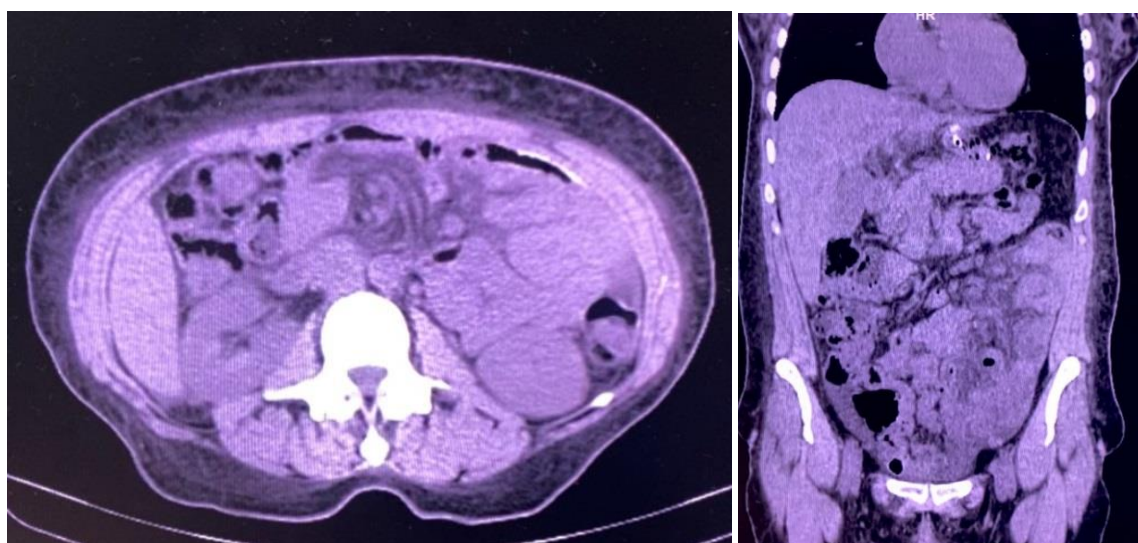
This is a 47-year-old female who attends the emergency department of the General Hospital "Dr. Rubén Leñero" from the Ministry of Health of Mexico City, Mexico country. She denies chronic-degenerative diseases. Surgical history of bilateral tubal occlusion 24 years ago and normal delivery at 16 years. Weight prior to bariatric surgery of 118 kg and height of 1.63 m. With a body mass index of 44.4 with grade III obesity, according to the classification of the World Health Organization; [3] or EOSS 2 (Edmonton Obesity Staging System), [4] for which 4 years ago it justified performing bariatric Roux-en-Y gastric bypass surgery with laparoscopic technique, undergoing an adequate evolution and fulfilling its objective, with a current weight of 60 kg. It begins suddenly with diffuse abdominal pain, crampy, of low intensity, immediate postprandial two hours after food intake, located in the epigastrium and mesogastrium, with a gradual increase in intensity; becoming continuous and severe for 12 hours, and already in the last 4 hours the symptoms become disabling. It presents with absence of evacuation and without channeling gases in more than 18 hours, with nausea and occasional vomiting; hyporexia, asthenia and adynamia. She denies fever. Physical examination with HR: 120x', FR: 28x', T/A: 98/62 mm Hg, Temp: 37.6°C. Conscious to drowsy, with dry mucous membranes,

pale integuments, abdomen with abdominal distension, peristalsis of struggle and metallic sounds. Intense pain on abdominal palpation and increases exponentially on decompression, making it impossible to palpate visceromegaly. Generalized tympanism. Capillary filling 6". Laboratories: minimum leukocytosis of: $11.3 \times 10^3 \text{ mm}^3$. Neutrophilia: 86.7%. Lymphopenia: 7.4%. With moderate microchromic microcytic anemia with hemoglobin: 9 mg/dl. Hematocrit: 28.5%. Platelets: $224.00 \times 10^3 \text{ mm}^3$. Prothrombin time: 13.1" INR: 1.14. Glucose: 93 mg/dl. Urea: 26.8 mg/dl. Creatinine: 0.5 mg/dl Mild hypoalbuminemia of: 3.4. Hypocalcemia of: 7.7 mg/dl. With Ca corrected from: 8.18. C-reactive protein increased to: 7.97 mg/dl with a baseline of 0.7. Na: 138 mEq/L. K: 3.54 Meq/L. LC: 110 mEq/L. Rest in normal parameters. Arterial blood gases with ph: 7.43. PCO₂: 32mmHg. PO₂: 74mm Hg. HCO₃: 22.8 nmol/L. Lac: 1 nmol/L. SO₂c: 95%. BEecf: -3.1 nmol/L. X-rays of the abdomen standing and decubitus [Figure 1] with dilation of the colon, air-fluid levels, edema of interest, reflex ileus, cut colon and fixed loop.



Figure 1

A simple abdominal computed tomography was performed, where interesting edema, intestinal dilatation not equidistant or reciprocal, was visualized, with the whirlpool sign. [Figures 2, 3]



Figures 2 and 3

An emergency exploratory laparotomy was carried out, finding Petersen's internal hernia with a 7 cm wide hernial hole or ring, with content of the entire small intestine, without ischemic changes, its reduction was achieved without complications, with closure of the defect that was acquired by previous bariatric surgery. [Figures 4, 5 and 6]



Figures 4, 5 and 6.

His evolution after surgery was satisfactory and he was discharged home in 48 hours, with follow-up in the Outpatient Surgery service. Currently asymptomatic.

DISCUSSION

PH as a practically exclusive complication of Bariatric Surgery (BS) has been increasing exponentially in terms of its incidence in recent years, due to the fashion for a reintroduction of BS with a laparoscopic approach. [2]

BC started in 1957 by John Linner who performed the first jejuno-ileal bypass in a canine model; causing a revolution in this type of surgery. In 1966, when Dr. Edward E. Mason, a surgeon who performed the first gastric bypass by making a horizontal cut through the stomach with a loop that diverted bile from the stomach. In 1986, L. Kuzmak invented a silastic ring with a small balloon, giving rise to the adjustable gastric band. In 1987, Johnston performed a procedure that was later perfected into the now well-known gastric sleeve. In 1995 MacDonald and Pories were the first surgeons to perform the Roux-en-Y gastric bypass. [5, 6]

Although BS is considered the best treatment option against obesity, the mortality rate has been reported from 5 to 6.3%, these studies are a world reference in the area; however, a single case of PH was not mentioned in any prospective and controlled study of more than 4000 patients. [7, 8, 9, 10] A 4-year retrospective case series of 500 patients is published in Mexico, where 4 patients with internal hernia are evidenced, reporting 9.8% early complications and 12.2% late complications, a total morbidity of 22% and no mortality. [11]

The clinical picture of PH is diverse, inconstant, and nonspecific, and these patients after a Roux-en-Y gastric bypass may present normal laboratory values, minimal findings on physical examination, and inconclusive radiographic results; it can present as intestinal obstruction

(already documented since 1955), chronic diarrhea, irritable bowel syndrome, or an acute abdomen where pain out of proportion to physical examination often indicates the need for urgent surgical intervention; [1, 12] or also as a chyloperitoneum associated with PH or only ascites that occurs in 46% of patients. The difficulty of an early diagnosis causes catastrophic complications, such as massive intestinal necrosis of the small intestine and/or colon, due to vascular strangulation of PH, necrosis, sepsis and/or even the death of the patient. [13, 14, 15] It is necessary to point out that the invaluable tool that helps to confirm the diagnosis is computed tomography where it allows finding indirect signs of PH; [2, 16] such as the whirlwind sign, cloudy mesenteric fat, distended upper abdominal bowel, herniated loop of bowel above the gastric level, median/distal ileum running downward from the left upper quadrant, and sign hook intestine, which means that two or more intestines pass through the inner side of the J-shaped vessels consisting of mesenteric vessels from the elevated jejunum; or in the absence of the resource, in the same surgical exploration. [17]

In a study where 3,368 bariatric surgical procedures were performed, only 96 patients in 4 years presented intestinal incarceration at Petersen's orifice (2.8%). [18] The treatment is surgical, and the earlier it is carried out, the better the prognosis and evolution of the patient, with the modalities of conventional surgery and/or laparoscopic surgery in certain highly selected cases. [19] Since the opposite of a delay in the diagnosis, decision and surgical management, it has devastating consequences and even the death of the patient. [13]

On the other hand, a preventive strategy for internal post-bariatric hernias is sought, closing the PH space using uninterrupted non-absorbable polypropylene sutures. Managing to abate in its entirety its presentation in several investigations or with a significant reduction in its incidence. [20, 21, 22, 23, 24, 25]

CONCLUSIONS

Surgery is the spearhead of medicine, and to carry it out, the medical professional requires exquisite preparation, character, iron and strict discipline. That is why an omission, an error, a bad decision has catastrophic consequences for the health and life of patients. And an example of this is PH, as an acquired pathology secondary to a calculated omission or error by the surgeon in the surgical technique, which can cost more than enough, a great waste of economic and human resources and even cause the death of the patient. So, it is unethical, that it should be a calculated risk if it is known in advance.

Due to all of the above, it must be pointed out in an improbable, indisputable and prevailing way that in any surgery, any gap, defect, orifice or caused mesenteric defect must be closed, with non-absorbable suture and in a continuous surgete, this would allow to abolish the risks due to one PH.

References

1. García-Sánchez M. A., et al. Hernia of Treitz of Colonic Content an Unexpected Diagnosis: Literature Review. *EC Gastroenterology and Digestive System*. 2022; 9(5); 27-32.
2. López-Morales P., González-Valverde F. M., y Albarracín-Marín-Blazquez A. Hernia del espacio de Petersen en paciente intervenido de bypass gástrico. *Cir. cir.* 2020; 88(6): 772-775.

3. Moral-García J.E., and Redondo-Espejo F. La obesidad. Tipos y clasificación. *Efdeportes Revista*. 2008; 122(13): 1-2.
4. Firman G. Sistema de Estadificación de la Obesidad de Edmonton (EOSS). 7 jun 2020. Medical Criteria Copyright by MedicalCriteria.com.
5. Faria G.R. "Una breve historia de la cirugía bariátrica", *Porto Biomed. J.*, 2017; 2(3): 90–92, doi: 10.1016/j.pbj.2017.01.008.
6. Chousleb. E., Rodriguez. J. A. and O'Leary. P., "Historia del desarrollo de la cirugía metabólica/bariátrica", en *The ASMBS Textbook of Bariatric Surgery*, 2a ed., Springer, pp. 37–46.
7. Sjöström, L. et al. Effects of Bariatric Surgery on Mortality in Swedish Obese Subjects. *N Engl J Med* 2007; 357:741-752 DOI: 10.1056/NEJMoa066254.
8. L. Sjöström, A.K., Lindroos, M. Peltonen, et al. Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. *N Engl J Med*.2004; 351: 2683-2693.
9. Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. *N Engl J Med*, 351 (2004); 2683-2693 <http://dx.doi.org/10.1056/NEJMoa035622>.
10. L. Sjöström, M. Peltonen, P. Jacobson, et al. Bariatric surgery and long-term cardiovascular events. *JAMA*. 2012; 315: 56-65 <http://dx.doi.org/10.1001/jama.2011.1914>.
11. L. Guilbert, P. Joo, C. Ortiz, E. Sepúlveda, F. Alabi, A. León, T. Piña, C. Zerrweck. Seguridad y eficacia de la cirugía bariátrica en México: análisis detallado de 500 cirugías en un centro de alto volumen. *Revista de Gastroenterología de México*. 2019; 84: 296-302.
12. Bortuzzo R. Occlusions of rare etiology. II. Petersen's hernia after gastrectomy]. *Friuli Medico* 10.1 1955: 51-62.
13. Reiss J.E., and Garg V.K., Bowel gangrene from strangulated Petersen's space hernia after gastric bypass. *Journal of Emergency Medicine*. 2014; 46: 31-4.
14. Del Valle-Ruiz S.R., et al. Incidental chyloperitoneum associated with Petersen's hernia in a patient operated by laparoscopic gastric bypass. *Cirugía Española*. 2019; 97: 351-353.
15. Athanasiadis D. I., et al. Chylous ascites in the setting of internal hernia: a reassuring sign. *Surgical Endoscopy*. 2022; 36: 2570-2573.
16. Kang K.M., et al. Internal hernia after gastrectomy for gastric cancer in minimally invasive surgery era. *Gastric Cancer*. 2019; 22: 1009-1015.
17. Yamashita W, et al. Hooking intestine sign: a typical diagnostic CT finding of Petersen's hernia. *Japanese Journal of Radiology*. 2017; 35: 718-723.
18. Petrucciani N., et al. Internal Hernia After One Anastomosis Gastric Bypass (OAGB): Lessons Learned from a Retrospective Series of 3368 Consecutive Patients Undergoing OAGB with a Biliopancreatic Limb of 150 cm. *Obesity Surgery*. 2021; 31: 2537-2544.
19. Min J.S., et al. A comparison of postoperative outcomes after open and laparoscopic reduction of Petersen's Hernia: a multicenter observational cohort study. *BMC Surgery*. 2021; 21: 195-199.
20. Lopera C., A., et al. Preventative laparoscopic repair of Petersen's space following gastric bypass surgery reduces the incidence of Petersen's hernia: a comparative study. *Hernia*.2018; 22: 1077-1081.

21. Hara K, et al. An easy and reliable method to close Petersen's defect using barbed suture to prevent internal hernia from developing after gastrectomy with Roux-en-Y reconstruction. *Asian Journal of Endoscopic Surgery*. 2020; 13: 238-241.
22. Pan T, et al. Closure of Petersen's defect in gastrectomy for gastric cancer: an interrupted time series analysis from a high-volume institution in China. *Langenbecks Archives of Surgery*. 2021; 406: 427-436.
23. Murakami K, et al. Mesenteric closure after laparoscopic total gastrectomy with Roux-en-Y reconstruction is effective for prevention of internal hernia: a multicenter retrospective study." *Surgical Endoscopy* 36.6 (2022): 4181-4188.
24. Athanasiadis D. I., et al. Chylous ascites in the setting of internal hernia: a reassuring sign." *Surgical Endoscopy*, 2022; 37: 2570-2573.
25. Min J.S., et al. Prevention of Petersen's hernia using jejunal mesentery fixing (Mefix). *Minimally Invasive Therapy & Allied Technologies: Mitat*. 2022; 31: 580-586.