

VOLUME 43, No. 3

JULY-SEPTEMBER 2021

# CIRUJANO GENERAL

## 2021



Internet: <http://www.amcg.org.mx>  
[www.medigraphic.com/cirujanogeneral](http://www.medigraphic.com/cirujanogeneral)

Official Scientific Publication of the  
ASOCIACIÓN MEXICANA DE CIRUGÍA GENERAL, A.C.  
E-mail: [revista@amcg.org.mx](mailto:revista@amcg.org.mx)



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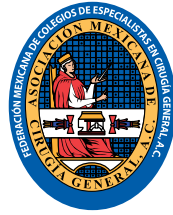
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Designed, produced, and printed in Mexico by:  **graphimedic** S.A. de C.V. Tels: 55-85-89-85-27 to 32. E-mail: emyc@medigraphic.com Printed in Mexico.

Available in full version at: [www.medigraphic.com/cirujanogeneral](http://www.medigraphic.com/cirujanogeneral)



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**EDITORIAL**

- The take-home message** 161  
Abilene Cirenía Escamilla Ortiz

**ORIGINAL ARTICLE**

- The role of the general surgeon in a  
Respiratory Care Unit in the 2020 pandemic** 162  
Erwin Iván Marín-Pardo, Elías Ballesteros-Suárez, Guadalupe K Peña-Portillo,  
Sandra G Ayala-Hernández, Delfino H Pérez-Cervantes, Guadalupe C Pérez-Torres

**REVIEW**

- Sigmoid volvulus. Review of literature** 165  
Luis Ángel Muciño-Pérez, José Luis Gutiérrez-Velazco,  
Yair Antonio Lozano-Vázquez, Jessica Ibarra-Maldonado,  
Sharon Judith Sánchez-Lara, Pasquinely Salvador Velasco-García

**CLINICAL CASES**

- Surgical approach and resolution without prosthesis of desmoid  
fibromatosis of the shoulder girdle. Report of a case** 176  
Lluvia del Carmen Venegas-Medina, Danilo Eterovic-Ruíz,  
Carlos Agustín Rodríguez-Paz, Ricardo Díaz de León Medina

- Paradoxical diarrhea as presentation of transverse  
colon invagination by colonic lipoma** 181  
Oscar I Ortiz-Ruvalcaba, Juan de Dios Díaz-Rosales, Gilberto Mena-Arias,  
Carlos R Cárdenas-James, Jorge Arenas-Valles

- Spontaneous cholecystocutaneous fistula or empyema *necessitatis*  
as an unusual presentation of cholecystitis** 186  
Arkaitz Perfecto-Valero, Clara Serrano-Hermosilla, Elena Aranda-Escaño,  
Miriam Tellaeché-de la Iglesia, Mikel Prieto-Calvo, Aingeru Sarriugarte-Lasarte,  
Patricia Mifsut-Porcel, Andrés Valdivieso-López, Mikel Gastaca-Mateo

- Adult nesidioblastosis, a rare entity for the general surgeon** 193  
Jorge Andrés Myers-Esmenjaud, José Felipe Urbina-de la Vega,  
Ramiro Esteban Mejía-Nogales, Armando López-Ortiz, Adriana Cecilia Gallegos-Garza,  
Javier González-Chavira, Constanza Martínez-de la Garma

- Circumferential perforation of duodenal ulcer.  
Duodenal stump management and literature review** 198  
Daniel Garay-Lechuga, Mónica León-González, Avi Afya, Alba Grisel Olvera-Luna

- Mesothelial cyst of the greater omentum** 202  
Carlos Manuel Neyra-Rodríguez, Fernando Karel Fonseca-Sosa,  
Alexis Pring-Silvera, Aníbal Ernesto Ramos-Socarrás

**HISTORY, ETHICS AND PHILOSOPHY**

- Statistics of trauma surgery in Mexico in the XIX century** 205  
Carlos Agustín Rodríguez-Paz, José Luis Gómez-De Lara

**EDITORIAL**

- El mensaje de llevar a casa*** 161  
Abilene Cirenia Escamilla Ortiz

**ARTÍCULO ORIGINAL**

- El rol del cirujano general en una Unidad de Cuidados Respiratorios en la pandemia de 2020*** 162  
Erwin Iván Marín-Pardo, Elías Ballesteros-Suárez, Guadalupe K Peña-Portillo, Sandra G Ayala-Hernández, Delfino H Pérez-Cervantes, Guadalupe C Pérez-Torres

**ARTÍCULO DE REVISIÓN**

- Vólvulo de sigmoides. Revisión de la literatura*** 165  
Luis Ángel Muciño-Pérez, José Luis Gutiérrez-Velazco, Yair Antonio Lozano-Vázquez, Jessica Ibarra-Maldonado, Sharon Judith Sánchez-Lara, Pasquinely Salvador Velasco-García

**CASOS CLÍNICOS**

- Abordaje quirúrgico y resolución sin prótesis de fibromatosis desmoide en cintura escapular. Reporte de un caso*** 176  
Lluvia del Carmen Venegas-Medina, Danilo Eterovic-Ruíz, Carlos Agustín Rodríguez-Paz, Ricardo Díaz de León Medina

- Diarrea paradójica como presentación de invaginación de colon transverso por lipoma colónico*** 181  
Oscar I Ortiz-Ruvalcaba, Juan de Dios Díaz-Rosales, Gilberto Mena-Arias, Carlos R Cárdenas-James, Jorge Arenas-Valles

- Fístula colecistocutánea espontánea o empiema necessitatis, una presentación inusual de la colecistitis*** 186  
Arkaitz Perfecto-Valero, Clara Serrano-Hermosilla, Elena Aranda-Escaño, Miriam Tellaeche-de la Iglesia, Mikel Prieto-Calvo, Aingeru Sarrigarte-Lasarte, Patricia Mifsut-Porcel, Andrés Valdivieso-López, Mikel Gastaca-Mateo

- Nesidioblastosis del adulto, una entidad poco frecuente para el cirujano general*** 193  
Jorge Andrés Myers-Esmenjaud, José Felipe Urbina-de la Vega, Ramiro Esteban Mejía-Nogales, Armando López-Ortiz, Adriana Cecilia Gallegos-Garza, Javier González-Chavira, Constanza Martínez-de la Garma

- Perforación circunferencial de úlcera duodenal. Manejo del muñón duodenal y revisión de la literatura*** 198  
Daniel Garay-Lechuga, Mónica León-González, Avi Afya, Alba Grisel Olvera-Luna

- Quiste mesotelial del omento mayor*** 202  
Carlos Manuel Neyra-Rodríguez, Fernando Karel Fonseca-Sosa, Alexis Pring-Silvera, Aníbal Ernesto Ramos-Socarrás

**HISTORIA, ÉTICA Y FILOSOFÍA**

- Estadística de la cirugía de trauma en México en el siglo XIX*** 205  
Carlos Agustín Rodríguez-Paz, José Luis Gómez-De Lara

## The take-home message

### *El mensaje de llevar a casa*

Abilene Cirenía Escamilla Ortiz\*

*He who knows all the answers has not  
asked all the questions.*  
Confucius

Writing a scientific article takes time, it is a gradual process and there are several obstacles. Some journals place the conclusion section after the discussion, others place it in a separate section.<sup>1</sup>

The conclusion is the most important component of a scientific manuscript, the reader always wants to remember, the first sentence should be clear with the main findings and should be taken as the take-home message.<sup>2</sup>

Choose the message well: everything should point to the central message, and this is obtained from the data, from the results; categorical statements should be avoided and as many as possible should be taken out.

Highlight the contribution and benefit of the results: do not include what has already been said in the introduction or discussion, the limitations of the work can be mentioned and suggestions for future experiments can also be made.<sup>1-3</sup>

It should be concise and the author should tell the reader what contribution his or her study will make to the field or area in question.

New data should not be included, or talk about economic costs or benefits if this was not touched upon in the manuscript.<sup>1</sup>

Make a final revision and check that you have convincing arguments, without grammatical flaws, and avoid putting your conclusions not drawn from the results.

A good conclusion will get the manuscript read.

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# The role of the general surgeon in a Respiratory Care Unit in the 2020 pandemic

## *El rol del cirujano general en una Unidad de Cuidados Respiratorios en la pandemia de 2020*

Erwin Iván Marín-Pardo,\* Elías Ballesteros-Suárez,\* Guadalupe K Peña-Portillo,\*  
Sandra G Ayala-Hernández,\* Delfino H Pérez-Cervantes,\* Guadalupe C Pérez-Torres\*

### Keywords:

pandemic, general surgeon, COVID-19.

### Palabras clave:

pandemia, cirujano general, COVID-19.

### ABSTRACT

The COVID-19 pandemic has affected politically, economically, and socially all countries in the world. The health systems have collapsed, and this has forced the reconversion of hospitals but also of health personnel. This article reflects the role that many general surgeons have had to assume in many hospitals in Mexico to join the fight during the pandemic.

### RESUMEN

*La pandemia por COVID-19 ha afectado política, económica y socialmente a todos los países del mundo, los sistemas de salud han colapsado y esto ha obligado a la reconversión de hospitales, pero también del personal de la salud. En este artículo se plasma el rol que, en muchos hospitales en México, han tenido que asumir muchos cirujanos generales en el afán de sumarse a la lucha durante la pandemia.*

On December 31, 2019, the Wuhan Municipal Health Commission (Hubei Province, China) reported a cluster of pneumonia cases in the city. They were subsequently determined to be caused by a new coronavirus.<sup>1</sup> On February 27, 2020, the first case was confirmed in Mexico,<sup>2</sup> and on March 11, 2020, the World Health Organization (WHO) declared COVID-19 a pandemic.<sup>3</sup>

After seven months, more than 16 million confirmed cases and more than 600,000 deaths had been reported.<sup>4</sup> COVID-19 has changed how the world has been understood until today, global health systems have been overwhelmed, and the social, economic, and political consequences have pushed even the world powers to their limits. Despite the efforts of the "Solidarity" trial and the many ongoing investigations, we have yet to find a fully effective therapy.

In the surgical setting, research has focused on the risk of surgery in infected patients and concluded that postoperative pulmonary complications occur in half of the patients with perioperative SARS-CoV-2 infection and are associated with high mortality, suggesting the need to postpone non-urgent procedures and promote non-surgical treatments to delay or avoid the need for surgery.<sup>5</sup> Also discussed was the need for adjustments to the operating rooms, the suspension of the outpatient clinic, personal protective equipment, some modifications to informed consent, and other aspects of patient and surgical staff safety. If only that were the focus of the discussion, if only the pandemic had not hit so hard.

In Mexico, as in most developing countries, the pandemic has brought devastating consequences; a historically forgotten health system could not contain the brutal onslaught

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Received: 12/27/2020  
Accepted: 03/23/2022



**How to cite:** Marín-Pardo EI, Ballesteros-Suárez E, Peña-Portillo GK, Ayala-Hernández SG, Pérez-Cervantes DH, Pérez-Torres GC. The role of the general surgeon in a Respiratory Care Unit in the 2020 pandemic. *Cir Gen.* 2021; 43 (3): 162-164. <https://dx.doi.org/10.35366/108568>



of the pandemic. From the largest institutes to health centers, caring for patients infected with SARS-CoV-2 became Mexico's focal point of public health. This situation led not only to the reconversion of hospitals but also to the reconversion of healthcare personnel.

Initially, the first line of defense for these patients was composed of intensivists, pulmonologists, internists, and infectious disease specialists. However, there are not enough specialists in Mexico capable of caring for the number of patients that day by day was added to the long list of hospitalized patients with severe infections. In addition, the personnel in contact with these patients had eventually become ill and, in some unfortunate cases, died, which reduced the already limited number of qualified physicians to attend to patients.

Thus, many hospitals in Mexico have found it necessary to rely on physicians from other areas for care in respiratory care units. Because of his experience in the treatment of septic patients, shock, fluid, and electrolyte management, in the care of postoperative patients, in addition to the skills for performing invasive and surgical procedures, the general surgeon became an ideal element to be part of the second line of defense of care, or first in some cases. So we went from worrying about how to adapt our operating room to deciding the most appropriate therapy for the patient with pneumonia in our care; we went from treating the patient with sepsis of abdominal origin to sepsis of pulmonary origin; we went from being part of a surgical team to a perfectly organized multidisciplinary team that worked side by side to treat patients with a severe SARS-CoV-2 infection, acute respiratory distress syndrome, and all the organic alterations derived from this disease.

This improvised but capable and willing team of intensivists, internists, anesthesiologists, and general surgeons fully involved in the Respiratory Care Units fulfills roles assigned to provide comprehensive care to sick patients. This team allows an anesthesiologist to intubate, an intensivist to resuscitate, and a surgeon to place a central venous catheter and an endo pleural probe in the same setting, thus saving time for the patient and reducing the

possibility of errors that could lead to medical complications and contagion among the staff.

This model of care is proof of the capacity of general surgeons to care for critically ill patients and of the adaptability to which Mexican physicians have responded due to the social context in Mexico.

May this pandemic serve as a watershed for governments to become aware of the importance of strengthening health infrastructure and human and material resources in Mexico. It remains for reflection: that in the face of scenarios as bleak as this one, teamwork is more robust than any individual and that the common good goes beyond the differences that may exist between specialties; for the hospitals that train residents, they recognize the need to continue training the general surgeons and specialists capable of caring for the critically ill patient; for universities, to consider the need to create curricula that adapt to the changes in the current world health panorama; and for the general population, to meditate on the urgency of modifying lifestyle habits that will lead us to become a healthier society, making us less vulnerable to this and many other diseases.

The days passed, and the scenario became more and more complicated. Doctors from all areas are dedicating all their efforts to the fight against COVID-19. We are going to win, despite all the adversities and how long the road may seem, we are going to win, and if it lasts, we surgeons will be there.

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**Ethical considerations and responsibility:** data privacy. By the protocols established in our work center, we declare that we have followed the

protocols on patient data privacy and preserved their anonymity.

**Funding:** no financial support was received for the elaboration of this work.

**Disclosure:** none of the authors had any conflict of interest to declare in the conduct of this study.

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# Sigmoid volvulus. Review of literature

## Vólvulo de sigmoides. Revisión de la literatura

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Yair Antonio Lozano-Vázquez,\* Jessica Ibarra-Maldonado,\*  
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### Keywords:

sigmoid volvulus,  
ischemia, colostomy,  
Hartmann procedure,  
unresectable.

### Palabras clave:

vólvulos sigmoides,  
isquemia, colostomía,  
procedimiento  
de Hartmann, no  
resectivo.

### ABSTRACT

Sigmoid volvulus remains a relatively rare cause of acute abdomen, with a 60% mortality rate in complicated cases with higher prevalence among older males with a history of limited sufficiency. It often debuts as an occlusive clinical picture with few unspecific biochemical alterations, except in advanced cases with objective signs of colonic ischemia and abdominal sepsis. As to imaging diagnosis, the simple abdominal X-rays show the characteristic and best-known “coffee bean” sign. Nevertheless, the computed tomography scan is still considered the gold standard with high specificity and sensitivity. Early diagnosis in stable patients allows an extensive range of surgical, endoscopic, or interventional options, either transitory or definitive. Complicated cases with abdominal sepsis or hemodynamic compromise often require surgical management with a higher rate of complications.

### RESUMEN

El vólvulo sigmoideo representa una causa relativamente rara de abdomen agudo, con una mortalidad de hasta 60% en casos complicados. La mayor prevalencia se presenta en hombres de edad avanzada con historial de autosuficiencia limitada. Debuta como un cuadro oclusivo intestinal con alteraciones bioquímicas inespecíficas con datos de isquemia intestinal o sepsis abdominal en casos complicados. En cuanto a estudios de imagen se presenta el signo del “grano de café” en la radiografía simple, el cual es el más característico y conocido; sin embargo, la tomografía axial continúa siendo el estándar de oro por su alta tasa de sensibilidad y especificidad. El diagnóstico oportuno permite múltiples opciones endoscópicas y quirúrgicas para su tratamiento, transitorio o definitivo. La sepsis abdominal y el compromiso hemodinámico suelen requerir manejo quirúrgico urgente con una tasa mayor de complicaciones.

## INTRODUCTION

The term “volvulus” comes from the Latin *volvulus* (‘vól.ve.re/), meaning twist. The twisting of a segment of the alimentary tract was first described in 1550 in the Ebers papyrus; the first description of sigmoid volvulus was made by Rokitsky in 1836.<sup>1,2</sup>

By definition, a volvulus is the torsion of an organ through an axis on its vascular pedicle; in the case of sigmoid volvulus, this causes the formation of a closed loop in which there is compromised blood circulation. The leading cause is a failure or laxity of the peritoneal fixation, called fixed point to cecal adhesions, abdominal mass, gestational uterus, and adenopathy.<sup>3</sup>

Volvulus of the gastrointestinal tract remains a vital etiology of acute abdomen, not because of its frequency, but because of the complications’ severity, making early diagnosis imperative.<sup>3</sup> The most frequent cases are cecum and sigmoid volvulus.<sup>4</sup> If mesenteric circulation is compromised or colonic distension compromises irrigation, ischemia develops, leading to necrosis in case of late diagnosis with massive bacterial translocation and sepsis.

### Epidemiology

Sigmoid volvulus is the third leading cause of colonic obstruction (10%),<sup>3</sup> with a variable incidence, which tends to be higher in regions

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Received: 08/28/2020  
Accepted: 03/03/2022



**How to cite:** Muciño-Pérez LÁ, Gutiérrez-Velazco JL, Lozano-Vázquez YA, Ibarra-Maldonado J, Sánchez-Lara SJ, Velasco-García PS. Sigmoid volvulus. Review of literature. Cir Gen. 2021; 43 (3): 165-175. <https://dx.doi.org/10.35366/108569>

Table 1: Risk factors for volvulus-differential features.

Sigmoid	Colonic
Chronic constipation	Chronic constipation
Recurrent occlusion	High-fiber diet
Laxative dependence	Frequent use of laxatives
Hirschsprung's disease	History of abdominal surgery
Diabetes mellitus	Failure in the embryological process
Neuropsychiatric history	Pregnancy
Prolonged bed rest	History of pelvic surgery
Chagas disease (megacolon)	Colonoscopy
Hospitalization in a medical facility	

of India, Africa, and Middle Eastern countries, but relatively lower in the United States, Australia, New Zealand, and Western European countries. More than 95% of cases involve the sigmoid colon.<sup>5</sup> Fifty to 80% of sigmoid volvulus are the most common etiology of intestinal occlusion in developing countries.<sup>6</sup> In Western countries, it usually occurs in patients in the sixth to eighth decade of life with chronic medical conditions, neuropsychological disability, or constipation. Recent studies report a 2:1 prevalence of sigmoid volvulus in men, mainly in elderly patients (over 70 years), and a 3:1 prevalence of cecal volvulus in young women (under 60 years).<sup>1,7</sup>

There are two peaks of higher incidence: the first is from the first to the third decade of life due to intestinal malformations from the embryonic process, excessive exercise, or common mesentery for small and large intestines; the second peak from 60 to 79 years of age, associated with chronic constipation, distal obstruction, and significant neurocognitive disorder.<sup>8</sup>

#### Etiology and pathophysiology

The etiology of volvulus is multifactorial, usually occurring in patients with predisposing factors, such as a redundant sigmoid colon, failure of the standard fixation of the mesentery, ileus, high fiber diets, chronic constipation, gas distention, abnormal postures in children with cerebral palsy, Chagas disease with megacolon and malrotations in the embryonic process.<sup>3</sup>

In a case-control study by Akinkuotu et al,<sup>9</sup> a significant increase in rectosigmoid length was found in patients who required surgical intervention.

In the sigmoid, a rotation of 180 degrees is considered physiologically normal; however, a more significant than these 180 degrees leads to complications such as obstruction, ischemia, necrosis, and, consequently, perforation. During sigmoid volvulus, colonic distension causes increased intraluminal pressure resulting in decreased capillary perfusion, which causes mural ischemia, aggravated by mesocolon venous occlusion due to the mechanical phenomenon of compression and axial rotation.<sup>1</sup>

Early mucosal ischemia leads to bacterial translocation and gas production, which increases colonic distension and systemic involvement. If the torsion is not reversed early, a vicious circle is created, leading to necrosis, possible perforation, and, subsequently, to ischemia-reperfusion syndrome, which will result in a state of distributive shock.<sup>10</sup>

#### Diagnosis

The most common condition occurs in patients over 60 years of age and under psychiatric treatment that causes chronic constipation, together with risk factors (Table 1).<sup>1,6,10</sup> It presents with colicky abdominal pain, nausea, vomiting, and constipation; there is usually abdominal distention, variable degrees of

tenderness, decreased or increased peristaltic sounds, and empty rectal ampulla on digital examination, although a percentage may be asymptomatic initially. Thirty-three percent of patients have the triad of sigmoid volvulus, emesis, colicky pain with constipation, and abdominal distention.<sup>1</sup> Thirty to 40% of patients will have a history of intestinal occlusion.<sup>8</sup> The duration of symptoms can be from a few hours to several days.

The emergency presentation usually involves peritonitis or shock related to ischemia or perforation, with a frequency of 25 to 35% of patients with sigmoid volvulus.<sup>7</sup>

On plain radiography, the diagnostic key to sigmoid volvulus is the dilated colon without haustra, inverted “U” shaped and in the midline towards the upper quadrants. The “coffee bean” sign is produced by the central image created by the contact of the medial walls of the volvulus loop and the lateral walls that give rise to the edges of the bean (Figure 1).<sup>3</sup> However, only 60% of patients are diagnosed by abdominal radiography. The presence of linear pneumatosis suggests imminent perforation due to intestinal necrosis; the presence of free air suggests intestinal perforation.<sup>11</sup>

The study of choice is computed tomography due to its sensitivity of 100% and specificity of > 90% since it allows the creation of multiplanar reconstructions that facilitate the definitive diagnosis<sup>1</sup>. The findings are better than those of plain radiography; the specific signs of both

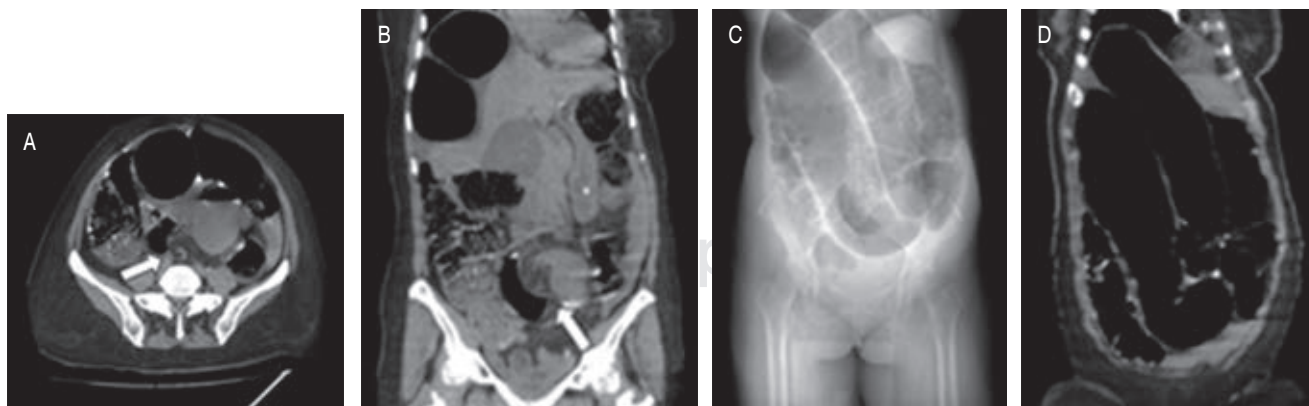
CT and radiography for sigmoid and colonic volvulus are shown in Table 2.<sup>3,11</sup> However, up to 25% of the patients did not present these characteristic signs (Figure 1).

Barium enema shows the characteristic “folded paper” or “bird’s beak” image at the point where the volvulus is formed.<sup>11</sup> Its usefulness as a therapeutic, diagnostic method will be explained later.

Lactate elevation in cases of ischemic disease or sepsis data, in case of sepsis, is usually the only change in the biochemical profile. Similarly, blood biometry, electrolytes, general urine test, and an immunological pregnancy test should be requested for all women of childbearing age, as well as alkaline phosphatase and liver function tests, including bilirubin, amylase and lipase count in all cases of abdominal pain to rule out any other pathology.

## TREATMENT

Timely diagnosis in stable patients allows multiple surgical, endoscopic, or interventional diagnostic-therapeutic options, whether transitional or definitive. The first step in treating uncomplicated sigmoid volvulus is to perform a therapeutic, diagnostic colonoscopy to assess sigmoid viability and its detorsion.<sup>1</sup> If images suggest necrosis, biochemical data of ischemia, or the endoscopic resource is not accessible, the patient requires emergency surgery (Figure 2).



**Figure 1:** Simple CT scan showing the characteristic sign of a sigmoid volvulus with a “whirlpool image” (arrow) in axial (A) and coronal (B) sections. The characteristic sign of the sigmoid volvulus of “coffee bean” is also shown (C and D).

Table 2: Radiological signs of volvulus.

	Sigmoid volvulus	Colonic volvulus
Abdominal radiography	Dilated bowel loop with hydro aerial levels	Loop distension extending from the right upper quadrant to the epigastrium or left upper quadrant Single hydro aerial level
Computerized axial tomography	“Coffee bean” sign Absence of gas in rectal ampoule Dilated bowel loop with an absence of haustra Whirlpool sign: twisting of the mesentery and mesenteric vessels “Bird’s beak” sign  “Coffee bean” sign “X” sign: crisscrossing of intestinal loops at the site of torsion Sign of “divided wall”: due to mesenteric fat invaginating into intestinal wall	Colon dilatation Focal air dilatation with haustra in the left upper quadrant Whirlpool sign: twisting of the mesentery and mesenteric vessels “Bird’s beak” sign “X” sign: the intertwining of intestinal loops at the site of torsion

### Non-surgical and endoscopic treatment

The initial treatment in cases without perforation or ischemia is endoscopic detorsion, which is effective in 60 to 95% of cases, can be performed with sigmoidoscopy or flexible colonoscopy, and a decompression probe is usually left in place for one to three days to maintain reduction, allowing continuous decompression and facilitate mechanical preparation of the colon if necessary. With exclusive endoscopic management, the mortality is 6.4%, with a long-term recurrence in 43 to 75% of patients and a recurrence during the same hospitalization of 3 to 5%.<sup>7</sup> It offers a transitional therapeutic possibility for unstable patients with high preoperative risk and the benefit of good colonic preparation and optimization of general conditions before definitive treatment.

A percutaneous endoscopic colostomy is a promising option that has demonstrated low morbimortality and is indicated in patients with high anesthetic risk for whom general anesthesia is impossible. Long-term studies with a more significant number of patients are needed to support this recommendation.<sup>1</sup>

A barium enema is still a viable option. It is traditionally indicated in patients without



**Figure 2:** There is evidence of a segment of approximately 120 cm with ischemic findings.

hemodynamic instability or the need for urgent surgery and without necrosis or perforation. It has a success rate of 69%. However, it has high morbidity (23%), mortality (6.4%), and recurrence of 43-75% compared to flexible endoscopy, which has a success rate of 76% and recurrence of 25, 0.3, and 6%, respectively. It is not considered a first-choice therapeutic alternative at present due to this results.<sup>2</sup>

Sigmoidoscopy is indicated in hemodynamically stable patients; it allows

colon viability and devolvement assessment with a success rate of 70-95%, a morbidity of 4%, and a mortality of 3%. Flexible endoscopy is preferred over rigid endoscopy.<sup>12</sup> After decompression, a rectal probe is placed for up to 72 hours. Currently, the consensus is to perform a resection and elective surgical management two to five days after endoscopic devolvement, due to the high recurrence rates (45-71%) for exclusive endoscopic management, in addition to a mortality of 9 to 36% during the same period.<sup>12,13</sup>

Colon plication with percutaneous colostomy is a relatively new procedure, initially described in 1990 and traditionally used in geriatric patients with a contraindication to general anesthesia or an ASA score of > 3; it consists of colonic fixation to the abdominal wall using an endoscopic colostomy.<sup>12</sup> In a 2019 Japanese study with eight patients and a follow-up of 22.8 months, no recurrence was observed; however, there are no multicenter studies with large samples or studies in obese populations to evaluate its application in a Western population.<sup>14</sup>

Endoscopic detorsion will not be possible in 5 to 22% of patients and require emergency surgical treatment. Five to 25% of patients will have ischemia, perforation, peritonitis, or septic shock as initial presentation, requiring emergency surgery.<sup>7</sup>

### Surgical treatment

The indicated treatment will be surgical in cases initially presenting with signs or symptoms of intestinal ischemia or perforation (*Figure 2*). Also, in patients in whom advanced mucosal ischemia and perforation, or imminent perforation, are observed during endoscopy, the procedure should be aborted, and emergency surgical management should be implemented,<sup>7</sup> based on three essential surgical techniques: 1) detorsion and plication of the mesentery, 2) bowel resection and anastomosis, and 3) Hartmann's procedure,<sup>2</sup> but in patients with more favorable conditions for safe anastomosis the treatment of choice is resection with primary anastomosis.

According to the guidelines of the American Society for Gastrointestinal Endoscopy, surgical intervention is the indicated therapy in patients presenting peritonitis, ischemia, perforation, clinical deterioration, or a cecal diameter greater than 12 cm; in patients with an ischemic or perforated bowel, a mortality of up to 44% has been found. In patients with alarm data, devolvement of the bowel should not be performed to prevent reperfusion syndrome; in these cases, resection of the volvulus area should be performed in its same position.<sup>11,15</sup>

Some classifications of surgical procedures for treating sigmoid volvulus divide them into resection and unresectable techniques. The patient's general and the colon's local conditions are fundamental in deciding the technique.

### Unresectable

Currently, unresectable techniques are reserved for cases where the affected segment is viable, in patients with high preoperative risk or with conditions of transoperative instability, or as a palliative measure in patients with lower life expectancy and when the endoscopic resource is not viable.

Sigmoid plication has the advantage of not requiring colon preparation for its performance; however, the recurrence rate with this procedure is 22%<sup>16</sup> and is associated with a 3% mortality rate.<sup>1</sup>

Mesosigmoidoplasty, initially described by Tiwary and Prasad in 1979, is a non-resection procedure indicated in cases where the sigmoid colon is still viable during the surgical event; it is no longer used due to its high recurrence rate. It consists of a longitudinal incision of the mesosigmoid and a transverse closure.<sup>3</sup> Low postoperative morbidity has been reported with surgical wound infection rates of 2.7% and postsurgical ileus of 8%, mortality of 0-11% related to the patient's comorbidities and not to the surgical procedure itself, and a recurrence rate of up to 80%.<sup>17</sup>

Extraperitonealization of the sigmoid was first described in 1970 as a safe alternative for acute, uncomplicated sigmoid volvulus and was used to prevent recurrences in young,

healthy patients; it involves the creation of a pocket between the peritoneum and the fascia of the posterior rectus muscle, which exteriorizes the sigmoid colon through a peritoneal opening in the left parietocolic gutter; the approach is usually through a paramedian incision, and the edges of the peritoneum are then approximated to the colon with absorbable sutures to avoid herniation of small bowel loops into it. It is associated with minimal morbidity and mortality rates; this technique is said to successfully prevent volvulus recurrence, even when there is generalized dilatation of the colon, thus offering a viable option for the geriatric population or those with significant comorbidities.<sup>18</sup>

### Resection techniques

Resection surgical treatments are further divided into reconstituted and non-reconstituted (Hartmann's procedure) techniques; the latter is suggested for patients presenting hemodynamic instability, acidosis, hypothermia, or coagulopathy;<sup>15</sup> however, at present, colonic resection with the restoration of continuity is considered the standard treatment.<sup>16</sup>

The established resection procedures are performed in two stages and comprise two technical variants: 1) sigmoid resection in the first stage by the Rankin-Mikulicz technique complemented with extraperitoneal closure of the colostomy, and 2) sigmoid resection with colostomy and Hartmann pouch complemented with intraperitoneal anastomosis of the colon in the second stage. Resection of the affected sigmoid loop is usually a sufficient extension of colonic resection; however, subtotal colectomy should be considered in cases associated with colonic atony, double volvulus, or megacolon.<sup>1</sup> Resection of infarcted bowel should be performed without distortion and with minimal manipulation to prevent the release of endotoxins, potassium, and bacteria into the general circulation and prevent colonic perforation.<sup>7</sup>

Colostomy is recommended if there are adverse local or systemic conditions or the surgeon's experience is limited.<sup>1</sup> The

maturation of a colonic stoma allows bypass of the intestinal transit. It allows fixation of the volvulus loop to the abdominal wall as a preventive measure to avoid the recurrence of the loop torsion.

In the case of volvulus, the creation of a stoma with a double lumen is recommended since it prevents future recurrences of the volvulus, as well as adequate monitoring of colonic transit and the simplest restoration of intestinal continuity as a delayed elective procedure,<sup>1</sup> with the following alternatives:

- **Loop:** in which one lumen is used for fecal discharge while the other functions as a mucosal fistula, thus avoiding the elevation of intra-abdominal pressure; it requires a transversal cut of 50% of the diameter of the loop.
- **Double stoma:** it can be used after resection and presents two lumens, one in which fecal matter is discharged and the other through which mucus is discharged, known as a mucosal fistula. In this case, a complete section of the intestine and separation by skin segment is performed.
- **Bloch-Paul-Mikulicz (shotgun):** it is performed after resecting a segment of the colon; then, the ends are joined together at the level of the posterior face, which gives a passage for fecal waste and a mucosal fistula.

Initially described by Henri Albert Hartmann in 1923 for the management of colorectal cancer, the Hartmann procedure consists of a sigmoidectomy without restoration of bowel continuity, with terminal colostomy in the left lower quadrant, with primary closure of the rectal stump preserving the possibility of eventual restoration of bowel continuity.<sup>17</sup>

In the context of sigmoid volvulus, it is indicated when there is colonic ischemia with fecal peritonitis, hemodynamic instability, or a poor general condition of the patient,<sup>17</sup> as well as in cases of lower volvulus with colonic necrosis extending to the rectosigmoid junction and making it impossible to bring the colonic segment to the skin.<sup>1</sup> The critical points of the procedure involve the (a) definition of



the resection margins; (b) retrograde dissection from the sigmoid towards the splenic flexure along Toldt's white line; (c) opening of the retroperitoneum and exposure of the left ureter; (d) identification of the inferior mesenteric vein; (e) identification of the hypogastric nerves for their preservation; (f) control of the inferior mesenteric or superior hemorrhoidal vascular stalk; (g) liberation of the mesosigmoid and intestinal resection; and (h) closure of the distal stump and maturation of the terminal stoma.

### Resection with primary anastomosis

Primary anastomosis is generally performed in cases where the colon is viable; there is no hemodynamic instability, coagulopathy, acidosis, or hypothermia, which preserves the basic principles for successful anastomosis, including well-vascularized proximal and distal margins, free of active disease and tension. The anastomosis should also be hemostatic and circumferentially tight and, if possible, performed in a patient with adequate nutrition and controlled systemic disease. It is to satisfy these conditions that less invasive transitional procedures have become popular in recent years, with a delayed definitive procedure, under the best local and general conditions of the patient, constituting the procedure of choice in the context of elective surgery to prevent recurrent episodes of sigmoid volvulus.<sup>7</sup>

For manual anastomosis, of great complexity for colorectal anastomosis, the use of a layer of continuous stitches with slow absorption monofilament material is preferred since it is associated with less tissue reaction and lower risk of infection; a good example is the slow absorption polydioxanone-based sutures provides, a long preservation of tensile strength and a low bacterial adherence.<sup>19</sup> Although the technique of manual intestinal anastomosis is not correctly standardized (inter-suture distance, the distance of the suture to the anastomotic edge, and the suture tension), the classic manufacture of the posterior wall, followed by the closure of the anterior wall with Cushing or Connel Mayo stitches, with

or without reinforcement with a second line of sutures with invaginating Lembert stitches, has satisfactory results.<sup>19</sup> No statistically significant difference has been found in favor of continuous stitches compared to interrupted stitches based on the percentage of anastomotic leakage or anastomotic tensile strength.<sup>20</sup>

Mechanical anastomosis is supported by tools to perform an airtight closure by stapling all the intestinal layers, which helps to optimize surgical time. The most used circular stapler for end-to-end or end-to-side anastomosis, with three lines of directional staples at different levels, allows achieving better hermeticity, less tissue stress, and the better perfusion of the anastomotic edges.<sup>21</sup> They can be reinforced with a layer of a manual suture with invaginating hemostatic stitches. Several studies support the theory that there is no significant difference between manual and mechanical anastomosis-both results in adequate healing and adequate tensile strength, with a similar rate of anastomotic leakage.<sup>4</sup>

In addition, safety factors for mechanical anastomosis have been described, which are:

1. Review the anastomotic labrum to ensure that they are intact.
2. That both ends of the colon are perfectly joined.
3. Reinforce the anastomosis with an omentum or serosal patch.
4. The pneumatic test consists of applying an intestinal clamp in the proximal portion of the anastomosis, filling the cavity with physiological solution, and then blowing air through the rectum to verify the permeability of the anastomosis.
5. If leakage sites are identified, they will be repaired with invaginating stitches.

Various monitoring methods have been proposed for follow-up. C-reactive protein (CRP), an acute phase reactant with a half-life of 19 hours, used in a serial measurement method –CRP ratio– has shown a negative predictive factor of 97% at three, four, and five postoperative days with a cutoff less than or equal to 1.5 times its baseline

value. A value above this cutoff suggests the performance of a contrasted tomography for the timely diagnosis of anastomotic leakage with a sensitivity of 73% and specificity of 91%. The limitations of this type of study when evaluating anastomotic leakage are the need for a proper reference method, not having CRP measurements at patient admission or daily measurements, not having a control group, and not having imaging studies in all patients.<sup>22,23</sup> Tachycardia, fever, leukocytes, and in general, the torpid postoperative evolution with a high index of suspicion continues to play an essential role in the timely diagnosis of anastomotic leakage.

Fecal diversion through a loop ileostomy or proximal colostomy, most used in oncologic surgery, offers protection for high-risk colorectal anastomosis from a technical aspect. Protective ileostomy patients demonstrated a significantly higher complication rate in high-output stomas than colostomy patients. In comparison, colostomy patients had a higher complication rate for wound infection, contained abdominal eventration, and bowel transit reconstitution.<sup>24-26</sup>

### Complications

Complications are those typical of closed-loop obstruction: ischemia, necrosis, perforation, or strangulation (*Figure 3*). In some patients in whom the sigma is redundant, the mesentery elongated, and the pedicle narrow, small bowel loops may wrap around the pedicle so that the twist of the volvulus drags them, and small bowel ischemia occurs. This association is called sigmoid ileus knot, found in 5-8% of sigmoid volvulus.<sup>3</sup>

The presence of severe comorbidities (chronic obstructive pulmonary disease, systemic arterial hypertension, cardiac ischemic disease, heart failure, diabetes, chronic renal failure, hemiplegia, and Parkinson's disease), as well as the presence of shock, prolonged duration of symptoms, and the combination of colonic and ileal volvulus, had all been significantly associated with the risk of colonic necrosis. No relationship between patient age and colonic necrosis has been demonstrated.<sup>1</sup>

Colonic necrosis and peritonitis are the two main risk factors for mortality.<sup>1</sup>

Anastomotic complications (leakage, postoperative bleeding, and stricture) require a second operation with an incidence of up to 50% of permanent stoma.<sup>17</sup>

Anastomotic dehiscence (AD) is defined as a clinical manifestation that includes leakage of intestinal contents and gases through a drain from the primary wound or fistula to a neighboring organ and findings of reoperation for localized (collection) or generalized peritonitis secondary to anastomotic leakage (usually recorded as dehiscence).

The critical period in the occurrence of anastomotic failure is between the third and fifth postoperative day, which is the time when the suture has the least resistance. During this period, there is a decrease in the amount of collagen in the submucosa, which also coincides with a precarious situation in vascularization. Both facts cause this lower strength in the anastomosis. The overall incidence of this complication in colorectal surgery varies between 3.4 and 6%, which rises to 15% if the lower colorectal anastomosis is specifically analyzed after a previous resection.<sup>24</sup>

High-risk factors for anastomotic leakage are male sex, malnutrition, severe cardiovascular disease, steroid use, history of alcohol abuse, perioperative blood transfusion, advanced age, obesity, and patients with a history of pelvic radiation, in whom a protective ileostomy may be considered.<sup>25</sup>

Among the studies that selectively used a dysfunctional stoma are those of Gastinger and colleagues, who performed a retrospective multicenter study of a total of 2,729 patients, where 881 received a stoma, and 1,848 did not; they found no difference in overall anastomotic leak rates between the two groups but found a significantly lower rate of surgical intervention in patients who had a protective stoma.<sup>27</sup>

A dilated proximal colon increases the risk of postoperative anastomotic leak.<sup>1</sup> Oren et al. found no significant difference in mortality between the Hartmann procedure (22%) versus resection with anastomosis

(19%) in patients who underwent surgery for a complicated volvulus. The risk of anastomotic leak and hospital stay were similar between the laparoscopy and laparotomy approaches.

**Prognosis**

In patients with gangrene, a mortality rate of 11 to 60% has been seen, while in patients without gangrene, it is reduced to less than 10%; the recurrence of volvulus in patients who did not undergo surgery is 84% and varies in its presentation from hours to weeks.<sup>11</sup>

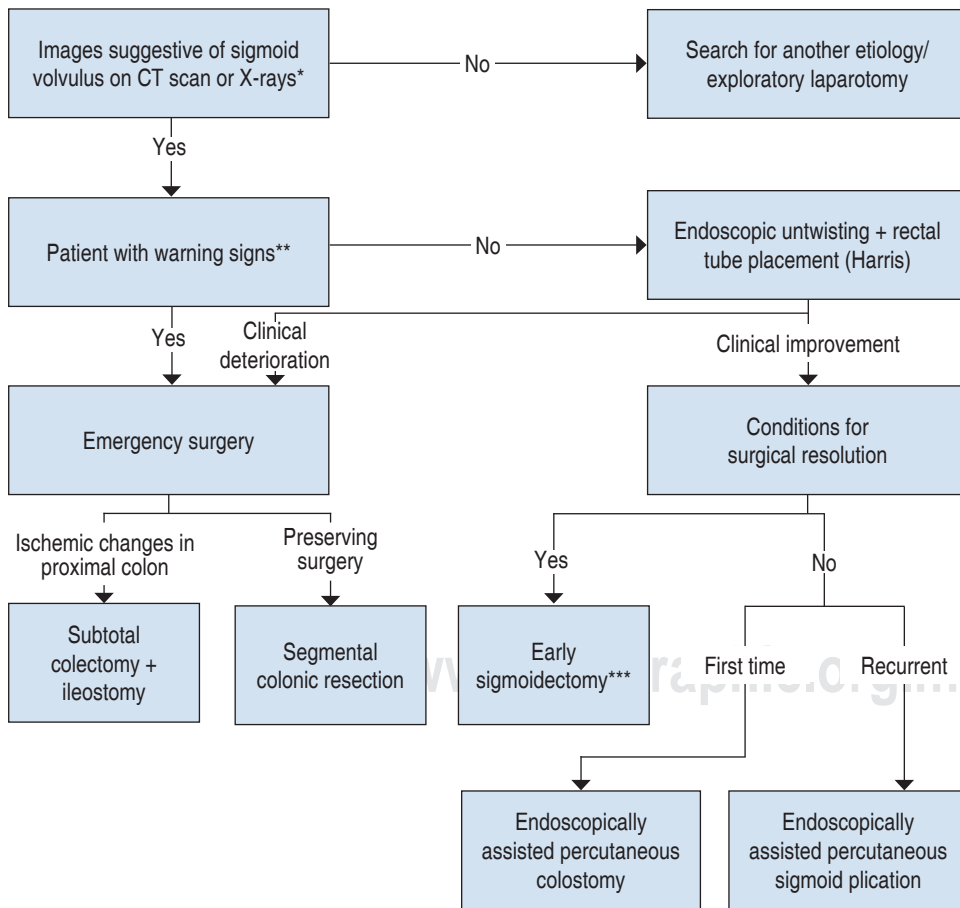
There are factors to consider in favor of not restoring intestinal transit, such as an ASA score > III, age > 75 years, presence of neoplasia, reluctant patient, and impossibility to access the rectal stump, among others,

which represents 8-12% of all patients with a stoma.<sup>17</sup>

For anastomotic reconnection, the laparoscopic route is preferred since it presents fewer serious complications (multiorgan failure, reoperation), infection (sepsis, septic shock, intra-abdominal abscesses), lower mortality (12%), a lower percentage of anastomotic leakage (1.2%) and fewer parietal complications, along with shorter hospital stay (1.5 days); however, the availability of the appropriate laparoscopic resource and an experienced surgeon should be factors to be considered when choosing the method of transit restitution.<sup>17</sup>

**CONCLUSION**

Sigmoid volvulus represents an emergency entity whose timely diagnosis allows us to



**Figure 3:**

*Therapeutic decision-making concerning findings in patients with abdominal pain.*

*\* See radiological images in Table 2.*

*\*\* Peritonitis or perforation data.*

*\*\*\* During the same hospital admission or as soon as possible to prevent a recurrence.*

outline each case to offer a stepwise, minimally invasive treatment and favor a safe transition to standard resection procedures in the best possible conditions. However, it is essential to know the large arsenal of transitional procedures that the general surgeon can use in unstable patients or those with significant comorbidities who do not benefit from an invasive procedure with a long duration and high postoperative risk.

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**Ethical considerations and responsibility:** data privacy. By the protocols established in our work

center, we declare that we have followed the protocols on patient data privacy and preserved their anonymity.

**Funding:** no financial support was received for the elaboration of this work.

**Disclosure:** none of the authors had any conflict of interest in the conduct of this study.

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## Surgical approach and resolution without prosthesis of desmoid fibromatosis of the shoulder girdle. Report of a case

*Abordaje quirúrgico y resolución sin prótesis de fibromatosis desmoide en cintura escapular. Reporte de un caso*

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### Keywords:

desmoid fibromatosis, surgery, Tikhoff-Linberg.

### Palabras clave:

fibromatosis desmoide, cirugía, Tikhoff-Linberg.

### ABSTRACT

In a 46-year-old woman with an intermuscular lipoma who started suffering from pain in the right shoulder, with the presence of a tumor of progressive growth in the ipsilateral supraclavicular region, a biopsy was performed. As there was no improvement, computerized axial tomography was taken, showing a right subscapularis tumor that eroded the scapular spine and replaced the subscapularis muscle. Resection of the right shoulder girdle type 4, Tikhoff-Linberg, without the use of scapula or humerus prosthesis, with a histopathological and immunohistochemical report of fibromatosis, was done. Currently, the patient is with pharmacologically controlled pain and limited movement. Desmoid fibromatosis has an incidence of two to five cases per million population. Surgical resection is the beginning of treatment, using the Tikhoff-Linberg technique with the use of a prosthesis. In this case, an alternative surgical variable was performed without the use of a prosthesis.

### RESUMEN

Mujer de 46 años que inicia padecimiento con dolor en hombro derecho, al que se agrega la presencia de tumoración de crecimiento progresivo en la región supraclavicular ipsilateral, se realizó biopsia que reporta lipoma intermuscular. Al no tener mejoría, se lleva a cabo tomografía axial computarizada donde se observa tumor subescapular derecho que erosiona espina escapular y reemplaza al músculo subescapular. Se hace resección de cintura escapular derecha tipo 4, Tikhoff-Linberg, sin uso de prótesis de escápula ni de húmero, con reporte histopatológico e inmunohistoquímico de fibromatosis. Paciente actualmente con dolor controlado farmacológicamente y con movimientos limitados. La fibromatosis desmoide tiene una incidencia de dos a cinco casos por millón de habitantes, la resección quirúrgica es el inicio del tratamiento, al emplear la técnica Tikhoff-Linberg con el uso de prótesis, en este caso se realizó una variable quirúrgica sin el uso de prótesis.

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Received: 05/09/2020  
Accepted: 09/14/2021



### INTRODUCTION

Desmoid fibromatosis, also known as a desmoid tumor or aggressive fibromatosis, is a rare condition with a frequency of two to five cases per million inhabitants per year;<sup>1-3</sup> it is characterized by the proliferation of fibroblasts, which, despite not having histological characteristics of malignancy, are locally aggressive and with

an unpredictable clinical behavior.<sup>2,3</sup> The World Health Organization (WHO) describes it as a monoclonal proliferation of fibroblasts affecting soft tissues with infiltrative growth and a tendency to local recurrence, but without distant metastasis.<sup>4</sup>

This type of tumor occurs in patients between 20 and 70 years of age, with a peak in frequency between 30 and 40 years of age.<sup>2,4</sup>

**How to cite:** Venegas-Medina LC, Eterovic-Ruíz D, Rodríguez-Paz CA, Díaz de León MR. Surgical approach and resolution without prosthesis of desmoid fibromatosis of the shoulder girdle. Report of a case. *Cir Gen.* 2021; 43 (3): 176-180. <https://dx.doi.org/10.35366/108570>

According to their location, they are divided into the extra-abdominal, the abdominal wall, and the intra-abdominal. Of the extra-abdominal tumors, 17% are in the shoulder girdle.<sup>3</sup> The treatment of choice is surgical resection, which is a surgical challenge due to the difficulty to distinguish the capsule from the tumor and the high risk of injury to the brachial plexus and axillary vessels.<sup>1-3</sup> In addition, these factors may require multiple surgical procedures and cause severe aesthetic and functional morbidity, so the decision-making is complex in this type of case.<sup>5</sup> The complexity of the surgery is related to the tumor size and location, for which a local control rate of 80% at five years is reported.<sup>4</sup> Due to all these factors that make resection with negative margins complex, adjuvant radiotherapy is the method of choice to avoid recurrences.<sup>2</sup> The main treatment is surgical resection, whose priority is to preserve function, but in cases where morbidity is high, observation can be considered while the patient is asymptomatic; when surveillance fails, surgery is the next option.<sup>6</sup>

### CASE REPORT

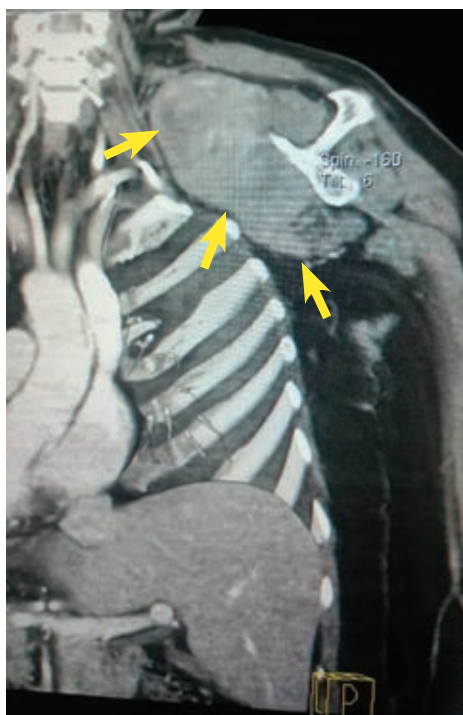
This is a 46-year-old woman with a history of bilateral tubal occlusion performed 10 years earlier. She denies any familiar oncologic history. Her current condition began some seven years before with right shoulder pain, non-radiating, continuous, and moderate to severe in intensity, with no response to non-steroidal anti-inflammatory drugs, but with partial response to buprenorphine, which was discontinued due to adverse effects.

About 10 months later the patient self-detected a slow-growing right supraclavicular mass, with mild pain elicited only on palpation. Magnetic resonance imaging (MRI) was performed that showed an infrascapular lesion. Four months later a new MRI was performed showing almost complete loss of the subscapularis tendon insertion compatible with a tear. Surgical exploration of the right rotator cuff with a biopsy of the ipsilateral supraclavicular tumor was performed. In February 2015 the tumor was resected through the right trapezius muscle, which was

approached through a previous scar on the right shoulder. This first histopathological report (HPR) indicated an intermuscular lipoma, with no other alteration of the muscle or fatty tissue cytoplasm, nor changes in the nuclei.

Due to postoperative pain, the patient was sent to radiotherapy, after an MRI that showed a subscapular lesion with extension towards the supraclavicular fossa, involving the subscapularis muscles. It could not be established with certainty if it was a fatty tumor, nor if it had an intrathoracic extension; therefore, a CT scan was performed showing a heterogeneous right subscapular tumor measuring 11.6 × 11.5 × 9.4 cm, with increased vascularity, that was compressing and displacing the internal jugular vein. It was not eroding the ribs, but it was eroding the scapular spine. No adenopathy was seen. The tumor was shown to involve the subscapularis muscle and replacing it in its entirety (*Figures 1 and 2*). The axillary and supraclavicular neurovascular bundles were identified. In May 2015 a percutaneous biopsy was performed with a histology report of myofibromatosis.

On July 2015, a Tikhoff-Linberg type 4 right shoulder girdle resection surgery was performed without the use of a scapula or humerus prosthesis. Cephalothin was administered as a preoperative antibiotic without any additional drug. The surgical approach was through an incision and lifting of a supraclavicular skin flap, with dissection of the deltoid and suprascapular muscles. Once the area was exposed (*Figure 3*) the dissection of the mass was performed with resection of the clavicle two distal thirds, as well as the elimination of the proximal humerus up to its surgical neck. The humerus was anchored to the clavicle with a polyester suture #3. The aponeurotic fasciae were closed in planes with a 2-0 vicryl anchored continuous suture. In the postoperative period, there was no dehiscence, seroma, or hematoma formation, nor infection. The histology report described a neoplasia with the anterior surgical edge in contact with the tumor. The rest of the margins were tumor-free and respected the subclavian vein and artery. The definitive histology report histologically described a non-atypical cellular proliferation, without evidence of mitosis, with spindle-shaped proliferating elements with



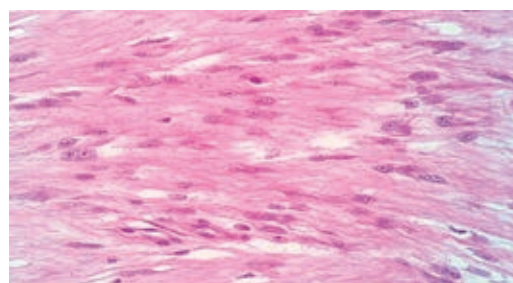
**Figure 1:** CT scan showing a heterogeneous right desmoid subscapularis tumor with hypervascularity, replacing the entire subscapularis muscle (shown between arrows).



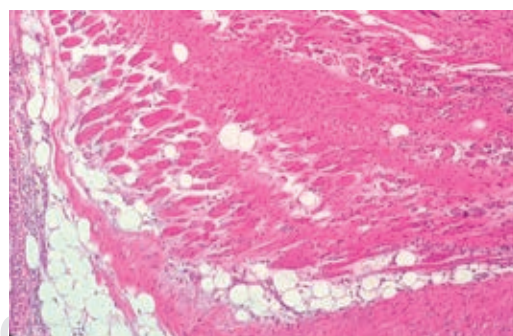
**Figure 2:** A computed axial tomography reconstruction showing the right subscapularis tumor.



**Figure 3:** Prosthesis of the scapula and proximal humerus after resection of these structures.



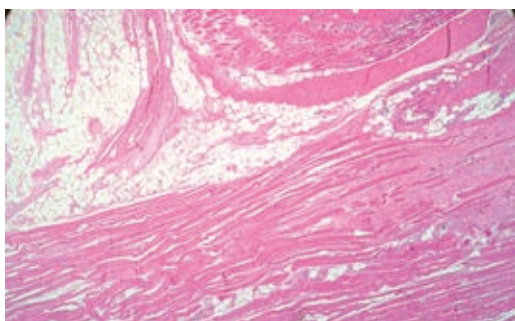
**Figure 4:** Histopathologic section (40×), showing non-atypical cell proliferation, without evidence of mitosis.



**Figure 5:** Histopathologic section (10×) showing the fibromuscular bundle.

intercellular collagenization and infiltrating adipose and muscular tissue in the periphery (Figures 4 to 6).





**Figure 6:** Histopathologic section (40×) showing the fibromuscular bundle.



**Figure 7:** “Anchoring” of the humerus to the residual clavicle with polyester suture after tumor resection.

After the third week following surgery, the patient was found to have mild pain on passive movement of the shoulder, with adequate strength in the deltoid muscle, but without abduction, flexion, or extension of the shoulder due to lack of support sites in the joint. A rehabilitation program was started. She was sent for adjuvant radiotherapy but was not considered a candidate. Instead, she was prescribed thalidomide which she had continued until her last evaluation.<sup>6</sup>

A comparative computed tomography (CT) scan taken in 2017 showed a heterogeneous lesion at the site where the humeral head was, with calcifications inside, extending intramedullary, which had decreased in size from 3.5 to 2.7 cm. Another CT scan taken in September 2018 showed no lesion. In 2019, the patient mentioned she was stable, and her pain was well controlled with paracetamol and

gabapentin, which is the treatment suggested in the current National Comprehensive Cancer Network (NCCN) guidelines.<sup>6</sup> She kept full hand and elbow functions, and no shoulder functions. Due to the COVID-19 pandemic, the patient was lost to follow-up.

## DISCUSSION

Currently, 95% of patients with sarcomas of the shoulder girdle are treated with surgery, which preserves the limb and function of the elbow, wrist, and hand.<sup>7</sup> The Tikhoff-Linberg surgery was first described in 1928<sup>8</sup> but underwent subsequent modifications, including the Malawer classification that is used today.<sup>9</sup>

Depending on the patient, and the symptomatology and morbidity expected from resection, the surgical approach versus observation may be considered. The choice of surgery depends on the size of the tumor, the speed of growth, and the symptomatology it causes.<sup>4</sup> As it was shown in the case presented, the growth evolved for two years and the pain was the main symptom, which coincides with the reported literature.<sup>10</sup> The local control rate with surgery ranges from 68 to 75%. These rates do not improve with adjuvant radiotherapy and even recurrences increase with this type of treatment.<sup>5,10</sup>

The approximate incidence of this case is 2-5:1'000,000, so it is a very rare entity. In studies where the use of the Tikhoff-Linberg type 4 technique is reported,<sup>10,11</sup> scapula and/



**Figure 8:** X-ray after the surgical procedure.

or humerus prosthesis are used (Figure 7). In this case, an alternative surgical procedure was performed without the use of a prosthesis. This way, the humerus of the residual clavicle was “anchored” using polyester suture (Figure 3), a technique which, despite being described by Linberg,<sup>8,11</sup> has not been used in any of the published cases of its use. We show the image of post-procedure radiography (Figure 8).

An expected medium-term outcome is a symptomatic improvement. Regarding the lineage, the variable found in this case is even rarer. At five years it has a prognosis of 80% of local control after surgery if the surgical margins are negative margins.<sup>4,12</sup> CAs far as we know, the patient is stable, and pain is controlled with drugs.

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**Ethical considerations and responsibility:** the authors declare that they followed their center’s protocols on the publication of patient data and safeguarded their right to privacy by keeping their data confidential.

**Funding:** no financial support was received for this work.

**Disclosure:** the authors declare that there is no conflict of interest in carrying out this work.

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# Paradoxical diarrhea as presentation of transverse colon invagination by colonic lipoma

## *Diarrea paradójica como presentación de invaginación de colon transverso por lipoma colónico*

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### Keywords:

lipoma, colon, intussusception, diarrhea, adult.

### Palabras clave:

lipoma, colon, intususcepción, diarrea, adulto.

### ABSTRACT

We present a 53-year-old female patient with abdominal pain and diarrhea caused by a transverse colon tumor. On tomographic and endoscopic evaluation, it corresponded to a tumor with defined borders and an ulcerated surface. The patient developed a clinical picture of colonic invagination secondary to the colon tumor and paradoxical diarrhea, so the patient underwent laparoscopic resection of the affected segment. The histopathological analysis described a submucosal lipoma. The binomial of colonic lipoma and invagination is a clinical constant; however, due to its very low frequency, the diagnosis becomes a difficult task.

### RESUMEN

Se presenta un paciente femenino de 53 años con dolor abdominal y diarrea, ocasionada por un tumor de colon transverso. En la evaluación tomográfica y endoscópica correspondía a un tumor de bordes definidos y superficie ulcerada. La paciente desarrolló un cuadro clínico de invaginación colónica secundaria al tumor de colon y diarrea paradójica, por lo que la paciente fue sometida a resección laparoscópica del segmento afectado. El análisis histopatológico describe un lipoma submucoso. El binomio del lipoma y la invaginación colónicas es una constante clínica; sin embargo, su escasa frecuencia hace del diagnóstico una tarea difícil.

## INTRODUCTION

Gastrointestinal lipoma is a benign, sporadic, and usually asymptomatic tumor that can be located in any segment of the gastrointestinal tract. Most of the time this type of tumor is detected incidentally by computed tomography (CT) scan or colonoscopy performed due to any other indication.<sup>1</sup> If symptoms are present, abdominal pain, bleeding, and changes in bowel movements are the most found.

Invagination of the bowel in adults is a rare entity, contrary to what occurs in children, and it is usually related to the presence of an adjacent tumor<sup>2-4</sup> and is an uncommon cause of intestinal obstruction (1 to 5% of cases).<sup>5</sup>

Both colonic lipoma and colonic invagination are entities that can occur in adults, so it is of clinical importance to keep them in mind as a binomial. In this clinical report, we present the case of a patient with an invaginated colonic lipoma that conditioned partial intestinal occlusion and paradoxical diarrhea.

## CASE PRESENTATION

A 53-year-old female, with no relevant history, came to the emergency department with abdominal pain of two weeks of evolution; she described moderate to severe pain (5-6/10 on the visual pain scale [VAS]), predominantly colicky, as well as chronic

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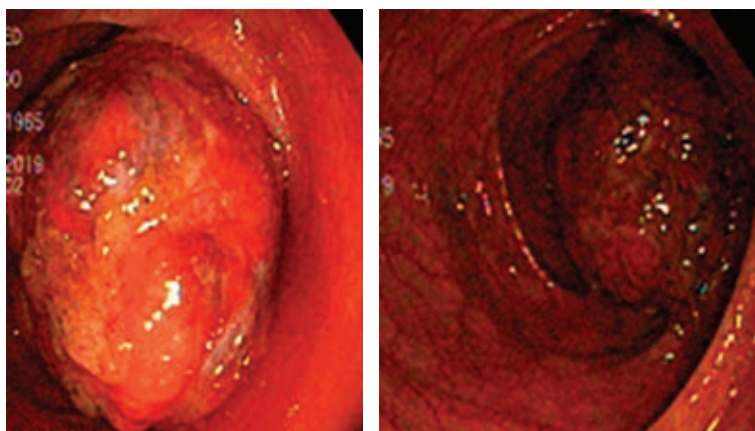
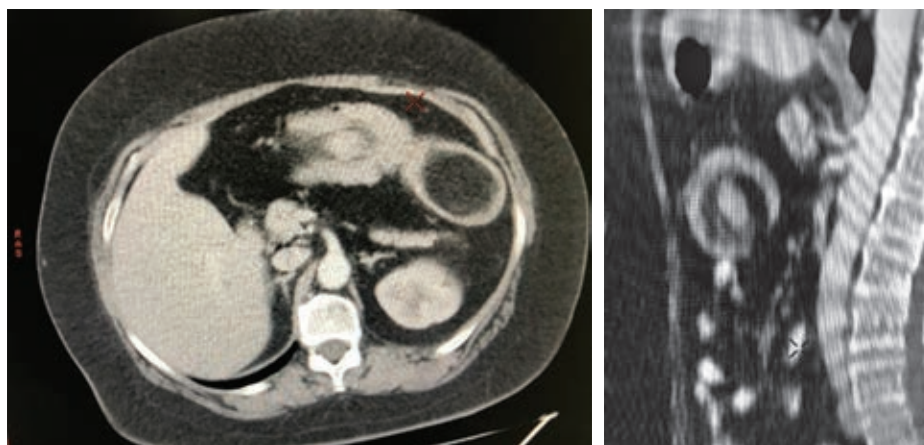
Received: 05/28/2020  
Accepted: 09/13/2021



**How to cite:** Ortiz-Ruvalcaba OI, Díaz-Rosales JD, Mena-Arias G, Cárdenas-James CR, Arenas-Valles J. Paradoxical diarrhea as presentation of transverse colon invagination by colonic lipoma. *Cir Gen.* 2021; 43 (3): 181-185. <https://dx.doi.org/10.35366/108571>

**Figure 1:**

Contrast abdominal CT scan showing the tumor in the transverse colon with invagination of the colon at the same level.



**Figure 2:** During the colonoscopy study, a spherical mass with a broad base and ulceration on the surface was seen.

constipation (1-2 bowel movements per week during the last year). On admission, she had a heart rate of 78 per minute, respiratory rate of 14 per minute, blood pressure of 150/98 mmHg, 36.7 °C of temperature, and oxygen saturation of 97% without supplemental oxygen.

Physical examination revealed a rounded abdomen secondary to belly fat, without abdominal plastrons, delimiting the pain in the colic frame predominantly in the epigastrium and mesogastrium, without data of peritoneal irritation. Rectal examination showed no abnormalities.

Contrast tomography (CT) scan of the abdomen showed, at the level of the transverse colon, a well-demarcated tumor, measuring

4.6 × 7.7 × 6.5 cm, with a density of 115 Hounsfield units (a quantitative scale used in CT scans to describe the different levels of tissue radiodensity), invaginated into the lumen of the transverse colon itself and with a discrete inflammatory process of the perilesional fat (Figure 1).

Colonoscopy was performed and a polypoid, spherical tumor was observed, with a broad base, ulcerated in its visible portion, occluding 80% of the intestinal lumen in the transverse colon segment (Figure 2). The rest of the study showed no alterations. Biopsies of the lesion were reported as inflammatory tissue and mucinous material.

The patient was managed with analgesics, antispasmodics, and proton pump inhibitors for 48 hours. Resection of the affected segment was proposed in the first hospitalization; however, the patient did not accept it and was discharged due to improvement. Two weeks after the first hospitalization, she had liquid evacuations of three days of evolution and very severe colicky abdominal pain (7-8/10 VAS); subsequently, hematochezia was added, so she was hospitalized for hydro and electrolyte replacement and surgical management, which she accepted on this occasion.

During surgery, a tumor was found in the transverse colon with colon-colonic invagination, which was completely resected. Latero-lateral anastomosis of the remaining transverse colon was performed with a linear mechanical suture 2.5 × 45 mm, and

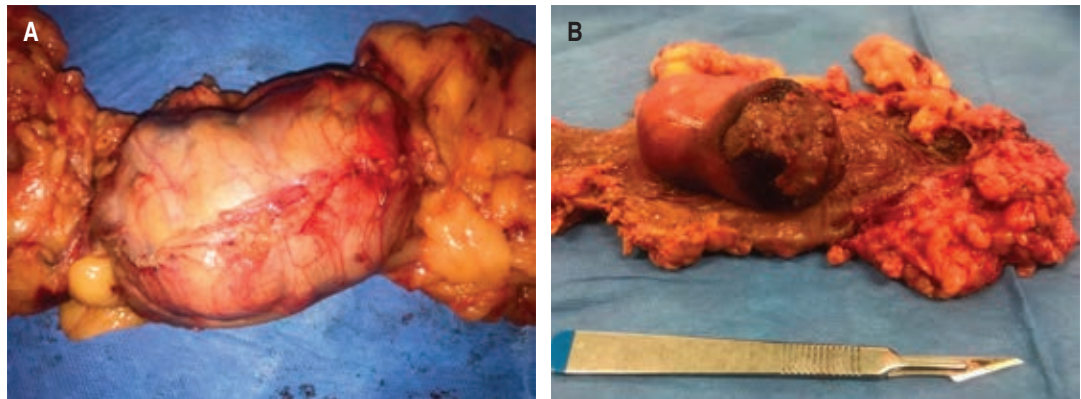
the intestinal defect was closed with a 3-0 polypropylene continuous suture.

In the histopathological study, macroscopically, an ulcerated tumor with a wide base and well-delimited borders measuring  $8.2 \times 7.3 \times 5.2$  cm was observed (Figure 3); microscopically, a tumor composed of mature adipocytes in a submucosal arrangement without atypia was identified (Figure 4).

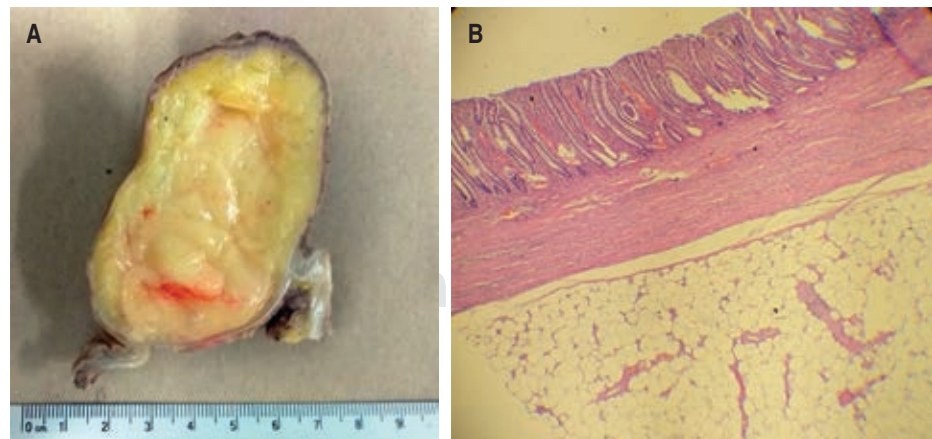
In the postoperative period, the patient had an adequate evolution, and she was discharged due to improvement on the fifth postoperative day with a soft diet and closed drainage, which was removed in the outpatient clinic on day seven. Follow-up at 12 months showed no complications.

## DISCUSSION

Although most colonic lipomas are asymptomatic, when the size is greater than 2 cm, they can present symptoms or complications, such as colonic invagination and intestinal obstruction.<sup>6</sup> Because colonic invagination causes nonspecific symptoms, making the diagnosis without imaging studies or endoscopy is very complicated. The classic triad of colicky abdominal pain, currant jelly stools, and a palpable tumor in the abdomen occurs in only 10% of adult patients with colonic lipoma.<sup>7</sup> In this patient, abdominal pain and hematochezia were present, while the palpable tumor was not evident, probably



**Figure 3:** A) Surgical specimen of the colon showing the tumor occupying the entire colon lumen. B) Longitudinal section of the surgical specimen exposing a submucosal mass with a wide base and ulcerated surface.



**Figure 4:** A) Cross-section of the surgical specimen. B) Histological section (hematoxylin & eosin, 40 $\times$ ) in a panoramic view.

due to the patient's abundant adipose panniculus.

Colonic invagination occurs when the lipoma acts as a stimulant of colonic peristalsis so that the constant movement invaginates the colon of the affected segment.<sup>8</sup> As in the present case, such invagination can cause partial occlusion and produce paradoxical diarrhea to overcome the obstacle and evacuate the fecal material. This phenomenon occurs most commonly in elderly patients with constipation, fecal impaction, and colon cancer (adenocarcinoma or lymphoma).<sup>9</sup>

Abdominal CT scan (with oral and intravenous [IV] contrast) is the most sensitive (71 to 87%) and specific (close to 100%) imaging method because the mass with fat density (80-120 Hounsfield units) and the classic target sign or sausage-shaped mass is seen.<sup>10,11</sup> Ultrasound can also provide data to guide the diagnosis; however, as it is an operator-dependent imaging study its sensitivity and specificity vary.<sup>12</sup>

Colonoscopy may be both diagnostic and therapeutic since it indicates the site of the lesion, and in specific cases, a loop resection (cold or hot, according to the surgeon's preference) can be performed in lesions smaller than 2 cm or pedunculated.<sup>13</sup> In the case presented, resection was not possible due to the size of the lipoma and the wide base, conditions that increase the risk of perforation. Although endoscopic biopsy may not be very useful due to the little information it provides, the formation of ulcerations should always make suspect a malignant pathology,<sup>14,15</sup> so the endoscopic or surgical specimen will always be sent to pathology to rule out the latter diagnosis.

En bloc surgical resection is the treatment of choice when the polyps are larger than 2 cm, broad-based, and/or complicated (bleeding, occlusion, and/or invagination).<sup>14,15</sup> In this case, surgical resection was initially refused by the patient, which led to the evolution of her clinical picture to complications with increased pain, diarrhea, and bleeding.

Intussusception is a rare condition in adult patients, and a tumor should always be ruled out as the cause of this pathology. Colon tumors

will always be a concern for the surgeon, since malignant neoplasia should be ruled out in all cases, especially in ulcerated lesions. Although diarrhea is an uncertain clinical finding, we must keep in mind that it may be the result of a paradox due to incomplete occlusion of the colonic lumen.

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**Ethical considerations and responsibility:** the authors declare that they followed the protocols of their work center on the publication of patient data, safeguarding their right to privacy through the confidentiality of their data.

**Funding:** no financial support was received for this work.

**Disclosure:** the authors declare that they have no conflict of interest.

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# Spontaneous cholecystocutaneous fistula or empyema *necessitatis* as an unusual presentation of cholecystitis

*Fístula colecistocutánea espontánea o empiema necessitatis, una presentación inusual de la colecistitis*

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## Keywords:

cholecystocutaneous fistula, spontaneous cholecystocutaneous fistula, abdominal abscess, perforated cholecystitis, empyema *necessitatis*.

## Palabras clave:

fístula colecistocutánea, fístula colecistocutánea espontánea, absceso abdominal, colecistitis perforada, empiema *necessitatis*.

## ABSTRACT

**Introduction:** a cholecystocutaneous fistula is an exceptional form of cholecystitis. It mainly affects elderly and institutionalized patients and causes high morbimortality. It usually manifests with an abscess in the right hypochondrium that must be correctly treated with antibiotics and percutaneous drainage. **Objective:** the purpose of this monographic study is to expose the generalities of this uncommon entity. **Clinical cases:** we present a series of five cases of spontaneous cholecystocutaneous fistula. **Results:** four of them presented good immediate clinical evolution. **Conclusions:** definitive treatment depends on the evolution and characteristics of the patient and may vary from permanent maintenance of the drainage to a deferred intervention to perform cholecystectomy with excision of the fistulous tract and repair of the abdominal wall.

## RESUMEN

**Introducción:** la fístula colecistocutánea constituye una forma de presentación excepcional de la colecistitis. Afecta principalmente a pacientes ancianos e institucionalizados, y ocasiona una elevada morbimortalidad. Suele manifestarse con un absceso en el hipocondrio derecho que debe ser correctamente tratado mediante antibioterapia y drenaje percutáneo. **Objetivo:** el propósito de este estudio monográfico es exponer las generalidades de esta infrecuente entidad. **Casos clínicos:** presentamos una serie de cinco casos de fístula colecistocutánea espontánea. **Resultados:** cuatro de ellos presentaron buena evolución clínica inmediata. **Conclusiones:** el tratamiento definitivo depende de la evolución y las características del paciente, y puede variar desde el mantenimiento permanente del drenaje hasta una intervención diferida para practicar la colecistectomía con extirpación de los trayectos fistulosos y reparación de la pared abdominal.

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## INTRODUCTION

Spontaneous cholecystocutaneous fistula (CCF) is defined as a communication between the gallbladder and the skin, not preceded by surgery or trauma.<sup>1</sup> It usually presents with an abscess in the right hypochondrium (RHC), which may be painless or associated with the typical symptoms of biliary colic.<sup>2</sup> Classically it was more

frequent in women from the fifth decade onwards, but nowadays it mainly affects the elderly, neuropsychiatric, multi-pathological, or institutionalized patients.

Diagnostic suspicion should be confirmed by imaging tests, ideally computed tomography (CT) or ultrasound scans. Initial treatment includes water and electrolyte resuscitation, antibiotic (AB) therapy, analgesia, and percutaneous drainage (PD).<sup>3</sup> After resolution



**How to cite:** Perfecto-Valero A, Serrano-Hermosilla C, Aranda-Esaño E, Tellaeche-de la Iglesia M, Prieto-Calvo M, Sarriugarte-Lasarte A et al. Spontaneous cholecystocutaneous fistula or empyema *necessitatis* as an unusual presentation of cholecystitis. Cir Gen. 2021; 43 (3): 186-192. <https://dx.doi.org/10.35366/108572>



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Received: 09/16/2021  
Accepted: 02/03/2022

of the acute episode, deferred intervention may be indicated to perform cholecystectomy with excision of the fistulous tract and repair of abdominal wall defects, if present. It must be preceded by an exhaustive study of the gallbladder, the biliary tract, and adjacent structures, as well as the anatomy of the fistula itself. In patients at high surgical and/or anesthetic risk, maintenance of the drains may be a prudent and acceptable attitude since conservative treatment is estimated to be effective for gradual resolution of the fistula in up to 20% of cases.<sup>4</sup>

It is worth noting the high morbimortality that CCF presents in both its acute and chronic phases.

The following is a descriptive, retrospective study of five CCF cases treated between 2016 and 2019. Informed consent was obtained from the patients for the use of data derived from their attendance, for research purposes. Basic statistics were performed with the R software (version 4.0.1).

### PRESENTATION OF CLINICAL CASES

**Case 1.** A 92-year-old woman, diabetic and institutionalized for dementia. She consulted for a painless and progressively growing tumor in the RHC during the last weeks. On examination, the mass had a diameter of 10 cm, with fluctuation and purulent exudate seen through a small solution of continuity (*Figure 1*). Suspecting an underlying CCF, an abdominal CT scan was performed with findings of multiple choledocholithiasis and perforated cholecystitis towards the abdominal wall musculature, with a collection in the subcutaneous tissue measuring 10 × 10 × 6 cm.

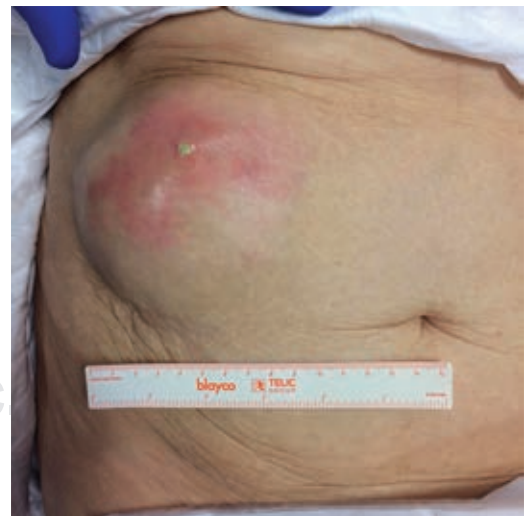
A percutaneous drainage of the abscess was performed, and AB treatment was given, which ruled out other surgical or endoscopic procedures due to patient's advanced age and comorbidities. She had an unfavorable evolution, with multiorgan failure secondary to septic shock, and died on the sixth day.

**Case 2.** An 87-year-old man is dependent for basic activities of daily living (BADL). He had a history of myasthenia gravis, hypothyroidism, vasculopathy with chronic ischemia of the lower extremities, and a myocardial infarction, as well

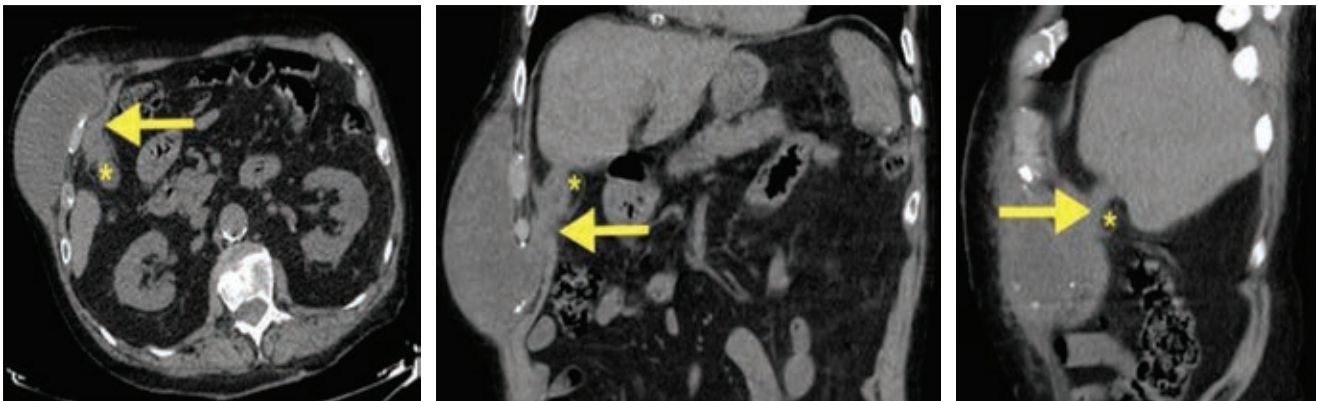
as an episode of acute cholecystitis treated conservatively five years earlier. He consulted for a painless mass in the RHC of a year and a half of evolution, with spontaneous suppuration during the last week. On examination, the mass had a diameter of 20 cm and a small solution of continuity. An abdominal CT scan showed chronic calculous cholecystitis complicated by an abscess in the abdominal wall fistulizing to the skin surface (*Figure 2*).

A percutaneous drainage of the abscess was performed, and AB treatment was given. A subsequent magnetic resonance (MRI) cholangiography reported a small liquid collection of 4 × 1 cm in the right anterosuperior abdominal wall with small gallstones inside, a collapsed gallbladder with cholelithiasis, and no clear evidence of a fistula, in addition to the absence of alterations in the intrahepatic and extrahepatic biliary tract. The scarce secretion, but maintained through the drainage, motivated the maintenance of this drainage, until after four weeks it presented an accidental exit, so it was decided not to reposition the liquid lost. Subsequent evolution was favorable. Definitive treatment was discarded due to the high anesthetic risk.

**Case 3.** An 83-year-old man, independent for ADL, hypertensive, with dyslipidemia and



**Figure 1:** Abscess in the right hypochondrium with a small solution of continuity preceding the formation of the external fistulous orifice –*empyema necessitatis*–.



**Figure 2:** An abdominal CT scan showing complicated chronic calculous cholecystitis (asterisk) in continuation with an abscess in the abdominal wall and a fistula to the skin surface (arrow).



**Figure 3:** Percutaneous drainage of the abscess. The use of a Penrose type favors exudation by capillarity.

with chronic obstructive pulmonary disease, consulted for a painful mass in the RHC of four days of evolution. It had a size of 15 × 20 cm and fluctuation. An abdominal CT showed a subcutaneous collection of 10 × 6 × 9 cm over a fistulous tract involving the abdominal wall musculature, and the hepatic angle of the colon that continued through the subhepatic space to the gallbladder, showing chronic parietal thickening, lithiasis, and aerobilia.

A percutaneous drainage of the abscess was performed, and AB treatment was given

(Figure 3). The study was completed by an MRI cholangiography at eight weeks, which showed a decrease in inflammatory changes and a possible cholecystoduodenal fistula. Gastroduodenoscopy and colonoscopy were performed, and no cholecystoduodenal or cholecystocolonic fistula was found.

A delayed cholecystectomy was indicated at six months, by laparotomy, with findings of a scleroatrophic vesicle and an inflammatory plastron involving the hepatic hilum, transverse colon, and duodenum, without evidence of CCF or a cholecystoenteric fistula. The immediate postoperative period passed with a low-expenditure biliary fistula that resolved in the following days without the need for additional therapies. The patient had a satisfactory evolution and is asymptomatic two years after the surgery.

**Case 4.** An 89-year-old woman, independent for BADL, had no relevant medical or surgical history. She consulted for epigastric pain for two months associated with postprandial vomiting. On examination, she had a painful and fluctuating tumor in the RHC measuring 10 cm in diameter. An abdominal CT scan showed evidence of evolved chronic lithiasis cholecystitis, with a fistula to the abdominal wall and attempted spontaneous drainage to the skin.

A percutaneous drainage of the abscess was performed and AB treatment was given, with the placement of an ultrasound-guided percutaneous cholecystostomy (PC) catheter.

After four weeks, transcatheter cholangiography was performed without findings of fistula or obstruction to the passage of contrast to the duodenum, and the PD was closed. In the following days, she presented a biliary filtrate around the drainage that forced its reopening. The biliary output remained low, and the patient adapted to the care of the PC, so it was decided to maintain it temporarily until the definitive intervention. Exploratory laparoscopy was indicated eight weeks later, with the finding of a gallbladder intimately adhered to the anterior parietal peritoneum and duodenum. After the gallbladder dissection, there was no evidence of a fistula and the cholecystectomy could be performed laparoscopically. She was discharged 24 hours after the procedure. Subsequent evolution was satisfactory.

**Case 5.** A 75-year-old man had been operated on 30 years earlier for a gastric ulcer. He consulted for weight loss and a mass on the cranial end of the mid-laparotomy scar, painful, and not reducible on palpation. The abdominal CT scan showed a subcutaneous collection of 10 × 6 cm in trans parietal continuation with a gallbladder of irregular contours and thickened walls suggesting evolved cholecystitis. In addition, he reported a 9 mm focal lesion in segment IVb compatible in the clinical context with a hepatic abscess.

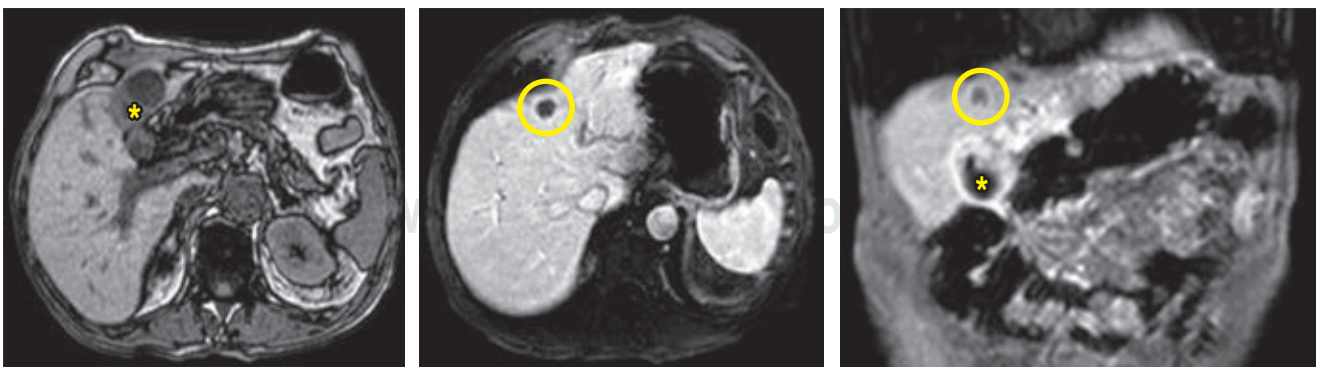
A percutaneous drainage of the abscess was performed, and AB treatment was given. A subsequent MRI cholangiography showed heterogeneous thickening of the gallbladder wall, adenopathy in the hepatic hilum, and

the focal lesion in the hepatic segment IVb previously described (*Figure 4*). A biopsy of the hepatic lesion was performed, with an immunohistochemical result of metastatic adenocarcinoma of biliopancreatic origin. The PET-CT extension study showed pathological uptake in the gallbladder, hepatic hilum, segment IVb lesion, and a nodule in the right lung. Palliative chemotherapy and placement of a biliary stent were indicated, with immediate good evolution regarding the resolution of the septic picture and FCC. He died 14 months after the diagnosis of gallbladder neoplasm.

*Table 1* summarizes the general characteristics of each case.

## DISCUSSION

The oldest descriptions of CCF date back to 1670 and are attributed to Thilesus,<sup>5</sup> although in 1667 Stalpert already warned, after the drainage of an abscess in the right epigastrium, of the presence of stony concretions in the contents of the latter, which probably corresponded to gallstones. The first treatments proposed to correspond to Petit, in 1673, with the recommendation to make an incision and extract the gallstones from the gallbladder using forceps, to create a fistula towards the exterior. In 1798, Richter proposed the puncture of the gallbladder using a cannula similar to current cholecystostomy. Finally, in 1859, Thudichum and Carré began to perform the technique of opening the gallbladder and fixing it by suturing it to the abdominal



**Figure 4:** A MRI cholangiography showing findings compatible with locally advanced gallbladder neoplasia (asterisk) and metastatic lesion in hepatic segment IVb (circle).

Table 1: Case series. General characteristics of the patients.

Sex	Age (years)	Background	Clinical presentation	Findings in imaging studies	Lab findings	Bile culture/ abscess	Treatment	Evolution
Female	92	BADL dependent, T2D, dementia	Painless RHC tumor	Lithiasis cholecystitis, choledocholithiasis, parietal abscess, CCF	Cr 2.91* mg/dl, CRP 157.7* mg/l, GPT 13 U/l, 7,800 WBC/ $\mu$ l	<i>L. casei</i>	PD + AB	Multiorgan failure Died on day six
Male	87	BADL dependent, myasthenia <i>gravis</i> , hypothyroidism, acute cholecystitis	Painless RHC tumor	Cholecystitis lithiasis, parietal abscess, FCC	CRP 1.2 mg/l, GPT 100* U/L, Br 0.5 mg/dl, 7,300 WBC/ $\mu$ l	<i>E. coli</i>	PD + AB Temporary PD maintenance	Favorable
Male	83	BADL independent, HBP, DLP, COPD	Abdominal pain, painful RHC lump	Cholecystitis lithiasis, aerobilia, parietal abscess, cholecysto-colo-parietal fistula	CRP 1.0 mg/dl, GOT 39 U/l, GPT 45 U/l, GGT 92* U/l, FA 84 U/l, Br 0.4 mg/dl, 9,600 WBC/ $\mu$ l	<i>E. coli</i> <i>S. milleri</i> <i>B. thetaiotaomicron</i>	PD + AB Definitive: cholecystectomy by laparotomy	Favorable
Female	89	BADL independent	Abdominal pain, vomiting, painful RHC lump	Cholecystitis lithiasis, parietal abscess, CCF	Cr 1.32* mg/dl, CRP 191.9* mg/l, GOT 63* U/l, GPT 42 U/l, GGT 63* U/l, FA 141* U/l, Br 1.1 mg/dl, 16,200* WBC/ $\mu$ l	<i>B. ovatus</i>	PD + CP + AB Temporary maintenance of the COP Definitive: laparoscopic cholecystectomy	Favorable
Male	75	BADL independent, history of gastric ulcer surgically operated	Weight loss, irreducible painless lump (laparotomy)	Alithiasic cholecystitis, parietal abscess, CCF	CRP 17.1* mg/l, GOT 26 U/l, GPT 11 U/l, GGT 64* U/l, FA 130* U/l, Br 0.2 mg/dl, 7,300 WBC/ $\mu$ l	4 aerobic bacterial species Mixed anaerobic flora	DP + AB Palliative: biliary endoprosthesis, chemotherapy	Favorable Gallbladder neoplasia E. IV Died at month 14

BADL = basic activities of daily living. T2D = type II diabetes mellitus. RHC = right hypocondrium. CCF = cholecystocutaneous fistula. Cr = serum creatinine. CRP = C-reactive protein. GPT = serum glutamic pyruvic transaminase. WBC = leukocytes. PD = percutaneous drainage. AB = antibiotic therapy.

HTA = arterial hypertension. DLP = dyslipidemia. COPD = chronic obstructive pulmonary disease. GOT = glutamic oxaloacetic transaminase.

GGT = gamma-glutamyl transferase. PC = percutaneous cholecystostomy.

\* All data are from the review of medical records performed by authors.

wall. This surgical cholecystostomy procedure was one that would become popular in the following decades. At the end of the 19th century, Courvoisier documented 499 cases of perforation of the gallbladder, 169 of them with the formation of CCF.<sup>5</sup> In 1934 Niemer proposed the classification of gallbladder perforations into acute, subacute, and chronic. Acute perforation represents to the rupture into a free cavity, with consequent biliary peritonitis; subacute perforation results in the formation of a perivesicular abscess; and chronic perforation is the result of a fistula formation of an abscess. The state preceding the fistula formation of the abscess to the skin was defined in 1963 by Nayman as *empyema necessitatis*.<sup>6</sup>

The topographic classification of biliary fistulas divides them as internal and external. The former includes communication with the duodenum (75%), colon (15%), jejunum (10%), and exceptionally, other organs such as the stomach or bronchi; and the latter includes communication with the skin. The origin of the CCF is usually in the fundus of the gallbladder,<sup>7</sup> and its proximity to the anterior parietal peritoneum explains why the external fistulous orifice is found in most cases in the RHC. However, other drainage locations have been described, such as the epigastrium, the iliac fossa and right inguinal region, the umbilicus, scars from previous drains or laparotomies, and even in the gluteal region.<sup>7-9</sup> Its etiopathogenesis consists of an obstruction to biliary drainage, mainly due to lithiasis or neoplasms, as in our series case, with the consequent bile stasis, bacterial superinfection, increased intraluminal pressure, mural necrosis, formation of a trans parietal abscess and finally, the fistula formation to the skin. Predisposing factors include diabetes, corticosteroid treatment, polyarteritis nodosa, and typhoid fever.

The initial diagnosis and treatment should include imaging tests, AB, and PD of the abscess, with the placement of a PC that may be considered to favor control of the infectious focus in cases of grade III acute cholecystitis with organic repercussions or in patients at very high surgical risk. Other more exhaustive studies such as MRI or fistulography may serve to characterize the anatomy of the

fistula and detect the concomitant presence of choledocholithiasis, neoplasms of the biliopancreatic junction, or cholecystoenteric fistulas. The role of endoscopic procedures can be therapeutic as well as diagnostic. Specifically, retrograde cholangiopancreatography, with or without papillotomy, provides great benefits such as the removal of choledocholithiasis, the reduction of the fistulous expenditure by reducing the pressure of the gallbladder and biliary tract, or the placement of endoluminal prostheses for the internal biliary drainage in palliative cases.

After the resolution of the acute episode, and if the patient is a candidate for surgery, definitive intervention would be indicated at least four to eight weeks after presentation. In the absence of an inflammatory plastron preventing the correct identification of the gallbladder hilum, cholecystectomy may be performed, with excision of the fistulous tract and repair of abdominal wall defects, if present.<sup>5</sup> Excision of the fistulous tracts decreases the risk of malignant degeneration; in fact, cases of adenocarcinoma originating on the CBD have been described.<sup>10</sup> Normally, the potential technical difficulties of an inflamed operative field force the operation to be performed by laparotomy, although the development of laparoscopy has allowed gradual treatment by this approach during the last decades.<sup>11,12</sup> On the other hand, in patients with high surgical and/or anesthetic risk, conservative treatment with the maintenance of the drains is estimated to be effective in the definitive resolution of the fistula in up to 20% of cases.<sup>4</sup> For advanced gallbladder cancer, treatment is usually palliative.

The five patients in our series were correctly studied by CT scan before urgent drainage of the abscess, and all of them were found to have cholecystitis and a CCF or a cholecystoparietal fistula. The presence of cholelithiasis was found in four of them, one of which also had concomitant choledocholithiasis. The patient with a finding of alithiasic cholecystitis was later diagnosed with adenocarcinoma of the gallbladder. The mean age at presentation was  $85.2 \pm 6.6$  years, and the incidence by sex was similar. Some antecedents such as dementia, ABVD dependence, advanced

age, and diabetes could justify the masking of pain in the presentation of the abscess in the RHC. In the case of a later diagnosis of gallbladder neoplasia, the presentation was also characteristically oligosymptomatic.

Two patients were candidates for deferred surgery, so cholecystectomy could be performed in both: one by laparotomy and the other by laparoscopy. In another case, it was decided to temporarily maintain the PD, and in the patient with advanced gallbladder neoplasia, the placement of a biliary endoprosthesis was indicated. The evolution was satisfactory in all of them. The only death attributable to the context of the CCF corresponded to the oldest woman who probably had the lowest physiological reserves in the series.

To our knowledge, the last clinical series was reported by Henry and Orr in 1949, with 36 CCF cases collected since 1890.<sup>5</sup> In 2011 the total number of cases published throughout history was estimated at 226.<sup>13</sup> Despite the unusual nature of this pathology, several isolated cases have recently been reported.<sup>14,15</sup> This relative scarcity of publications and the practically anecdotal incidence of CCF at present are the main limitations to the study of this pathology, whose initial surgical treatment does not differ much from that practiced during the past four centuries.

A cholecystocutaneous fistula is an unusual form of presentation of gallbladder pathology in our environment, due to early diagnosis, universal access to antibiotics, and the generalization of laparoscopic treatment of symptomatic cholelithiasis. Diagnostic suspicion of a tumor or cellulitis in the right hypochondrium, a correct initial study by computed tomography scan or ultrasound, and early treatment with antibiotics and drainage of the abscess are fundamental due to the high morbimortality rates that this infrequent entity entails since it affects mostly fragile patients.

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**Ethical considerations and responsibility:** the authors declare that they followed the protocols of their work center on the publication of patient data, safeguarding their right to privacy through the confidentiality of their data.

**Funding:** no financial support was received for this work.

**Disclosure:** the authors declare that there is no conflict of interest in carrying out the work.

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## Adult nesidioblastosis, a rare entity for the general surgeon

*Nesidioblastosis del adulto, una entidad poco frecuente para el cirujano general*

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### Keywords:

nesidioblastosis, hypoglycemia, distal pancreatectomy, laparoscopy, hyperinsulinism, insulinoma.

### Palabras clave:

nesidioblastosis, hipoglucemia, pancreatectomía distal, laparoscopia, hiperinsulinismo, insulinoma.

### ABSTRACT

Nesidioblastosis is a rare pathology of the endocrine pancreas that causes hypoglycemia due to endogenous hyperinsulinism. It is a Langerhans islet hyperplasia with  $\beta$ -cell hypertrophy. In most cases, the treatment option is distal pancreatectomy. We report the case of a 64-year-old man that presented with multiple hypoglycemia events over a long evolution. A diagnostic protocol was performed, showing the suggestive presence of an insulinoma. It was decided to perform a distal pancreatectomy by laparoscopy. A pancreatic fragment showed pancreatic islet hyperplasia and isolated endocrine cells. On immunohistochemistry, positivity for synaptophysin and chromogranin confirming the diagnosis of diffuse nesidioblastosis was reported. The patient was discharged without complications and good metabolic control and episodes of hypoglycemia. Thus, nesidioblastosis represents a diagnostic challenge in patients with hyperinsulinemic hypoglycemia refractory to medical management.

### RESUMEN

La nesidioblastosis es una patología del páncreas endocrino poco frecuente que origina cuadros de hipoglucemia por hiperinsulinismo endógeno. Se trata de una hiperplasia de los islotes de Langerhans con una hipertrofia de las células  $\beta$ . Las opciones de tratamiento en la mayoría de los casos es la pancreatectomía distal. Hombre de 64 años que presenta múltiples eventos de hipoglucemia de larga evolución. Se realizó protocolo diagnóstico evidenciándose la presencia sugestiva relacionada con insulinoma. Se decide realizar pancreatectomía distal por laparoscopia. Se informó de un fragmento pancreático con hiperplasia de islotes pancreáticos y células endocrinas aisladas. En la inmunohistoquímica con positividad para sinaptofisina y cromogranina que confirma el diagnóstico de nesidioblastosis difusa. El paciente fue egresado sin complicaciones y con adecuado control metabólico y sin episodios de hipoglucemia. Es así como la nesidioblastosis representa un reto diagnóstico en el paciente con hipoglucemia hiperinsulinémica refractaria a manejo médico.

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Received: 02/14/2022  
Accepted: 10/12/2022



### INTRODUCTION

Hyperinsulinemic hypoglycemia in the adult is usually caused by an insulinoma. However, in the absence of an insulinoma, there is a rare condition that accounts for 0.5-5% of these cases and is termed nesidioblastosis or non-insulinoma pancreatic hypoglycemic syndrome.<sup>1,2</sup>

Nesidioblastosis is described as a Langerhans islet hyperplasia in children, and

the adult form is characterized by diffuse hyperfunction of the pancreatic  $\beta$ -cells.<sup>2,3</sup>

This pathology presents with episodes of fasting hypoglycemia, tremor, dizziness, palpitations, sweating, and neurological alterations, among other symptoms. Clinical manifestation of postprandial neuroglycopenia is obtained with a fasting test that can be either positive or negative for 72 hours. However, the definitive diagnosis is histopathological using

**How to cite:** Myers-Esmenjaud JA, Urbina-de la Vega JF, Mejía-Nogales RE, López-Ortiz A, Gallegos-Garza AC, González-Chavira J et al. Adult nesidioblastosis, a rare entity for the general surgeon. Cir Gen. 2021; 43 (3): 193-197. <https://dx.doi.org/10.35366/108573>



**Figure 1:** A) A three-phase computed tomography scan. The arterial phase shows a solid nodule hypodense concerning the rest of the pancreatic parenchyma. B and C) Portal and venous phases in which a hyperintense nodule measuring 12.9 mm is evident.

neuroendocrine markers (chromogranin, enolase, and synaptophysin).<sup>2</sup>

### CASE PRESENTATION

A 64-year-old man with a history of arterial hypertension and psoriasis reported multiple events of diaphoresis, palpitations, nausea, dizziness, vomiting, and somnolence with repeated events of loss of alertness, with no predominance of time, although the symptoms occurred mainly after food intake. To avoid these events, he increased his food intake every hour, resulting in a weight gain of 7 kg.

On multiple occasions, he required attention in the emergency department where the presence of hypoglycemia was evidenced and treated with a glucose solution that improved the clinical picture. In general, the physical examination was normal. His weight was 90 kg, height 170 cm, and body mass index (BMI) was 31.1. As part of the diagnostic approach, a fasting test was performed, which had to be suspended after 18 hours due to neuroglycopenic symptoms. Serum hyperinsulinism was identified with serum glucose of 56 mg/dl, serum insulin of 79  $\mu$ U/ml, C-peptide of 10.2 ng/ml, and an insulin/glucose ratio of 13.1. A three-phase helical computed tomography scan was taken which showed a round nodule, with well-defined contours, solid, of superficial location in the distal portion of the tail of the pancreas measuring 12.9 mm in diameter, hypodense in the arterial phase and hyperdense in the portal phases, mainly in the venous phase. The radiological report was of suspicion for

insulinoma (Figure 1). Based on the findings of the imaging studies, the patient was scheduled for a laparoscopic distal pancreatectomy, which was performed without complications. The histopathological study reported a 3.5  $\times$  3  $\times$  2.5 cm, pinkish-yellow, single, spherical lesion with a purplish-gray surface measuring 1.5  $\times$  0.9  $\times$  0.9 cm. Pancreatic islet hyperplasia and isolated endocrine cells were seen, as well as an accessory spleen in the tail of the pancreas. Immunohistochemistry revealed positivity for synaptophysin and chromogranin in the pancreatic islets of Langerhans with a ki67 proliferation index of 1%. With all these data, diffuse nesidioblastosis was diagnosed (Figures 2 and 3). The patient's follow-up has shown adequate glycemic control and remission of neuroglycopenic events until this time.

### DISCUSSION

Insulin is a hormone synthesized by the  $\beta$ -cells of the pancreas that is responsible for the regulation of blood glucose. If there are irregularities in these compensatory mechanisms, conditions such as hyper- or hypoglycemia can occur; the latter in non-diabetic patients is an infrequent condition that requires a thorough study to have an adequate diagnosis and treatment.<sup>2</sup> Whipple's triad (low blood glucose concentration, clinical signs, or symptoms compatible with hypoglycemia, and resolution of these with increasing plasma glucose concentration) should be documented before starting the evaluation. In general, in these cases, the approach should begin with blood glucose, serum insulin levels, and

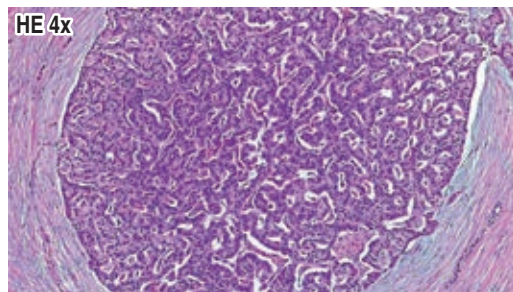


C-peptide measurements at the time of the presumed hypoglycemic crisis to be able to orient about the probable etiology.<sup>4</sup>

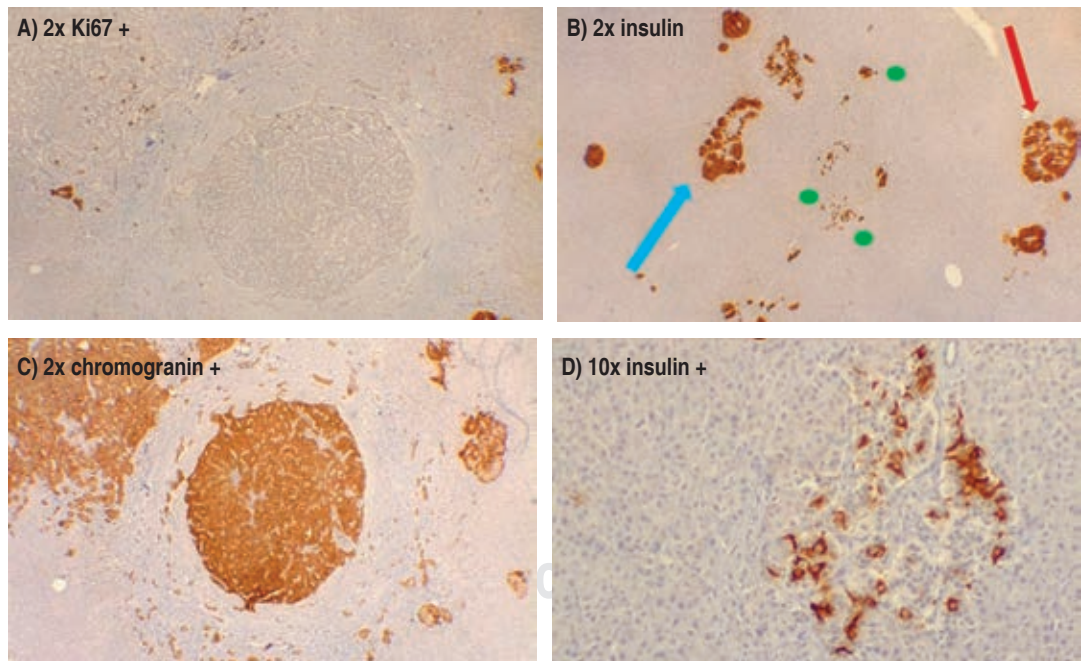
In the case of this patient, with the clinical characteristics mentioned, several suggestive pathologies could cause clinical manifestations of hyperinsulinemic hypoglycemia. A strict analysis was initiated, with laboratory and imaging studies, to rule out the main

differential diagnoses: insulinoma, drug-induced hypoglycemia (such as sulfonylureas and exogenous insulin), or hypoglycemia mediated by anti-insulin antibodies (AIA). Drug-induced hypoglycemia was ruled out by interrogation since the patient had no history of drug intake. Therefore, the first cause to rule out was insulinoma. Therefore, imaging studies were requested that showed the previously described lesion; however, once the final histopathological report was obtained, nesidioblastosis was concluded.

Nesidioblastosis is a term used to refer to abnormal hyperplasia of the islets of Langerhans and excessive function of the pancreatic beta cells causing persistent hyperinsulinemic hypoglycemia, which can be acquired or congenital. Two types of nesidioblastosis have been described: focal nesidioblastosis in which the islets form nodules and diffuse nesidioblastosis which is formed throughout the whole pancreas.<sup>4</sup> Epidemiological statistics are scarce since the incidence of congenital nesidioblastosis is reported worldwide in



**Figure 2:** (Hematoxylin-eosin staining). A well-differentiated grade 1 neuroendocrine tumor of 0.15 cm in its greatest diameter is shown.



**Figure 3:** A) 2× Ki67 (+) 1% of neuroendocrine tumor nuclei. B) 2× insulin (+) islet hyperplasia (blue arrow), isolated neuroendocrine cells (green dots), and an islet with preserved characteristics (red arrow). C) 2× chromogranin (+) in the neuroendocrine tumor and isolated neuroendocrine cells and hyperplastic islets. D) 10× insulin (+) isolated neuroendocrine cells, nesidioblastosis.

one in 50,000 live births and adulthood it represents 0.5-5% of cases of hyperinsulinemic hypoglycemia.<sup>5</sup>

Several molecular alterations have been identified in congenital nesidioblastosis associated with mutations in the genes *ABCC8*, *KCNJ11*, *HNF4A*, *HNF1A*, *GLUD1*, *GCK*, *HADH1*, *UCP2*, *MCT1*, *HK1*, and *PGM1*, as well as in different congenital syndromes; however, they may not be associated with adult nesidioblastosis. A high expression of hypoglycemic peptides such as insulin-like growth factor type 2 (*IGF2*), insulin-like growth factor type 1 (*IGF1*), and transforming growth factor beta-3 has been found in adults with nesidioblastosis, which give us an idea of the pathophysiological mechanism that is not well defined so far.<sup>6</sup> A particular case is that of postoperative Roux-en-Y gastric bypass patients with whom cases of nesidioblastosis have been described due to an increase in glucagon-like peptide type 1 (*GLP-1*) that contributes to pancreatic  $\beta$ -cell hypertrophy causing hyperfunction of these cells, which consequently induce hypoglycemia.<sup>7</sup> Clinically this entity presents with symptoms and signs typical of hypoglycemia such as tremors, dizziness, palpitations, sweating, and neurological alterations that improve with food intake, and it is also characterized because these episodes occur postprandially.

To make the diagnosis, an adequate clinical history should be taken first, inquiring about comorbidities, alcohol intake, and intake of hypoglycemic drugs. Once an adequate interrogation has been performed, the suspicion of probable pathologies begins, guided by the clinical and natural history of the disease. In the case of a patient with postprandial hypoglycemia, the presence of endogenous hyperinsulinism should be ruled out by performing a 72-hour fasting test, which is considered positive when after that time the blood glucose levels are  $< 45$  mg/dl and insulin levels rise  $> 6$  m U/l and C-peptide  $> 0.6$  ng/ml.<sup>8</sup> Imaging studies that can be used to complement the diagnosis are transabdominal ultrasound, computed tomography (CT) scan, endoscopy, selective catheterization with intra-arterial calcium injection, or even a positron emission tomography (PET) scan,

where it has been observed that in patients with nesidioblastosis, there is a mild to moderate increase of <sup>68</sup>GA-NOTA-Exedin-4 uptake in certain segments of the pancreas when performing the PET imaging study. In congenital cases of hyperinsulinism of infancy, <sup>18</sup>F-fluoro-L-dihydroxyphenylalanine (<sup>18</sup>F-DOPA) PET has been described as an accurate technique to distinguish between focal and diffuse types of nesidioblastosis and thus guiding surgical resection.<sup>8</sup>

The definitive diagnosis is made by histopathology means, using neuroendocrine markers, and observing whether the histologic criteria (major and minor) for the diagnosis of nesidioblastosis are met.<sup>9</sup> Treatment with drugs such as glucocorticoids, somatostatin analogs or diazoxide can be initiated to control insulin secretion; however, if there is a persistence of symptoms, the treatment of choice is surgical resection. In most cases distal pancreatectomy is performed; if the symptoms do not remit after the intervention, the previously mentioned drugs can be used as a complementary treatment.<sup>10</sup>

## CONCLUSIONS

Nesidioblastosis represents a rare pathology that should be considered when other more frequent causes of endogenous hyperinsulinism have been ruled out. It should be studied by a multidisciplinary team to identify and propose the most appropriate treatment to have an acceptable prognosis in terms of quality of life.

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**Ethical considerations and responsibility:** the authors declare that the procedures followed were by ethical standards. No patient data appear in this article.

**Financing:** the authors declare that there is no financing.

**Disclosure:** the authors declare that there is no conflict of interest in carrying out the work.

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## Circumferential perforation of duodenal ulcer. Duodenal stump management and literature review

*Perforación circunferencial de úlcera duodenal. Manejo del muñón duodenal y revisión de la literatura*

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### Keywords:

duodenal ulcer, perforated ulcer, duodenal stump, surgery.

### Palabras clave:

úlcera duodenal, úlcera perforada, muñón duodenal, cirugía.

### ABSTRACT

Duodenal ulcer perforation has been an increasingly rare entity since the advent of H2 antihistamines and proton pump inhibitors. Treatment depends on the lesion's extent and the patient's clinical course. We report the case of an uncommon condition with an unusual presentation and review the literature regarding managing duodenal stump.

### RESUMEN

*La perforación de úlcera duodenal es una entidad cada vez menos frecuente desde el advenimiento de los antihistamínicos H2 e inhibidores de bomba de protones. El tratamiento depende de la extensión de la lesión y el curso clínico del paciente. Se reporta el caso de una condición infrecuente con una presentación inusual y revisión de la literatura con relación al manejo del muñón duodenal.*

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Received: 02/20/2020  
Accepted: 09/15/2021



### INTRODUCTION

The incidence of peptic ulcers, both duodenal and gastric, has decreased as a result of two events: the discovery of *H. pylori* and the advent of antisecretory drugs, such as histamine receptor antagonists and proton pump inhibitors (PPIs).<sup>1</sup> From 2 to 10% of peptic ulcers are complicated by perforation, most frequently in duodenal ulcers (60%).<sup>2</sup> Early recognition and diagnosis of perforation are essential for adequate management and reduction of morbidity and mortality.

There is currently no consensus on the management of choice for peptic ulcer perforation; however, much will depend on the patient's preoperative status and the surgeon's judgment.

### CLINICAL CASE

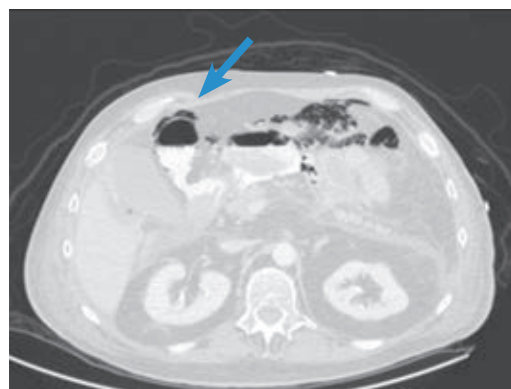
This patient was a 58-year-old male with a history of granulomatous vasculitis treated with azathioprine, methotrexate, and prednisone. Five months prior to his admission to our hospital, the patient was treated for sepsis as a result of *Pneumocystis jirovecii* pneumonia, for which reason azathioprine and methotrexate were withdrawn, and treatment was continued only with prednisone at a dose of 10 mg per day.

Five days before admission, the patient underwent elective sigmoidectomy, colorectal anastomosis, and protective ileostomy without complications due to diverticular disease, with good evolution in the immediate postoperative period. However, on the fourth

**How to cite:** Garay-Lechuga D, León-González M, Afya A, Olvera-Luna AG. Circumferential perforation of duodenal ulcer. Duodenal stump management and literature review. Cir Gen. 2021; 43 (3): 198-201. <https://dx.doi.org/10.35366/108574>

postoperative day, he started with sudden pain in the epigastrium that was constant and with an intensity of 9/10 on the visual analog pain scale (VAS), without irradiation, accompanied by nausea and, on one occasion, gastro biliary vomiting, as well as abdominal distension and decreased urinary volumes. Physical examination revealed tachycardia, cardiopulmonary function without alterations, distended abdomen with generalized pain on palpation, absence of peristaltic sounds, and signs of peritoneal irritation. The ileostomy had adequate coloration and intestinal output.

During the approach, laboratory tests were performed (Table 1), and a double contrast abdominal tomography (Figure 1), in which the outflow of contrast material into the abdominal cavity at the level of the first



**Figure 1:** Abdominal CT scan with oral and intravenous contrast. Lung window, showing intra-abdominal free air dissecting the mesentery planes.

portion of the duodenum and much free air, was evident.

An emergency exploratory laparotomy was performed, which revealed the presence of a circumferential duodenal ulcer with a complete section of the first portion of the duodenum (Figure 2), abundant free bile fluid, and coffee wells; duodenal stump closure was performed with duodenostomy, antrectomy and manual Braun's omega gastrojejunal bypass with the placement of closed drains adjacent to the anastomosis, with a procedure duration of four hours.

In the immediate postoperative period, the patient required management in the Intensive Care Unit due to hemodynamic instability with gradual improvement in the following days; invasive mechanical ventilation and aminergic support were removed on the third postoperative day. An esophagogastroduodenal series was performed on the fourth postoperative day, which was reported with the adequate passage of contrast medium into the jejunum without evidence of leakage (Figure 3). He started an oral diet without complications; the patient had a minimal serous output removed on the fifth postoperative day and a progressive decrease of duodenostomy output until discharge on postoperative day seven. He was discharged after his improvement. In ambulatory follow-up, duodenostomy was withdrawn on postoperative day 23.

**Table 1: Lab tests.**

Blood cytology	Result	Reference values
Leukocytes ( $10^3/\mu\text{l}$ )	12.1	4.8-10
Hemoglobin (g/dl)	13.4	14.5-18.5
Platelets ( $10^3/\mu\text{l}$ )	311.0	150-450
C-reactive protein (mg/dl)	19.08	0-0.3
Procalcitonin (ng/dl)	0.81	0-0.5
Renal function		
Creatinine (mg/dl)	0.6	0.4-1.4
Blood urea nitrogen (mg/dl)	19.0	6-20
Sodium (mEq/l)	142.0	137-145
Potassium (mEq/l)	3.6	3.5-5.6
Calcium (mg/dl)	8.1	8.5-10.5
Chlorine (mEq/l)	106.0	100-112
Venous gasometry		
pH	7.37	7.35-7.45
pO <sub>2</sub> (mmHg)	29.0	80-100
HCO <sub>3</sub> (mEq/l)	20.9	22-26
pCO <sub>2</sub> (mmHg)	38.7	35-45
Excess base	-3.3	0 ± 2
Lactate (mmol/l)	3.8	< 2

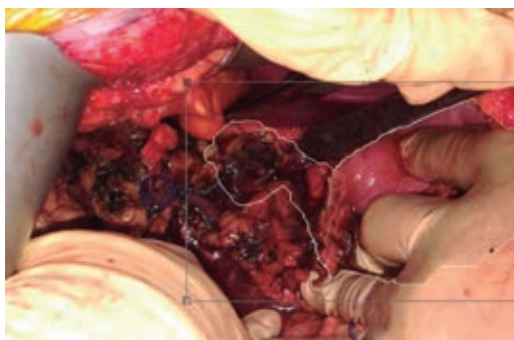
## DISCUSSION

Beyond the functions of regulation, absorption, and alkalinization of the chyme, the duodenum is located in a highly complex anatomical region, which represents a challenge for the surgeon in the context of surgical injuries. Such injuries are infrequent; however, in the absence of trauma, the list of causes is headed by peptic ulcer disease and, secondly, by iatrogenesis. However, in the specific case of the patient presented, the cause of perforation was attributed to exposure to high-dose steroids, which contributes to decreased mucus secretion and  $\text{HCO}_3^-$ , as well as impaired epithelial repair.<sup>3,4</sup>

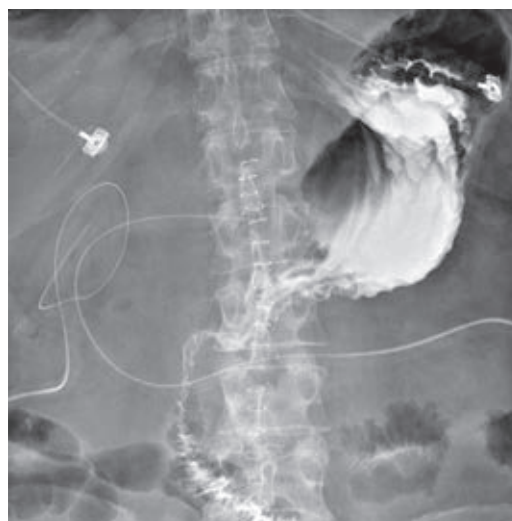
International guidelines,<sup>5</sup> currently standardize the management of tiny perforations. However, in the case of giant perforated ulcers (perforations more significant than 3 cm), the conduct to be followed concerning the management of the duodenal stump remains to be defined.

Given the degree of complexity in their management, these lesions are essential since they frequently involve tissue loss and abundant inflammation (difficult duodenum). Likewise, once the duodenal stump has been closed, there is a high tendency to duodenal leakage or bursting due to high intraluminal pressure, poor stump closure (extrusion of mucosa through the closure), or enzymatic autodigestion.<sup>6</sup>

It is understood that performing a Billroth I reconstruction eliminates the possibility of a problematic duodenum; however, given the cases



**Figure 2:** Surgical findings. In the marked area, a complete section of the first portion of the duodenum immediately after the pylorus is seen.



**Figure 3:** Esophagogastrroduodenal series. An adequate opacification of the gastric reservoir and changes by the gastrojejunostomy with the passage of contrast medium into the jejunum without evidence of leakage is shown.

in which it is not possible (emergency surgery, unstable patient, etcetera), some techniques have been described to reduce the number of complications associated with duodenal stump closure.

In the setting of a released duodenum, with wall integrity, no pancreatic head involvement, and non-edematous, in a retrospective comparative study of 2,034 cases in 2011, linear stapler, hand suture, and tobacco pouch closure were included, no statistical difference was found in terms of leakage or bleeding.<sup>7</sup>

In 1933 the Bsteh-Nissen technique was published for the first time, initially described for managing ulcers with penetration to the pancreas. It consists of resectioning the affected edges of the duodenum and adequate mobilization of the duodenum to subsequently perform an anastomosis of the healthy duodenum to the ulcerous edge in the head of the pancreas.<sup>8</sup>

Bennett and colleagues modified the Bancroft technique described in 1932, resulting in the technique currently used, which consists of preserving the right gastric and right gastroepiploic artery to ensure irrigation, given that antrectomy is performed 4-5 cm from

the pylorus. The mucosa is dissected from the seromuscular layer of the duodenum. It is pushed towards the lumen of the duodenum to obtain a seromuscular flap with which a flap-wall closure is performed.<sup>9</sup>

In 1950 Welch and collaborators used for the first time duodenostomy for the management of difficult duodenum; this technique consists of the placement of a tube that communicates the duodenal lumen with the exterior; there are several modalities (terminal, lateral, Stamm, etcetera); however, they are beyond the limits of this review.<sup>8,9</sup>

In our case, we opted for management with duodenostomy, which was to relieve intraluminal pressure given the loss of tissue integrity at the mouth of the ulcer, as recommended by recent literature.<sup>3</sup>

## CONCLUSIONS

Managing the problematic duodenal stump is challenging for the surgeon due to the need for international guidelines for optimal treatment in the unstable patient scenario. For this reason, treatment should be personalized depending on the hemodynamic conditions of the patient, characteristics of the lesion, hospital conditions, and available material to seek the best results with a reduction in complications.

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**Ethical considerations and responsibility:** data privacy. Following the protocols established in our work center, we declare that we have followed the protocols on patient data privacy and preserved their anonymity.

**Funding:** no financial support was received for the preparation of this work.

**Disclosure:** none of the authors have a conflict of interest in the conduct of this study.

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# Mesothelial cyst of the greater omentum

## Quiste mesotelial del omento mayor

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### Keywords:

omental cyst,  
mesothelial cyst,  
abdominal cyst.

### Palabras clave:

quiste omental, quiste  
mesotelial, quiste  
abdominal.

### ABSTRACT

We present the case of a 49-year-old female patient with a history of slowly and progressively increasing intra-abdominal volume. A mass of approximately 16 cm, non-painful and mobile in all directions, was palpated in the epigastrium and mesogastrium. Abdominal ultrasound showed a cystic mass; abdominal computed tomography determined its origin and location precisely. A scheduled midline laparotomy was performed, and a 15 × 8 cm multiloculated cyst located in the greater omentum was identified and resected. The anatomopathological study reported a multiloculated cyst covered by the simple columnar epithelium of mesothelial type without cellular atypia resting on a thin layer of fibroconnective tissue, compatible with a simple mesothelial cyst. The postoperative evolution was favorable. Cysts of the greater omentum are rare surgical conditions. They should be considered as a differential diagnosis during the fourth decade of life in any patient presenting a mobile intra-abdominal enlargement in the mesogastrium of slow and progressive growth. The treatment of choice is surgical resection, either conventionally or laparoscopically.

### RESUMEN

Se presenta el caso de paciente femenino de 49 años de edad con antecedentes de aumento de volumen intraabdominal de crecimiento lento y progresivo. Se palpó en epigastrio y mesogastrio una masa de aproximadamente 16 cm, no dolorosa y móvil en todas las direcciones. La ecografía abdominal mostró una masa quística; la tomografía computarizada abdominal determinó con mayor precisión su origen y localización. Se realizó laparotomía media programada y se identificó quiste multiloculado de 15 × 8 cm localizado en el omento mayor, el cual se resecó en su totalidad. El estudio anatomopatológico informó un quiste multiloculado recubierto de epitelio columnar simple de tipo mesotelial sin atipia celular que se apoya sobre fina capa de tejido fibroconectivo, compatible con un quiste mesotelial simple. La evolución postquirúrgica fue favorable. Los quistes del omento mayor son afecciones quirúrgicas infrecuentes. Debe tenerse en cuenta como diagnóstico diferencial durante la cuarta década de la vida de toda paciente que presente un aumento de volumen intraabdominal localizado en mesogastrio, móvil, de crecimiento lento y progresivo. El tratamiento de elección es la resección quirúrgica, ya sea de manera convencional o laparoscópica.

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Received: 08/14/2020  
Accepted: 08/03/2021



## INTRODUCTION

L omentum cysts are rare benign tumors; Garnier published the first case of omentum cysts, and their frequency varies from one in 27,000 to one in 250,000. The highest frequency occurs in the fourth decade of life, although a quarter of the cases are found in children.<sup>1</sup>

There are many theories to consider regarding the formation of omental cysts;

among these is the benign proliferation of ectopic lymphatic tissue and lymphatic obstruction leading to large intraperitoneal cysts. Other causes also include failure of peritoneal sheet fusion, occult trauma, neoplasia, and lymph node degeneration.<sup>2,3</sup>

Histologically, cysts of mesothelial origin have a lining of flat, cuboidal, or columnar epithelial cells; the wall is fibrous and lacks muscle fibers or lymphoid tissue, which allows differentiation from simple lymphatic cysts.<sup>4</sup>

**How to cite:** Neyra-Rodríguez CM, Fonseca-Sosa FK, Pring-Silvera A, Ramos-Socarrás AE. Mesothelial cyst of the greater omentum. *Cir Gen.* 2021; 43 (3): 202-204. <https://dx.doi.org/10.35366/108575>



## PRESENTATION OF THE CASE

We present the case of a 49-year-old woman with a history of intra-abdominal volume increase with slow and progressive growth. Physical examination revealed a mass of approximately 16 cm, smooth surface, defined borders, stiff consistency, did not protrude with the Valsalva maneuver, does not pulsate or expand, is not painful, and is mobile in all directions in the epigastrium and mesogastrium. An abdominal ultrasound showed an intra-abdominal cystic mass with partitions inside, measuring approximately 155 mm, located in the epigastrium and mesogastrium, which was corroborated by contrasted abdominal tomography.

Laparotomy was performed, and a 15 × 8 cm multiloculated cyst located in the greater omentum was found (*Figure 1*), which was wholly resected without complications (*Figures 2 and 3*).

The anatomopathological study reported a multiloculated cyst covered by the simple columnar epithelium of mesothelial type without cellular atypia resting on a thin layer of fibroconnective tissue, compatible with a simple mesothelial cyst.

The patient evolved satisfactorily and was discharged five days after surgery with uncomplicated external follow-up at 12 months.



**Figure 1:** *Transoperative. Multiloculated cyst in the greater omentum identified by the black arrow. The red arrow shows the stomach.*



**Figure 2:** *Trans-operative. Greater omentum tractioned by Allis forceps after resection of the cyst.*

## DISCUSSION

According to Bannura G et al.,<sup>4</sup> most mesothelial cysts occur in young or middle-aged women who remain stable over time; however, their location is usually within the mesentery and not in the greater omentum. Few cases of omental cysts have been reported in the Japanese literature. In a study by Uramatsu M<sup>5</sup> and colleagues, this surgical condition occurs more than 68% of children under ten years of age and more frequently in male patients.

Small cysts are almost always asymptomatic and are detected during a laparotomy performed for another problem, and a palpable abdominal mass sometimes manifests larger cysts. Uncomplicated cysts are usually located in the lower mesogastrium and move freely, have a smooth contour, and are painless.<sup>6</sup>

Imaging studies, consistent with Kumar S and colleagues, establish the diagnosis.<sup>7</sup> The imaging modality of choice is abdominal ultrasonography. Ultrasonography shows a cystic structure, commonly with thin internal septa and sometimes with internal echoes of hemorrhage and infection; these can be confused with large ovarian cysts in women. Abdominal computed tomography adds little information, although it may reveal that the cyst does not arise from another organ such as the kidney, pancreas, or ovary.

The spectrum of presentation depends primarily on the location and size of the cyst. Any complications, including accelerated growth, intracystic hemorrhage, torsion,



**Figure 3:** Resected surgical specimen.

infection, or rupture, are common indications for surgical excision.<sup>8</sup>

We agree with other authors that complete resection represents the only correct therapeutic approach.<sup>9,10</sup> In 1993, Mackenzie described the first laparoscopic complete resection. The advantages of laparoscopic surgery are well known: respect for the abdominal wall, less postoperative pain, and shorter hospital stay, which results in a significant reduction in costs. In all cases, complete cyst resection is mandatory; conversion to “open surgery” is only necessary when laparoscopic resection is challenging to perform due to the risk of cellular leakage or inadequate treatment, which leads to a higher incidence of relapse.

### CONCLUSION

Cysts of the greater omentum are rare surgical conditions. They should be considered a differential diagnosis in any patient during their fourth decade of life who presents an intra-abdominal enlargement in the mobile mesogastrium of slow and progressive growth. The treatment of choice is surgical resection, either conventionally or laparoscopically.

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**Ethical considerations and responsibility:** the authors declare that they followed the protocols of their work center on the publication of patient data, safeguarding their right to privacy through the confidentiality of their data.

**Funding:** no financial support was received for this work.

**Disclosure:** the authors declare no conflict of interest in carrying out the work.

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# Statistics of trauma surgery in Mexico in the XIX century

## *Estadística de la cirugía de trauma en México en el siglo XIX*

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### Keywords:

surgery, history, trauma, amputations, biostatistics.

### Palabras clave:

cirugía, historia, trauma, amputaciones, bioestadística.

### ABSTRACT

Trauma cases have historically been an entity that has required constant attention by the surgeon throughout history in all cultures. However, in how they have been explained using statistics since the XIX century in our country, it has been possible to give a quantitative vision to solve this problem. Although medical statistics was born with the beginning of the activities of the National Academy of Medicine of Mexico in 1864, the first articles that used this mathematical means were written by the Australian physician Frederich Semeleder (1832-1901) in 1878, of a non-traumatic medical type and referring to ovarian cysts. The first works with quantitative description appeared thanks to Dr. Manuel Soriano (1837-1927) in 1886 in the same journal of the National Academy. They described the low mortality with the use of antiseptics in battle wounded. When reviewing theses and articles, we can affirm that trauma at the end of the 19th century in our country occurred predominantly in young people between 25 and 35 years of age and was due to sequelae of injuries caused by cutting trauma by streetcars or sharp weapons injuries (79% of cases) with a mortality rate of 41%.

### RESUMEN

Los casos de trauma históricamente han sido una entidad que ha requerido de manera constante atención por el cirujano a través de la historia en todas las culturas, pero, en la forma que se han explicado por medio de la estadística a partir del siglo XIX en nuestro país, se ha logrado dar una visión cuantitativa a fin de resolver dicho problema. Aunque la estadística médica nació con el inicio de las actividades de la Academia Nacional de Medicina de México en 1864, los primeros artículos que usaron este medio matemático son del médico australiano Frederich Semeleder (1832-1901) en 1878, de tipo médico no traumático y referentes a quistes ováricos. Los primeros trabajos con descripción cuantitativa surgieron gracias al Dr. Manuel Soriano (1837-1927) en 1886 en la misma revista de la Academia Nacional, y describían la escasa mortalidad con el uso de antisepsia en heridos de una batalla. Al hacer la revisión de tesis y artículos, podemos afirmar que el trauma a finales del siglo XIX en nuestro país se dio predominantemente en jóvenes de 25 a 35 años y fueron por secuelas de lesiones de trauma cortante por tranvías o lesiones por arma punzocortante (79% de los casos) con una mortalidad de 41%.

## INTRODUCTION

The word "trauma" comes from Greek and means wound. It was found in a vessel corresponding to the 2nd century B.C. as the affirmation of two brothers who denied having hit a third one. Trauma has accompanied the human being since its most remote origins and is an eternal health problem that medicine faced before it became a science.

Trauma constitutes in the medical field the fatal cause of immediate death and injuries requiring immediate attention; since the end of the 20th century, the World Health Organization has considered trauma an epidemic. In 2006, there were more than 800,000 people in Europe with injuries, with an annual loss of 2% of its gross domestic product.<sup>1</sup> In the United States, 59% of deaths in the population aged 1-44 years are due to trauma, with a mortality rate of 7.6% in hospitals that

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Received: 03/28/2021  
Accepted: 09/30/2022



**How to cite:** Rodríguez-Paz CA, Gómez-De Lara JL. Statistics of trauma surgery in Mexico in the XIX century. Cir Gen. 2021; 43 (3): 205-210. <https://dx.doi.org/10.35366/108576>

handle trauma relative to 9.5% in non-injury hospitals,<sup>2</sup> with 79,000 deaths per year, 7.5 days of hospital stay on average and 240.7 billion dollars of spending on health care costs from 2001 to 2011.<sup>3</sup>

Spain confirms the alarming frequency in people between 25 and 35 years of age, with more than 400,000 deaths in 2012 and an increase in those over 65 years of age, with the aggravating factor of difficulty in their management due to anticoagulants, poly pathology, etcetera.<sup>4</sup> Mexico does not have continuous national statistics as in developed countries. From the data shown in the case series, trauma was the fourth cause of death and the first among patients aged 25 to 44 years, with 38 deaths per 100,000 persons; of these figures, vehicular accidents represented the fifth cause of death due to trauma in 1999 in Latin America, which occurred more frequently in men.<sup>5</sup>

#### DESCRIPTION OF TRAUMA BEFORE 1800

Although we have the descriptions of trauma management in the classics of the Ebers-Smith papyrus,<sup>6</sup> aphorism of Hippocrates or commentaries of Celsus,<sup>7</sup> there is no numerical or quantitative review of how many people were injured in a disaster, battle or catastrophe before 1800; perhaps the comments on the number of deaths in the European plagues were an excellent motivation to translate the disasters into statistics and thus show their magnitude (although there were only estimates),<sup>8</sup> but with studies carried out after the event (due to the natural absence of the testimony of the actors who were there at the precise moment or of those who survived it afterward), only partial analyses remain to be seen.<sup>9</sup>

Except for these comments, medicine has always been mainly qualitative. Modern studies that analyze the number of wounded described in Homer's *Iliad* come out of this context, where several specialists transcribed, based on the literary aspect, an accurately quantitative vision of how many and how the participants of the conflict were wounded;<sup>10-12</sup> perhaps Homer used it as a literary element linked to the drama in order to make the text more realistic;

however, he gave us for posterity an element that serves to make a quantitative analysis of the magnitude of this human conflict and the type of wounds handled.

As described by Vaquero-Puerto and collaborators, since the Renaissance, the evidence of management was based on the description of clinical cases by the entity, without, of course, statistics. Classical is the texts by Ambrosio Paré (*Dix Livres de la Chirurgie*) and Dionisio Daza Chacón (*Practica y teórica de cirugía*), who, on opposite sides, gave testimony about cutting and gunshot wounds in a narrative and not the quantitative way.<sup>13</sup>

#### THE MEXICAN 19TH-CENTURY TRAUMA

Carmichael is right when he talks about the problems involved in studying a historical event when it has already happened and is described by people who did not participate. Primary sources, being written by the participants of the event themselves, have a connotation of greater relevance,<sup>8</sup> that is why we wish to rescue the quantitative data on trauma in Mexico at the end of the 19th century, based on primary sources described by the doctors themselves.

We begin with the first work on trauma surgery in our country, edited by Dr. S. Barceló, a viceroy military doctor, who described two cases of post-trauma trephine in the then prison of Chihuahua.<sup>14</sup> In the new nation, several works were collected in different stages of the *Gaceta Médica de México* between 1834 and 1900. However, it was not until the work of Dr. Carlos Alberto Ehrmann (1822-1871) that studies with statistical support were formalized within the nascent National Academy of Medicine (the second section of the Academy was in charge of the field of forensic medicine and statistics).<sup>15</sup> The first work incorporating a statistical study, but not on trauma, was that of Dr. Frederich Semeleder (1832-1901), where the management of 45 ovarian cysts was recorded.<sup>16</sup>

In trauma, the first formal work published in a journal was that of Dr. Manuel Soriano (1837-1927). Manuel Soriano (1837-1927), when describing with percentage statistics the causes of death after the Battle of San

Luis Potosí on July 1st, 1872, in the uprising of the Plan de la Noria (1871-1872);<sup>17</sup> this eminent military doctor described that out of 41 wounded patients, 18 died, 18 were cured and five convalesced; and he emphasized that the recovered patients were due to the daily change of clean sheets, the use of Labarraqué liquor and radical measures in surgeries,<sup>18</sup> for what is also our oldest antecedent of the beginning of antisepsis,<sup>19</sup> before Lister's era.<sup>20</sup>

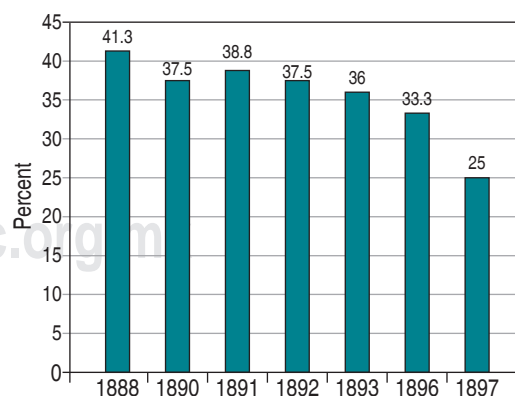
After the era of armed conflicts, the schemes of administration, clinical systems, and the teaching of medicine were modified (the analysis is yet to be written). This was favored by the creation of the National Academy of Medicine of Mexico, the incorporation of positivism, the organization of new medical schools in the country,<sup>21</sup> and other factors that saved the study of this work. What is certain is that the motivation within some medical schools to write degree theses left us an extraordinary legacy<sup>22</sup> firsthand that serves to reconstruct the situation of various diseases in Mexico at that time. Regarding trauma, the outlook was bleak as urban aggressions replaced armed ones.

If someone was wounded in Mexico City and survived the injuries, he was not taken to a hospital (at that time, the injured patients were handled by the *Hospital Juárez de México*<sup>14,23,24</sup>), as if he were just another object of a legal process, the injured patient was taken to the police station and, inside these dungeons of terror, he was left in a room called "Afanaduría", which consisted of a marble table, two tables where the statements were taken (while the wounded was alive) and a rudimentary instrumental room. He was left in a room called "Afanaduría",<sup>25</sup> which consisted of a marble table, two tables where statements were taken (while the wounded person was alive) and rudimentary instruments to give him some medical management, plus two practicing doctors, this happened 24 hours a day, every day; this trauma management alone was terrifying. Sotero and Zertuche describe in their thesis that, between 1870 and 1890, between 40 and 70% of trauma cases attended at the Juárez Hospital and between 50 and 200 cases in the fifth police district from 1880 to 1890.<sup>25,26</sup> In the same thesis, they described that 91% were men,

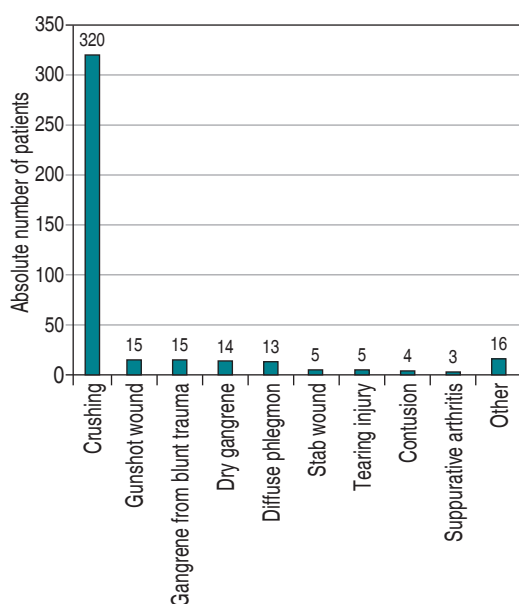
with 34% of the wounded between 20 and 25 years of age, the mortality rate for stab wounds (HPAPC) was 18% and for firearms was 100%, while anatomically in the abdomen it was 42% and if it involved the intestine it was 85%.

Concerning other mechanisms of injury, in addition to the direct aggressions due to fights and assaults mentioned above, there were industrial and labor injuries and, of course, those caused by trains (streetcars) and, to a lesser extent, animal-drawn vehicles (remember that automobiles did not appear in our country until after 1900); of these last two types of injuries, between 1888 and 1895 in the Juárez Hospital, there were 405 cases, of which 79% were due to "crushing", which was described in the thesis as having a high mortality rate, especially when the injury involved the thigh (the etiology of these injuries was due to the passing of the streetcar and when the pedestrian was careless he sawed the femur, tibia-fibula, and other bones), so most of them needed to be amputated or remodeled in the stump, this created mortality of 41% (*Figure 1*).<sup>27</sup>

It is interesting that the theses were based on European studies and that while in Europe, the causes of trauma were predominantly due to injuries in factories (as in England, France, and Germany), in Mexico City and San Luis Potosí, the injuries were due to tramways; and despite the wars of the 19th century, both in war and peace, in our country trauma involved a more significant number of pelvic limb amputations than thoracic;<sup>27,28</sup> even, Dr.



**Figure 1:** Mortality of amputations at Juárez Hospital. Source: Macías AC.<sup>28</sup>



**Figure 2:** Etiology of amputations at Juarez Hospital, Mexico, from 1888 to 1897.

Source: Villarreal C.<sup>27</sup>

Eduardo Vargas ratified in his undergraduate thesis work regarding two cases of thoracic limb amputations, that upper limb injuries were more common in Europe according to Dr. Trelat (Charity Hospital in Paris). However, it is true that in both countries, the mechanism was by crushing. In his comments and other theses in Mexico, he refers that it was thoracic limb injuries.

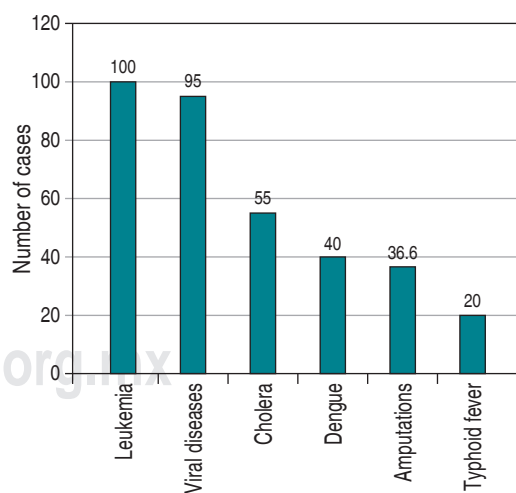
Another interesting difference between urban trauma in Mexico City was described with the data accumulated in *Figure 2*,<sup>27</sup> where the mechanism of aggression is, of course, very different in our 21st century, marked by vehicle injuries, compared to Mexico at the end of the 19th century which was located in patients with post-trauma gangrene (rarely seen after the antibiotic era), wrenching, among others.<sup>29</sup>

Another type of injury, no less important, was the abdominal injuries caused by HPAPC and HPPAF (firearm projectile injury) that we have already described previously in another work,<sup>30</sup> injuries of which, although their impact and clinical-surgical wear and tear was not so high in numbers for a hospital, just look at the reasons for mortality in Hospital Juarez

in 1889, where most of the cases were non-traumatic processes, while the fifth cause of death in 1889 were amputations (*Figure 3*); it is important to note that what the trauma theses of the late nineteenth-century claim as “leukemia” in these injured patients are a post-traumatic status where, due to blood loss, they were left with a significant clinical pallor. Of course, most of the data are either simple numerical or percentage, without the notion of presenting the data by rate. However, Villarreal realized the severity, noting that the trauma of various origins caused 90.2% of amputations.<sup>27</sup>

Although the change in the way of presenting the results of a medical study in Mexico started in 1864 with the beginning of the first statistical works, works on trauma continued to be published in a descriptive manner of series of cases, without quantitative casuistry, an example of this is the second journal on trauma published in our country,<sup>31</sup> the Annals of the Larrey Association, which was published from 1875 to 1876,<sup>32</sup> and where the totality of its works were narratives of compelling cases of trauma, but which in the end did not present an idea of severity, compiling series of cases of ailments such as those described in the previous quantitative works.

Regarding trauma cases in children, they were not appreciated or described in the XIX



**Figure 3:** General mortality in Juarez Hospital, Mexico, 1889.

Source: Macias AC.<sup>28</sup>

century, finding works with formal statistics until the second half of the XX century; trauma in infants was divided between urban accidents in vehicles and carelessness at home<sup>33</sup> and being more significant in the southern states of the country.<sup>34</sup> Unfortunately, the few citations regarding the management of trauma in children found that in the late nineteenth century was given by urban accidents by vehicles (streetcars as in adults),<sup>35</sup> or work injuries, as children worked in factories<sup>36,37</sup> and mines.<sup>38</sup>

### CONCLUSIONS

During the era of the government of Porfirio Díaz, the experience gained in the wars of the mid-nineteenth century was compiled, while the new generation of medical students changed the way of describing diseases; roughly speaking, we see that the reason for mortality (infections) changed in a century in the Juárez Hospital at the end of the nineteenth century, and in the same city, with social changes, trauma was now the first cause of care in the hospitals of the Medical Services network of the Federal District<sup>39</sup> and the rest of the country. Although in a veiled manner, studies from the 19th century emerged where we realize that occupational injuries, especially in children, had a social relevance, perhaps not statistical.<sup>37,38</sup>

Opening new lines of work for the investigation of the past in the surgical areas in order to understand the actual changes that have occurred in various conditions, especially those of trauma, we can indeed establish the evolution of the trauma patient, as occurred between 2005 to 2009, a trend in various parts of the country in describing the surgical experiences, which fortunately has been maintained by defining surgical schools throughout the country.<sup>40</sup>

### ACKNOWLEDGMENTS

We thank the staff of the Nicolás León Libraries of the Department of History and Philosophy of Medicine of the Faculty of Medicine of the UNAM, and the Historical Archives of the National Academy of Medicine, for their help in this work.

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**Ethical considerations and responsibility:** the authors declare that they followed the protocols of their work center on the publication of patient data, safeguarding their right to privacy through the confidentiality of their data.

**Financing:** this work was financed by the authors themselves, without support from grants, foundations, or similar.

**Disclosure:** the authors work in teaching and health institutions, with no commitments to the pharmaceutical industry or political interests.

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which is mentioned at the end of the introduction (the objectives, hypothesis, and approaches are not written separately).

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  - e) **Results:** In this section, according to the study's design, all the results should be presented; they are not commented on. If there are tables of results or figures (graphs or images), they should be presented separately, on the last pages, with figure captions.
  - f) **Discussion:** Based on the updated bibliography supporting the results. Conclusions are mentioned at the end of this section.
  - g) **Bibliography:** It should follow the specifications described below.
  - h) **Number of pages or pages:** a maximum of 12. Figures: 5-7 maximum, which must be original.
- II. **Clinical case report** 1 to 5 cases. Case series includes six or more clinical cases.
    - a) **Authorship or authors:** It is recommended to include a maximum of five authors who have participated in the preparation of the article or manuscript and not only in the management of the patient. The others should be included in the list of acknowledgments.
    - b) **Title:** Must specify whether it is a clinical case or a series of clinical cases.
    - c) **Abstract:** With keywords and abstract with keywords. It should briefly describe the case and the importance of its publication.
    - d) **Introduction:** The disease or attributable cause is discussed. The most relevant medical literature regarding the clinical case is summarized.
    - e) **Presentation of the clinical case(s):** clinical description, laboratory and others. Mention the time in which these cases were collected. Figures or tables should be on separate sheets.

- f) **Discussion:** The most recent bibliographic references or those necessary to understand the importance or relevance of the clinical case are discussed.
- g) **Number of pages:** maximum 10. Figures: 5-8.

### III. Review article:

- a) **Title:** specifying the subject to be dealt with.
- b) **Abstract:** In Spanish and English, with keywords.
- c) **Introduction and**, if necessary, subtitles: It may begin with the subject to be dealt with without division.

- d) **Bibliography:** Recent and necessary for the text.
- e) **Number of pages:** 20 maximum. Figures: 5-8 maximum.

**IV. Letter to the Editor:** This section is for documents of social interest, normative, and complementary to one of the research articles. It does not have a unique format.

**V. Article on the history, philosophy of medicine, and bioethics:** As in "letter to the editor", the author can develop his/her topic. A maximum of five images are accepted.

Manuscripts inadequately prepared or not accompanied by the checklist will be accepted with being submitted for review.

The requirements are shown in the checklist. The format is available at [www.medigraphic.com/pdfs/cirgen/cg-instr.pdf](http://www.medigraphic.com/pdfs/cirgen/cg-instr.pdf) (PDF). Authors should download it and check each section as each publication requirement is fulfilled.

## CHECKLIST

### GENERAL ASPECTS

- Articles should be submitted in electronic format. Authors should have a copy for reference.
- The manuscript should be typed in Arial 12-point font, double-spaced, in letter size, with 2.5 cm margins on each side. The standard page comprises 30 lines, 60 characters each (1,800 per page). Words in another language should be presented in italics.
- The text should be presented as follows: 1) title page, 2) abstract and keywords [in Spanish and English], 3) introduction, 4) material and methods, 5) results, 6) discussion, 7) acknowledgments, 8) references, 9) appendices, 10) text of tables, and 11) figure captions. Each section should start on a separate sheet. The format can be modified in review articles and clinical cases if necessary.
- Consecutive numbering of each page, starting with the title page.
- Write down the name, address, and telephone number of three probable reviewers not belonging to the working group to whom the article can be sent for review.

### TEXT

#### Title page

- Includes:
  - 1) Title in Spanish and English, maximum 15 words and short title of no more than 40 characters,
  - 2) Name(s) of the authors in the order in which they will be published; if the paternal and maternal surnames are noted, they may appear linked with a short hyphen,
  - 3) Credits to each of the authors,
  - 4) Institution(s) where the work was performed.
  - 5) Address for correspondence: complete address, telephone, fax, and e-mail address of the responsible author.

#### Abstract

- In Spanish and English, with a maximum length of 200 words.
- Structured according to the order of information in the text:

- 1) Introduction,
- 2) Objectives,
- 3) Material and methods,
- 4) Results and
- 5) Conclusions.

- Avoid using abbreviations, but if their use is indispensable, their meaning should be specified the first time they are cited. Symbols and abbreviations of units of measurement in international use do not require specification of their meaning.
- Keywords in Spanish and English, without abbreviations, with a minimum of three and a maximum of six. They must correspond to those accepted by PubMed in its MeSH section.

### **Text**

- Manuscript not exceeding ten pages, divided into subtitles to facilitate reading.
- The names, initials, or file numbers of the patients studied should be omitted.
- Abbreviations are accepted but must be preceded by what they mean the first time they are cited and the units of measurement of international use to which the Mexican government is subject.
- Drugs, medicines, and chemical substances should be named by their generic name, and the dosage and routes of administration should be indicated according to the international nomenclature.
- The statistical methods used should be described at the end of the Material and Methods section.

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### **References**

- From 25 to 30 in original articles, 25 to 35 in review articles, and 10 to 15 in clinical cases. They are identified in the text with Arabic numerals and in progressive order according to the sequence in which they appear in the text.

- References cited only in tables or figure captions should be numbered according to the sequence in which the identification of the table or figure first appears in the text.
- Personal communications and unpublished data will be cited without footnote numbering.
- The title of periodicals should be abbreviated according to the recommendations of the International Committee of Medical Journal Editors (ICMJE) <http://www.icmje.org/recommendations/browse/manuscript-preparation/preparing-for-submission.html#g>. Complete information should be provided for each reference, including the article's title, abbreviated journal title, year, volume, and initial and final pages. When there are more than six authors, the first six should be listed, and the abbreviation et al. should be added.

Examples of articles from periodicals with up to six authors:

Ohlsson J, Wranne B. Noninvasive assessment of valve area in patients with aortic stenosis. *J Am Coll Cardiol.* 1986; 7: 501-508.

Seven or more authors:

San-Luis R, Munayer J, Aldana T, Acosta JL, Ramirez H, Campos A, et al. Total anomalous pulmonary venous anomalous connection. Five years of experience. *Rev Mex Cardiol.* 1995; 6: 109-116.

Books, note edition when it is not the first one:

Myerowitz PD. Heart transplantation. 2nd ed. New York: Futura Publishing; 1987.

Book chapters:

Hardesty R, Griffith B. Combined heart-lung transplantation. In: Myerowitz PD. Heart transplantation. 2nd ed. New York: Futura Publishing; 1987. p. 125-140.

For more examples of reference formats, authors should consult:

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### **Tables**

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- They will be headed by the title and progressively marked with Roman numerals according to their appearance in the text.
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