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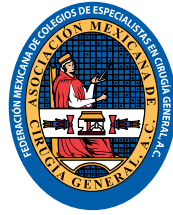
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The first impression

La primera impresión

Abilene Cirenía Escamilla-Ortiz*

When preparing a manuscript, the first impression is the essential thing. So, the introduction would need to be well-written.

Questions you should ask yourself:

1. What am I studying or reviewing?
2. What is the critical topic I am researching?
3. What is known about what I am researching?
4. What does what I am researching or proposing to contribute to?

“The white rabbit put on his spectacles. Where shall I begin, with your majesty’s permission, he asked. Start at the beginning, said the king gravely, and go on until you reach the end; there you stop”. These words describe with simplicity and elegance how to start telling a story; scientific authors may be considered storytellers.¹ Many dismiss this section, but for the editors, it is significant.

The introduction must be well written, as there will not be a second chance if you do not make a good impression in the first one.

Faber points out that one of the errors he has observed most often is that the introduction is too long and stresses that the rule of thumb should not exceed 10% of the article’s total word count.¹ The second most frequent error is the lack of coherence; it stresses that the authors should be directing the reader towards the objectives of the article.¹

He also suggests including a considerable number of references and avoiding citing the authors’ names; instead, it is better to write down the number of the citation, although it can be done if it is relevant.¹

It is not necessary to mention every article on the subject under discussion; instead, a careful selection of the most relevant articles should be made.²

It can begin as an exciting story, a lived experience description, and relevant data.³ It is like being in front of the entrance door of a glamorous city, but sometimes the door does not let us glimpse all that the city has so that the introduction can be the access to that city.⁴

Points to consider when writing the introduction:⁴

1. Acronyms should be accompanied by meaning and should not be included in the abstract.

* Editor, Cirujano General. orcid.org/0000-0001-5635-5845



2. Use present simple tense in writing.
3. References from prestigious journals and books with a good impact factor should be updated.
4. Avoid expressions that confuse or cause mystery and construct clear sentences.
5. Sentences should be attractive and understandable.
6. Inform first about the general topic, then include specific information, and finally, the objective should be clearly explained.

With all this, we must hook or attract readers, so they are interested in reading the whole article and say to themselves: Why didn't I think of this before?²

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Subtotal cholecystectomy as a management option for difficult cholecystectomy

Colecistectomía subtotal como opción de manejo para colecistectomía difícil

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Éctor Jaime Ramírez-Barba,§ Roberto Ávila-Baylón,¶ Manuel Insensé-Arana||

Keywords:

Laparoscopic cholecystectomy, difficult cholecystectomy, fenestrated subtotal cholecystectomy, reconstituted subtotal cholecystectomy, biliary leak.

Palabras clave:

Colecistectomía laparoscópica, colecistectomía difícil, colecistectomía subtotal fenestrada, colecistectomía subtotal reconstituida, fuga biliar.

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ABSTRACT

Objective: To describe the risks associated with subtotal cholecystectomy in patients with difficult cholecystectomy. **Material and methods:** A two-year review of the Hospital General León database was performed from January 2013 to December 2015. This was a retrospective study with reconstructed cohort analysis determining the risks associated with the intervention. **Results:** 18 patients operated on subtotal cholecystectomy due to difficult cholecystectomy were reported; in 18 patients included in the study, it was found associated morbidity of 44.4% (33.4% biliary leakage, 5.5% surgical site infection, and 5.5% residual choledocholithiasis). The most frequent postoperative complication was biliary leakage, 83.3% resolved nonoperatively, and 16.7% required endoscopic retrograde cholangiopancreatography (ERCP) with sphincterotomy for its resolution. No associated mortality or bile duct injury was found in this cohort. **Conclusion:** Subtotal cholecystectomy is a safe, feasible, and reproducible procedure as a management option for difficult cholecystectomy that keeps the incidence of bile duct injury at neutral margins.

RESUMEN

Objetivo: Describir los riesgos asociados a la colecistectomía subtotal en pacientes con colecistectomía difícil. **Material y métodos:** Se realizó una revisión de dos años de la base de datos del Hospital General León dentro del periodo enero de 2013 a diciembre de 2015. Se trata de un estudio retrospectivo con análisis de cohortes reconstruidas que determinan los riesgos asociados con la intervención. **Resultados:** Se reportaron 18 pacientes intervenidos de colecistectomía subtotal debido a colecistectomía difícil; 18 pacientes incluidos en el estudio, se encontró que la morbilidad asociada de 44.4% (33.4% fuga biliar, 5.5% infección de sitio quirúrgico y 5.5% coledocolitiasis residual). La complicación postoperatoria más frecuente es la fuga biliar, 83.3% resuelve de manera no operatoria y 16.7% requirió una colangiopancreatografía retrógrada endoscópica (CPRE) con esfinterotomía para la resolución de la misma. No se encontró mortalidad asociada ni lesiones de la vía biliar en esta cohorte. **Conclusión:** La colecistectomía subtotal es un procedimiento seguro, factible y reproducible como opción de manejo para la colecistectomía difícil que mantiene en márgenes neutros la incidencia de lesión de la vía biliar.

INTRODUCTION

Cholelithiasis is a public health problem that affects 1-4% of the world's population annually. Ten to 15% of the world's population has cholelithiasis. Gallbladder pathology is one of the common and costly digestive diseases. In the USA, an estimated 6.3 million men and 14.3 million women in the 20-74 age group have cholelithiasis, representing 10-20% of the US population. Laparoscopic cholecystectomy

is one of the most frequently performed by general surgeons, reaching > 750,000 interventions per year, uncomplicated biliary colic being its most common indication.¹

In Mexico, the prevalence of biliary lithiasis is 14.3%, with an incidence of 44% in women and 12% in men.²

Total cholecystectomy in patients with difficult cholecystectomy is a surgical procedure with an elevated risk of bile duct injury compared to cholecystectomies on non-inflamed



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gallbladders.³ Serious complications occur in up to 2.6% of laparoscopic cholecystectomies, with major bile duct injuries occurring in 0.3-0.5%.⁴

An incidence of difficult cholecystectomies of 16% (one in six) has been reported,⁵ being the most significant risk an acute inflammatory pathology secondary to a desmoplastic reaction that causes retraction and difficulty in dissection, obliterating surgical planes towards the hepato-cystic triangle and obscuring crucial structures.⁶ Other pre-surgical difficulty-related risk factors include acute cholecystitis of ≥ 72 hours, leukocytosis $> 18,000/\text{mm}^3$, palpable mass in the right hypochondrium, comorbidities such as type 2 diabetes mellitus (T2DM), systemic arterial hypertension, and suspicion of emphysematous cholecystitis.⁷

Difficult cholecystectomy refers to the surgical removal of the gallbladder when there are some associated conditions of the organ itself, of its neighboring organs, or of the patient, which do not allow an easy, fast, and comfortable dissection of the gallbladder, and which result in prolongation of the surgical time and increased risk of complications for the patient such as biliary tract injuries.⁸

The risk of hemorrhage and bile duct injury increases when performing Calot's triangle dissection, especially in the presence of acute inflammation or fibrosis of the gallbladder. Subtotal cholecystectomy has proven to be a safe surgical termination method, i.e., it avoids biliary lesions and is effective, considering that it does not require a second surgical time in difficult cholecystectomies.⁹

Since the emergence of laparoscopy, many innovations and technical modifications have been made to the satisfaction of the patient and the surgeon. Laparoscopic cholecystectomy has revolutionized the management of cholelithiasis, declaring itself the gold standard for dealing with any benign gallbladder disorder;¹⁰ however, in the context of cholecystitis, extensive experience is required for a better and safe outcome.¹¹

Studies with some cases of subtotal laparoscopic cholecystectomy have shown promising results in patients with various forms of cholecystitis; despite this, its indications, feasibility, performance, and technical characteristics are under-documented.^{12,13}

Because of the above, it is impossible to precisely define the terms "difficult gallbladder" and "difficult cholecystectomy" since "difficulty" is a relative term, and certain general principles should be followed before embarking on laparoscopic cholecystectomy. The surgeon's goal should not only be to provide the benefits of minimal access to surgery but also to avoid operative complications and decrease postoperative morbidity.^{14,15}

HISTORICAL BACKGROUND

Madding first reported subtotal cholecystectomy in 1955 as an alternative to cholecystectomy and a salvage procedure in technically difficult cholecystectomy cases. His technique involved incision of the gallbladder in the fundus, followed by stone extraction and excision of the anterior gallbladder wall.¹⁶ Thirty years later, Bornman and Terblanche described their experience in the management of difficult cholecystectomy in cases of severe cholecystitis and portal hypertension. These authors performed subtotal cholecystectomy by excision in parts of the gallbladder, starting at the Hartmann's pouch and leaving a rim of the posterior wall attached to the liver. The mucosa of this remnant was coagulated, and the gallbladder stump was closed with a tobacco-pouch suture. Numerous surgeons adopted this technique with some minor modifications.¹⁷

With the introduction of laparoscopic cholecystectomy by Mühe (1985) and Mouret (1987), laparoscopic subtotal cholecystectomy was considered a salvage technique in cases of difficult cholecystectomy to avoid injury to the bile duct and vascular structures.¹⁸ Bickel and Shtamler described their successful experience treating six patients with laparoscopic subtotal cholecystectomy; they opened the gallbladder with electrocautery and resected only the anterior wall leaving the posterior wall attached to the liver, which was subsequently coagulated.¹⁹

Palanivelu et al., published the most extensive series of laparoscopic subtotal cholecystectomies in the literature, which included 206 patients with liver cirrhosis and cholelithiasis.²⁰

Currently, some publications demonstrate the safety and effectiveness of subtotal cholecystectomy, whether laparoscopic or open, and more and more lines of research are opening about this management option for patients with difficult cholecystectomy.^{21,22}

The difficulty encompasses various factors, including the patient, the surgical scene, and the surgeon himself. The various safety measures in a safe laparoscopic cholecystectomy should not be undermined and left to oblivion. The surgeon should be familiar with multiple strategies under difficult circumstances. Subtotal cholecystectomy sometimes proves to be the only alternative for the surgeon.^{23,24}

MATERIAL AND METHODS

A review of the database of the Hospital General León, León, Guanajuato, Mexico, was performed during the period from January 2013 to December 2015 and found 18 patients operated on for subtotal cholecystectomy due to difficult cholecystectomy. A retrospective study with reconstructed cohort analysis was performed to determine the associated risks in this type of patients.

Inclusion criteria: 1) Age between 15 and 85 years, 2) Severe cholecystitis with inflammation or fibrosis of Calot's triangle (pyocystitis, gangrenous cholecystitis, cirrhosis), 3) Presence of Mirizzi syndrome.

Exclusion criteria: 1) Patients younger than 15 years and older than 85. **Elimination criteria:** 1) Patients with the histopathological result of gallbladder cancer. 2) Patients with incomplete data in the file.

Statistical analysis: descriptive and inferential statistics with tests of association of reconstructed cohorts.

RESULTS

The records of patients who underwent subtotal cholecystectomy between January 2013 and December 2015 were analyzed, identifying 21 patients, of which 18 met the inclusion criteria, and three were excluded.

The female sex corresponds to 61.11% (n = 11), while the rest (38.89%, n = seven) corresponds to the male sex; their age ranged

from 21 to 71 years, with an average of 48 years.

Of the 18 patients selected, 11 had chronic degenerative diseases (61.1%), of whom six had T2DM (33.3%), and five had obesity (27.8%).

As for the results of laboratory studies, we found a mean leukocyte count of 7,031 μL (range 6,900 to 18,000 μL); neutrophils of 51.3% (range 36 to 84.6%); hemoglobin of 12.8 mg/dL (range 10.8 to 15.1 mg/dL); platelets of 288,333 μL (range 160,000 to 574,000 μL); total bilirubin of 0.7 mg/dL (range 0.2 to 1.5 mg/dL); direct bilirubin of 0.37 mg/dL (range 0.2 to 1.1 mg/dL); alkaline phosphatase of 91.2 μL (range 43 to 159 μL); aspartate aminotransferase of 45.2 μL (range 22 to 70 μL); alanine aminotransferase of 46.9 μL (range 9 to 90 μL) and international normalized ratio (INR) of 1.09 (range 0.89 to 1.26).

All patients had a preoperative ultrasound of the liver and biliary tract; the findings reported were as follows: cholelithiasis in 100% of the patients; the mean common bile duct diameter was 5.9 mm (range 3 to 11 mm); the wall thickness was 4.1 mm (range 2 to 6 mm), and the gallbladder volume was 52.6 ml (range 16 to 124 ml). Among other ultrasonographic findings, we found three patients with the WES (*wall echoes shadow*) triad (16.7%), two patients with fatty liver (11.1%), and seven patients with choledocholithiasis (38.9%).

Four had a history of acute pancreatitis (22.2%), and five patients (27.8%) had choledocholithiasis confirmed and resolved by ERCP. The preoperative diagnosis in the operated patients was chronic cholelithiasis in 10 of them (55.6%), acute chronic cholelithiasis in seven (38.8%), and hydro-cholecystitis in one (5.6%); on the other hand, the postoperative diagnosis was chronic cholelithiasis in four patients (22.3%), chronic cholelithiasis in four patients (22.3%), and choledocholithiasis in four patients (27.8%).3%), in four more with acute chronic cholelithiasis (22.3%), three patients had Mirizzi's syndrome (16.7%), two patients presented piocholecystitis (11.1%), two reported xanthogranulomatous cholecystitis (11.1%), one with cholecystic-colonic fistula (5.5%) and one more with cholecystic-duodenal fistula (5.5%).

The trans operative findings reported were in 88.9% of the patients (n = 16) without identification of the structures of the hepato-cystic triangle and in 11.1% (n = two) the presence of Mirizzi syndrome, which is why it was decided to perform a subtotal cholecystectomy.

The surgery in all patients was cholecystectomy, four were programmed as an open (22.2%) procedure, and 14 were programmed laparoscopic (77.8%). The surgery performed was reconstituted subtotal cholecystectomy with closure with continuous stitches in five patients (27.8%); closure with separate stitches in 11 patients (61.2%); closure with continuous stitches and closure of duodenal fistula was performed in one patient (5.5%), and in another patient closure with continuous stitches with right hemicolectomy and ileal-transverse anastomosis was performed (5.5%). The sutures were made with poliglecaprone because it is a monofilament, synthetic, slow absorption material.

The mean operative time of the surgeries mentioned was 112.2 minutes (85 to 150 minutes). The mean postoperative bleeding was 205 ml (range 20 to 350 ml). No incidents or trans-operative complications were reported in any patient (Figure 1).

Patient follow-up averaged 45 months, and postoperative complications were identified in eight patients (44.4%), of which six showed biliary leakage (33.3%), one had surgical site infection (5.5%), and one had residual choledocholithiasis (5.5%).

The complication occurred between day 1 and day 29 (mean 4.5 days), and specifically, the biliary leak was observed between day 1

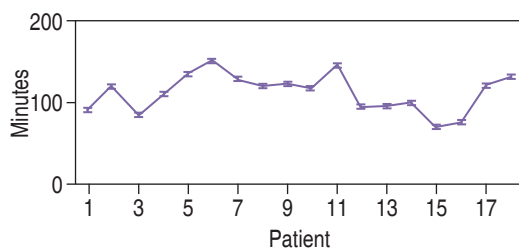


Figure 1: Surgical time in minutes. Own elaboration according to the study.

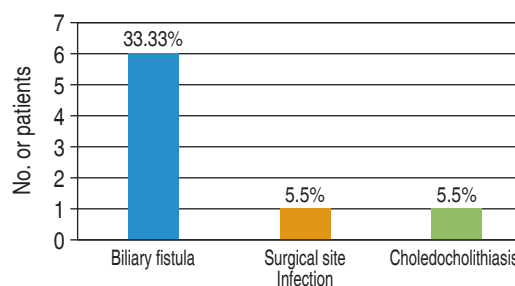


Figure 2: Post-surgical complications. Own elaboration according to the study.

and day 5 postoperatively (mean 2.7 days) (Figure 2).

Postoperative evolution was adequate in 66.7% of the patients (n = 12), and the morbidity found was 33.3% (n = 6) with biliary leakage. No postoperative mortality was reported during patient follow-up.

Regarding biliary leak, being the most frequent complication (33.3%) (n = six), the mean number of days with the presence of biliary leak was 14.8 days (range from seven to 20 days); one of the patients underwent ERCP for persistent high biliary fluid expense at day 15, showed remission of the leak at day 19. The site of the leak was identified at the level of the gallbladder stump and a stent was placed in the biliary tract. Five patients with biliary leak were managed non-operatively and showed remission of the leak without the need for additional procedures.

One patient presented surgical site infection on postoperative day 22; intrahospital treatment was given considering it low risk with ceftriaxone 1 g intravenous every 12 hours plus metronidazole 500 mg intravenous every eight hours for five days,²⁵ in addition to surgical bed cleaning. He improved on the seventh day of treatment and was discharged home. Another patient presented residual choledocholithiasis on postoperative day 29 requiring ERCP for its resolution.

The mean number of days of in-hospital stay was 2.4 (range one to seven days). In all cases, a Saratoga type passive drain was used, introducing a 20 Fr Nelaton tube fenestrated in a 3/4-inch Penrose tube, directed towards the subhepatic space, and extracting it through the right flank; the drain lasted on average 11.6

days (range from four to 21 days) and it was removed once the output decreased. There were no complications associated with the use of drainage.

There was no evidence of collections, residual cholelithiasis, gallbladder cancer, episodes of biliary colic pain, or other postoperative complications during patient follow-up.

The histopathological result was incomplete gallbladder with data of acute cholecystitis in 100%.

DISCUSSION

Laparoscopic cholecystectomy has become the treatment of choice for chronic cholelithiasis and cholecystitis, where extensive experience is required to obtain a satisfactory result.²⁶ Severe inflammation, gallbladder edema, and adhesion between adjacent structures prevent a clear anatomical identification of the artery and cystic duct, resulting in an increased risk of injury to the main bile duct and hemorrhage. Strasberg refers to three conceptual steps to avoid bile duct injury, which entail safety within laparoscopic cholecystectomy:

1. Achieve a critical vision of security; in case of difficulty, we move on to the next point.
2. Turning point, when it is decided to stop the dissection attempt in laparoscopic cholecystectomy and to finish the surgery with another method, and
3. Perform a safe and efficient rescue procedure.²⁶

When is it decided that we are at the tipping point? Asking another surgeon for help is considered good practice.

In our study, we have identified that the predictor factors that may play a role in difficult cholecystectomy and the need for subtotal cholecystectomy are the presence of obesity in 33.3% and T2DM in 27.8%; thickening of the gallbladder wall seen in the preoperative liver and biliary tract ultrasound with an average of 4.1 mm; the finding of choledocholithiasis by ultrasound and the need to perform preoperative ERCP, which was present in 38.8% of the patients. No associations were found between

the need for subtotal cholecystectomy due to difficult cholecystectomy and alterations in the laboratory studies or the other ultrasonographic findings analyzed.

According to the study by Roesch-Dietlen et al., the most critical risk factors for difficult cholecystectomy resolved by reconstituted subtotal cholecystectomy were obesity in 28% ($p = 0.185$) without specifying grade and T2DM in 15% ($p = 0.084$).²⁷ Although both comorbidities are more frequently observed in difficult cholecystectomies, no statistically significant difference is found in the influence of performing a subtotal cholecystectomy. Preoperative risk factors are of little utility in performing a subtotal cholecystectomy. Instead, this is done by observing the trans-operative findings, the main one being the difficulty in achieving the critical safety view, i.e., complete dissection of the hepato-cystic triangle demonstrating the cystic duct, the cystic artery, and cystic plaque.

Madni et al., proposed the Parkland scale to classify the grade of cholecystitis based on the first laparoscopic look once the four trocars had been introduced, which showed a positive correlation with the pathology report, operative time, conversion rate, days of hospital stay, and biliary leak, the latter only with grade V.²⁷ The rate of subtotal cholecystectomies was not evaluated, nor if when converting surgery a total cholecystectomy was achieved; however, it is interesting to propose a trans-surgical scale before attempted dissection that unifies the definitions, since currently, the turning point is subjective limited to the surgeon himself or to whoever assists him. Further studies and validation are required for this scale in the context of use in subtotal cholecystectomy.

A demonstration of the subjectivity of the tipping point is given by Ashfaq A et al. in presenting a cohort study of 2,212 patients undergoing laparoscopic cholecystectomy, in which they reported 351 (15.8%) difficult cholecystectomies, describing three predictors of conversion: urgent surgery (OR: 0.80; 95% CI: 0.351-0.881, $p = 0.032$.); previous abdominal surgery (OR: 2.18; 95% CI: 1.181-4.035, $p = 0.013$.); and gangrenous cholecystitis (OR: 1.92; 95% CI: 1.356-4.044, $p = 0.033$.), without having performed any

subtotal cholecystectomy, concluding that total laparoscopic cholecystectomy can be safely performed in difficult gallbladder situations with a lower conversion rate than previously reported and without bile duct injury.²⁸ In any case, the universal safety culture for cholecystectomy calls for us to stay within narrow confidence limits, recognizing the skills and limitations of each surgeon to avoid a major complication such as bile duct injury.

The morbidity associated with subtotal cholecystectomy in patients with difficult cholecystectomy was 44.4%, and the most frequent postoperative complication was a biliary leak in 33.3% (n = six) of the patients. Most patients who presented it were treated nonoperatively, and few patients required ERCP. In our analysis, 5.5% (n = 1) of the patients required ERCP to resolve the biliary leak. Residual choledocholithiasis requiring ERCP was reported in 5.5% (n = 1) and surgical site infection in 5.5% (n = 1) of the patients analyzed.

One of the fears when performing subtotal cholecystectomy is the risk of forming new stones in the remaining gallbladder stump. During the postoperative follow-up, which averaged 45.1 months, residual cholelithiasis was not detected, and no patient required surgical resection of the remaining gallbladder stump. Dissanaïke et al., after a median follow-up of six years, recurrent biliary events in reconstituted subtotal cholecystectomy were 19%, while with fenestrated subtotal cholecystectomy, they were 9%; however, biliary leakage in the fenestrated type was 18%²⁹ with the same management features previously described. No mortality associated with subtotal cholecystectomy was found in patients with difficult cholecystectomy.

The world literature reports a risk of bile duct injury of 0.8%, which increases in patients with difficult cholecystectomy up to 4%;¹ in our study, no association of subtotal cholecystectomy with bile duct injury was found.

CONCLUSION

Subtotal cholecystectomy is a safe surgical termination method that avoids biliary lesions

and is effective, considering that it does not require a second surgical time in difficult cholecystectomies. Postoperative complications are mild and resolve with non-operative management.

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Single-port laparoscopic cholecystectomy. Prospective non-randomized study of 106 cases

Colecistectomía laparoscópica por puerto único. Estudio prospectivo no aleatorizado de 106 casos

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Ariel de Jesús Martínez-Oñate§

Keywords:

Laparoscopic cholecystectomy, single-port cholecystectomy, single-port laparoscopic surgery, minimally invasive cholecystectomy, single-port robotic cholecystectomy.

Palabras clave:

Colecistectomía laparoscópica, colecistectomía por puerto único, cirugía laparoscópica por puerto único, colecistectomía por mínima invasión, colecistectomía robótica por puerto único.

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ABSTRACT

Introduction: Laparoscopic single-port surgery has been considered the natural evolution of minimally invasive surgical techniques for cholecystectomy, with the advantages of less postoperative pain, faster return to normal daily activities, and better cosmetic outcomes. **Objective:** To describe the analysis of 106 cases of laparoscopic cholecystectomy with the single-port technique. **Material and methods:** We present the results of a prospective, observational study of single-port laparoscopic cholecystectomy (SPLC) performed with a standardized technique over eight years of patients with clinical, ultrasonographic, and computed axial tomography diagnoses of chronic calculous cholecystitis, non-lithiasis cholecystitis, and acute cholecystitis. Demographic variables, surgical time, bleeding, days of hospital stay, complications, and postoperative pain were studied. **Results:** 106 patients were operated from June 2010 to December 2018, 44 (41.5%) were operated urgently and 62 (58.5%) electively ($p = 0.0001$). The mean operative time recorded was 85.7 ± 35.7 minutes. Ten patients (9.4%) presented complications, six were transoperative, and four were postoperative; according to the Clavien-Dindo classification, two were type II, one type IIIa and one type IIIb. **Conclusions:** The single port technique for cholecystectomy has proven to be safe, reliable, reproducible, and comparable in results and complications with the conventional laparoscopic technique with a relevant cosmetic advantage.

RESUMEN

Introducción: La cirugía laparoscópica por puerto único se ha considerado la evolución natural de las técnicas de cirugía de mínima invasión para colecistectomía, con las ventajas de menor dolor postoperatorio, regreso más rápido a la actividad normal diaria y mejor resultado cosmético. **Objetivo:** Describir el análisis de 106 casos de colecistectomía laparoscópica con técnica de puerto único (SPLC). **Material y métodos:** Presentamos los resultados de un estudio prospectivo, observacional de SPLC realizados con una técnica estandarizada en un periodo de ocho años, de pacientes con diagnóstico clínico, ultrasonográfico y por tomografía axial computarizada de colecistitis crónica litiásica, no litiásica y colecistitis aguda. Se estudiaron las variables demográficas, tiempo quirúrgico, sangrado y días de estancia hospitalaria, así como complicaciones y dolor postoperatorio. **Resultados:** De junio de 2010 a diciembre de 2018 se operaron 106 pacientes, 44 (41.5%) fueron operados de manera urgente y 62 (58.5%) de manera electiva ($p = 0.0001$). El tiempo quirúrgico promedio registrado fue de 85.7 ± 35.7 minutos. Diez pacientes (9.4%) presentaron complicaciones, seis fueron transoperatorias y cuatro postoperatorias, de estas últimas, acorde a la clasificación Clavien-Dindo, dos fueron tipo II, uno tipo IIIa y uno tipo IIIb. **Conclusiones:** La técnica de puerto único para colecistectomía ha demostrado ser segura, confiable, reproducible y comparable en resultados y complicaciones con la técnica laparoscópica convencional con una ventaja cosmética relevante.



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INTRODUCTION

For more than 100 years, open gallbladder resection remained the gold standard for cholecystectomy. The first cholecystectomy was performed by Carl Johan Langenbuch (1846-1901) in Berlin on July 15, 1882.¹ The first cholecystectomy with the laparoscopic technique was performed by Erich Muhe at the Boblingen County Hospital near Stuttgart, Germany, on September 12, 1985; while the first laparoscopic appendectomy had been performed earlier by Kurt Semm (1927-2003), gynecologist, on September 13, 1980² in Kiel, Germany. It is worth mentioning that Dr. Semm was harshly criticized nationally and internationally for having performed the procedure without his critics knowing the path being opened with this first laparoscopic gastrointestinal procedure.

During the last 30 years, and thanks to the improvement of vision technology and the development of *ad hoc* surgical instruments and materials for laparoscopic surgery, important advances have been made in the surgical procedures that can be performed with this technique in different specialties in the abdomen, pelvis, and thorax. Laparoscopic cholecystectomy is the gold standard for gallbladder resection for acute and elective cases. It has sought to further reduce trauma to the abdominal wall by reducing the number of surgical incisions or ports for its performance. This has led to the search to perform laparoscopic cholecystectomy through single access or port (single-port laparoscopic surgery). In 1995 Paganini performed the first single port laparoscopic cholecystectomy (SPLC); in 1997, Navarra published the first SPLC procedure in the world literature.³ In our country Dr. Fausto Davila, in Poza Rica, Veracruz, performed the first procedure of this type also in 1997. Since then, there has been great enthusiasm worldwide for applying this technique to different pathologies in the abdomen and thorax. This is the report of the SPLC experience of a group in private practice over eight years.

MATERIAL AND METHODS

A prospective, observational study of SPLC performed from June 2010 to December 2018 in a private general surgery practice was performed. The same surgical team operated on patients in different hospitals in Mexico City, Puebla, Puebla, and Acapulco, Guerrero.

All patients of both sexes between 18 and 75 years of age were included. They were non-consecutive patients with clinical, ultrasonographic, and computed axial tomography diagnoses of chronic calculous cholecystitis, non-lithiasis cholecystitis, and acute cholecystitis. In the absence of ultrasonographic evidence of gallbladder stones and based on the clinical picture, the history, the thickness of the gallbladder wall greater than or equal to 5 mm, the presence of excessive peri-vesicular fluid or a “bull’s eye” image suggestive of peri-vesicular edema were the diagnostic criteria for acute cholecystitis and indication for surgery.

Initially, it was proposed to perform SPLC on all cases scheduled for laparoscopic cholecystectomy; subsequently, subjects were selected based on imaging findings, general condition, and comorbidities of patients with acute and chronic cholecystitis.



Figure 1: The single-port laparoscopic cholecystectomy platform used in the study meets the features of other platforms.

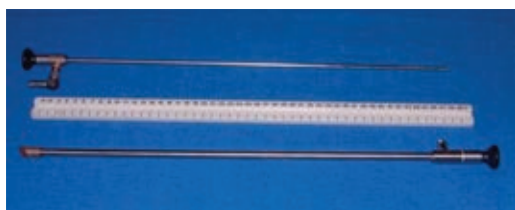


Figure 2: 5- and 10- mm diameter telescopes, 45 cm working length, and fiber optic 90-degree adapter.

Single-port laparoscopic cholecystectomy (SPLC)

In all cases, different single-port laparoscopic surgical platforms commercially available in our country were used (*Figure 1*). The incision to enter the peritoneal cavity was trans umbilical, longitudinal, 2.5 to 3 cm in length, hidden within the umbilicus limits, and indistinguishable three weeks after the procedure. No trocar was used immediately outside the trans umbilical incision. In some cases, an extra 3.5- or 5-mm puncture was used to help expose Calot's triangle or to hold the fundus of the gallbladder, depending on the anatomical difficulty of the case. Before the incision and with the patients under general anesthesia, a field block was applied with six subaponeurotic anesthetic points with 2 or 7.5% ropivacaine or 2% lidocaine with epinephrine, in addition to anesthetizing the skin and adipose tissue of the umbilicus.

In the first 30 cases, standard telescopes with a 30-degree viewing angle and 33 cm in length and laparoscopic instruments of average size that could not be angled were used. In two cases, a flexible tip laparoscope was used. Subsequently, 30- and 45-degree viewing angles and 45cm-long telescopes with 90-degree fiber optic adapter for the fiber optic cable or fiberoptic cables with 90-degree angled end on the telescope were used (*Figure 2*), as well as 44cm-long instruments, some with an angled tip and others with fixed bends. Insufflation pressure of 15 mmHg with maximum gas flow, illumination with the highest intensity, and monopolar and bipolar coagulation were used.

Once inside the peritoneal cavity, the platform chosen for SPLC was placed; in most cases, this included a surgical wound protector secured to the inside of the peritoneal cavity; for this reason, it was not necessary to use an extractor bag for the gallbladder. In patients with previous abdominal surgery, a digital dissection was performed to make room for the placement of the platform wound protector. After positioning the platform, a peritoneal cavity was reviewed with a 5 mm telescope inserted through the access in the 3 o'clock quadrant. The instruments for dissection and cutting were introduced through the access in the 6 and 12 o'clock quadrants. Occasionally, four devices, including the optics, were introduced simultaneously through the umbilical incision; in these cases, the diameter of the instruments was always 5 mm.

The first maneuver was clamping the gallbladder fundus with grasping forceps; in most cases, a 44cm, 5mm diameter SILS Endo Clinch™ forceps (Medtronic®), which is angled and rotating, was used (*Figure 3*). Then, a percutaneous suture of polypropylene 00 or preferably silk 0 or 1 with a straight needle was placed with an entry in the anterior aspect of the abdomen to the right of the round ligament of the liver and exit in the right subcostal lateral portion according to the dimensions of the abdomen of each patient. Anchoring of the suture was performed at the level of Hartman's pouch. This maneuver facilitates exposure of Calot's triangle and allows a critical safety revision (*Figures 4 and 5*).



Figure 3: 5 mm long clamping instrument with an angled tip and fixed curve.

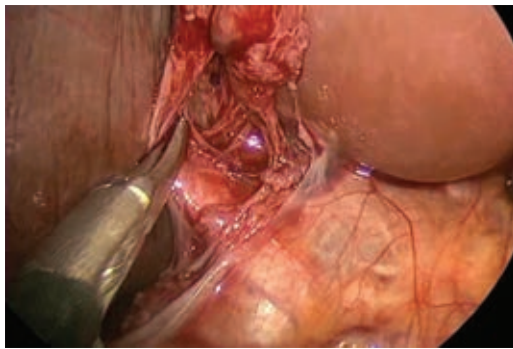


Figure 4: Critical safety view possible with adequate dissection and long instruments.

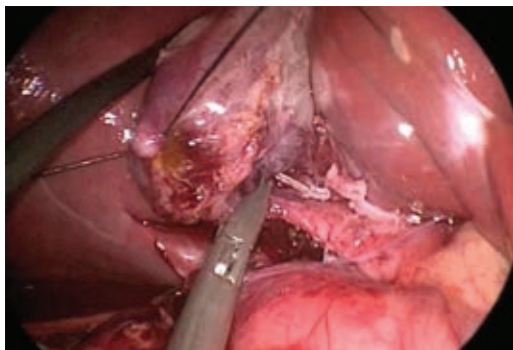


Figure 5: Dissection of Calot's triangle with the aid of a percutaneously placed rein with 0 or 1 silk passed with a straight needle to perform the "puppeteer's maneuver" of Hartman's pouch.

Section of the peritoneum was performed with a 45 cm long hook or monopolar scissors; the cut is in a V-shape of 3 to 4 cm in each branch with vertex at the site where the arrival of the cystic duct to Hartman's pouch was. Dissection, cutting, and closure of the cystic duct or cystic artery were never attempted as a first intention, even though they were easily identifiable.

Once the critical safety check had been performed, nylon hemostasis staples (Hem-o-Lok, Weck®) were placed with a reusable 45 cm-long applicator (Figure 6), and the artery and cystic duct were cut, as well as any other accessory vessels that might be found. In some cases, a 5 mm diameter disposable automatic metal staple

applicator was used, and a 10 mm diameter one-by-one reusable staple applicator. Then, sub-serosal dissection of the gallbladder was performed with different maneuvers using the percutaneous reins and the gallbladder fundus clamp until reaching the fundus of the gallbladder. The gallbladder's opening during sub-serosal dissection was not considered a complication or adverse event, nor was the outflow of bile from the gallbladder during these maneuvers or during the placement of the reins for manipulation of the Hartman's pouch during surgery. In three cases, sub-serosal retrograde dissection was performed due to the difficulty in identifying the structures of Calot's triangle. The gallbladder was removed through the umbilical incision without the need to enlarge it in any case. Before the conclusion of the surgery, hemostasis of the gallbladder bed was verified.

Only in one case was a vacuum drain left, which was decided at the end of the procedure, so that incision was not initially used to place any extra trocar for surgery. In female patients, the pelvic revision was performed before the end of the surgery, taking advantage of the ideal location of the trans-umbilical access in the center of the abdomen; if it was considered convenient, lysis of peritoneal pelvic adhesions was performed. In all cases, the incision was closed with non-absorbable 0 or 1-gauge polypropylene material with continuous stitches.



Figure 6: Nylon staples in the cystic duct before cystic duct cutting.

Surgical outcome variables

The variables studied were age, sex, body mass index, risk of pulmonary thromboembolism, *American Society of Anesthesiologists* (ASA) classification, surgical time in minutes, days of hospital stay (stratified into three groups: the first of stay less than 24 hours, the second of 24 to 48 hours and the third of more than 48 hours), whether the surgery was urgent or elective, conversion to conventional multiport surgery or open surgery, transoperative and postoperative complications, the performance of critical safety review, pain based on days of analgesic consumption, transoperative hemorrhage and degree of patient satisfaction.

The analgesic regimen used was the same for all patients: oral paracetamol every 8 hours alternating with sublingual ketorolac every 8 hours.

A questionnaire developed by our surgical team was used to define four levels of satisfaction: not satisfied, indifferent, satisfied, and very satisfied (*Annex 1*). The extended Clavien-Dindo classification⁴ was used to analyze complications, and the Caprini scale was used to classify the risk of pulmonary thromboembolism (PTE).⁵

Descriptive and analytical statistics

A database was created, initially in Excel, which was subsequently imported into the SPSS Statistics program for the Windows system, version 23.0. For quantitative variables, the mean was used as a measure of central tendency, along with the standard error of the mean (SE) and the standard deviation (SD), according to the distribution of the variable data, as measures of dispersion.

Qualitative variables were reported in frequencies and percentages, using Pearson's χ^2 test as the analytical statistic; for quantitative variables, the Kruskal-Wallis test for independent samples was used. The relationship of nonparametric variables was analyzed using Pearson's correlation coefficient.

RESULTS

Demographic and clinical characteristics of patients

A total of 106 patients undergoing SPLC were included. All patients were operated on one of the three single port platforms available (Lagis Port[®], Gelport Applied Medical[®], and SILS Medtronic[®]).

Of the total 106 patients, 88 (83%) were female and 18 (17%) were male ($p = 0.00$). The average age was 38.7 ± 12.6 years, with the youngest patient being 14 years old and the oldest 73. The population's average body mass index (BMI) was 26.3 ± 3.9 , with the maximum BMI being 42. For preoperative thromboembolic risk, 79 (74.5%) patients presented a low risk, 24 (22.7%) moderate risk, and three (2.8%) high risk. Regarding the pre-surgical ASA classification, 95 (89.6%) patients presented grade I and 11 (10.4%) grade II. Demographic characteristics are reported in *Table 1*.

Surgical procedure and postoperative outcome

The mean surgical time recorded was 85.7 ± 35.7 minutes. The average trans-surgical

Table 1: Demographic and clinical features.

Feature	n (%)
Age	38.7 ± 12.6
Sex	
Female	88 (83.0)
Male	18 (17.0)
Body mass index	26.3 ± 3.9
PTE risk	
Low	79 (74.5)
Moderate	24 (22.7)
High	3 (2.8)
ASA Classification	
I	95 (89.6)
II	11 (10.4)

PTE = pulmonary thromboembolism,
ASA = *American Society of Anesthesiologists*.

bleeding was 36.2 ± 28.3 ml. Of the total number of surgical procedures, the year in which SPLC was performed the most was 2012, with 18 (17%) procedures, followed by 2011 and 2013 with 17 (16%) procedures each; for each consecutive year of the study, the average surgical time was obtained, and the difference was found between the different years, with a $p = 0.005$ using the Kruskal-Wallis statistic, seeing a trend towards a decrease in the mean surgical time over the years, which is reported in *Figure 7*. Using Spearman's correlation coefficient, a value of -0.29 was obtained, with a $p = 0.003$, finding an inversely proportional correlation between the years of experience and surgical time. Similarly, an attempt was made to associate the presence of complications, conversion to conventional laparoscopic surgery, and days of hospital stay with the experience acquired over the years of surgery without finding any statistical significance.

Of the operated patients, 44 (41.5%) were operated on urgently and 62 (58.5%) electively ($p \leq 0.0001$). Only two conversion cases to conventional laparoscopic surgery found no relationship with urgent or elective surgery. One patient with gallbladder cancer was

initially converted to conventional multiport laparoscopic surgery. One patient with Mirizzi syndrome type I was initially converted to multiport surgery and open surgery. One patient had an accessory bile duct and choledocholithiasis and was directly converted to open surgery.

Transoperative and postoperative complications

Ten (9.4%) patients presented complications, six were transoperative, and four were postoperative; according to the Clavien-Dindo classification, two were type II, one type IIIa and one type IIIb. No relationship was found between complications and urgent or elective surgery; there were no deaths.

Three trans-surgical hemorrhages were reported and resolved during the same surgical event without needing technique conversion. Only one patient required transfusion of an erythrocyte concentrate on the second postoperative day.

In one patient, surgical wound dehiscence was managed on an outpatient basis with a primary suture in the office. Another patient operated during an instruction course in the technique presented intestinal occlusion on the seventh postoperative day with reintervention with exploratory laparotomy on the eleventh postoperative day, finding pexy of the terminal ileum loop in the umbilical scar wound, performing intestinal resection with primary anastomosis, with an excellent postoperative outcome; a different surgical team than ours intervened this patient. One patient was readmitted 40 days postoperatively due to intense abdominal pain. With imaging techniques, postoperative complications were ruled out and managed with analgesia and antibiotic therapy, resolving the abdominal pain.

Regarding hospital stay, 92.5% of the patients stayed between 24 and 48 hours after the surgical procedure, 4.7% stayed less than 24 hours after surgery, and the remaining 2.8% stayed more than 48 hours. Regarding postoperative pain, 73.6% of the patients presented low analgesic consumption.

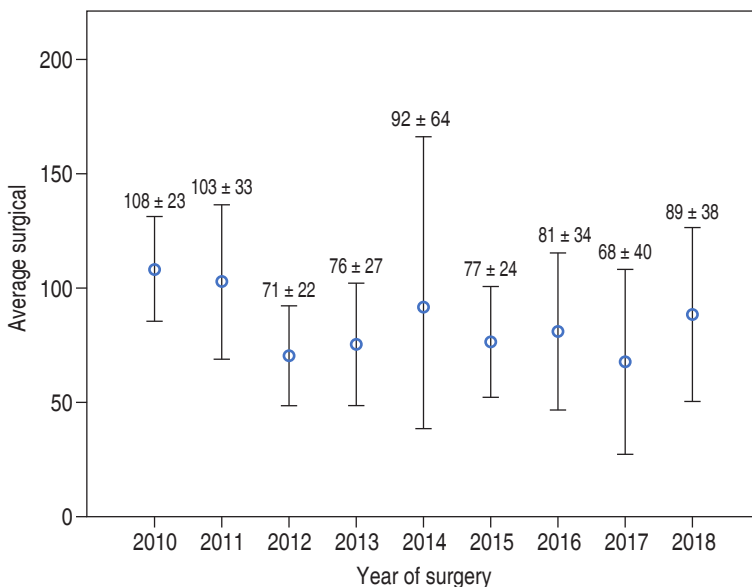


Figure 7: Average surgical time (minutes) according to the year of surgery.

Table 2: Surgical procedure features and outcomes.

Feature	n (%)	p
Surgery time	85.7 ± 35.7	
Bleeding	36.2 ± 28.3	
Type of surgery		0.080
Urgent	44 (41.5)	
Elective	62 (58.5)	
Complications		0.520
Transoperative	6 (5.6)	
Postoperative	4 (3.8)	
Total	10 (9.4)	
Conventional laparoscopic conversion	3 (2.8)	
Hospital stay		0.000
Less than 24 hours	5 (4.7)	
Between 24 and 48 hours	98 (92.5)	
Greater than 24 hours	3 (2.8)	
Postoperative pain		0.000
Mild	78 (73.6)	
Moderate	21 (19.8)	
Severe	7 (6.6)	
Satisfaction		0.690
Satisfied	51 (48.1)	
Very satisfied	55 (51.9)	

Therefore, they had mild postoperative pain. *Table 2* summarizes the results related to the surgical procedure. Regarding the post-surgical satisfaction questionnaire, 48% of the patients indicated feeling “satisfied” and 52% “very satisfied”, *Annex 1* shows the satisfaction questionnaire used.

DISCUSSION

Since the appearance and recognition of minimally invasive surgery (MIS), attempts have been made to improve techniques and add benefits for the patient by applying the principle of less surgical trauma. As a collateral effect, new instruments have been developed, and benefits that were not initially expected, such as better cosmesis,

and others that were always sought after, such as less postoperative pain (POP) and faster recovery.

The intention of reduced port surgery (RPS) and single port laparoscopic cholecystectomy is to achieve all the above outcomes (*Figure 8*). SPLC has become “the natural evolution” of MIS for cholecystectomy. In 2013, a randomized, prospective, multicenter, blinded, 1-year study comparing conventional multiport laparoscopic cholecystectomy surgery (MPLC) vs. SPLC was published.⁶ A total of 200 patients were randomized, 119 with SPLC vs. 81 with MPLC. In the preliminary phases of the study, the authors reported as primary objectives the feasibility and safety of SPLC and, as secondary objectives, POP pain, cosmesis, satisfaction with the procedure, and quality of life. The closure of the umbilical wound was at the discretion of the surgeon who had operated and is not specified in the material and methods section; therefore, no conclusions can be drawn about the influence of this aspect of the surgical technique used, which is very important in the development of a post-incisional hernia. The patients were blinded to how many incisions had been made up to seven days POP if any of the four surgical dressings placed (even if only one incision had been made) had not become dislodged. The MPLC group had one post-incisional hernia vs. 10 in the single-port group. Of these, five required reoperations. The SPLC group reported better cosmesis



Figure 8: The trans umbilical surgical scar appearance two weeks after single-port laparoscopic cholecystectomy.

rates at all stages of evolution up to 12 months after surgery. Other complications of the SPLC procedures were like those of MPLC. The authors conclude that cosmetically SPLC is better and that 50% of patients would be willing to pay more to be operated on with this technique.

Koo EJ and colleagues⁷ published a retrospective series of 100 cases similar to the present report regarding the evolution of the technique. In their results, like ours, they do not attribute any consequence to bile leakage during the separation of the gallbladder from the liver or during the manipulation of the gallbladder. Their percentage of conversion to multiport technique is high, with 21 cases, and the cause was poor visualization of Calot's triangle due to anatomical conditions of the liver. They did not have any conversion to open surgery. Their postoperative stay was long at 2.18 ± 1.2 days. They also report decreasing operative time as more experience is gained. They set their learning curve at 30 procedures, like our report. They had no complications that merited reoperation. They do not evaluate the long-term cosmetic outcome or the occurrence of post-incisional hernia. They conclude that SPLC is a safe and reproducible technique, with an adequate surgical time that can be reduced according to the experience acquired over time.

Few meta-analyses compare four-port MPLC vs. SPLC. Recently, in the article published by Laura Evers and collaborators,⁸ of the University of Maastricht, The Netherlands, they found nine studies that met the inclusion criteria with a total of 860 patients, all over 18 years of age, with ASA I to III classification, most of them being ASA I-II. Some of the studies included a comparison with mini-laparoscopic cholecystectomy; more moderate (wound infections, bile leaks, or intra-abdominal collections that were easily treated or subsided spontaneously) and severe adverse events (bile duct disruption, bile duct injuries, reoperations, intra-abdominal collections, bile leaks or intra-abdominal abscesses that required drainage) were reported in the single-port cholecystectomy (SPC) group. POP pain and cosmesis were significantly better in SPC patients. However,

the authors did not consider this to affect patients' quality of life. Surgical time was longer in SPC, and hospital stay did not vary between MPLC and SPLC.

In the study by Cinar H and his team from Turkey, the impact of SPC on quality of life was analyzed.⁹ Over nine years (2009-2018), 43 patients were operated on for SPLC and 114 with MPLC. The SF-36 format was used to measure the quality of life. The questionnaire evaluates physical functioning, social functioning, mood, vitality, pain, and well-being. POP complications were higher in MPLC than in SPLC (8 vs. 5). The incidence of post-incisional hernia in the SPLC group was not significantly higher than in MPLC. It is important to note that the authors closed the single incision in the SPLC with a nonabsorbable suture. Finally, the quality of life measured on the SF-36 format was similar in both groups, with better physical functioning in the SPLC patients.

Regarding the perception of the general population and patients regarding the procedure, there is an article in Holland by Sofie Fransen AF and colleagues¹⁰ in which the aspects mentioned above were studied. An anonymous questionnaire of 33 questions was applied to the general population with different levels of school education and to patients who were going to have a consultation with the surgeon to be scheduled for cholecystectomy; these were adult patients between 17 and 82 years of age. The questionnaire informed them of what SPLC and MPLC consisted of. It included 101 people from the general population and 104 patients who were going to be operated on for cholecystectomy. Seventy-two percent of the patients had never heard of SPLC. The safety of the procedures was the most critical issue for 96% of the respondents; 70% of the participants would be willing to travel to another city if their local hospital did not offer SPLC. The authors conclude that, although being cured of the condition and safety are most important for the general population, the perception of SPLC is favorable.

Our group of patients answered “satisfied” or “very satisfied” based on the satisfaction questionnaire attached at the end. Only one patient to whom the procedure was proposed was adamant in rejecting it for philosophical/religious reasons regarding the navel, as she explained.

Ning Sun and his group,¹¹ of Shenyang, Liaoning, in the People’s Republic of China, conducted a systematic review and meta-analysis published in 2018. They found six studies with 633 patients from 2011 to 2017 comparing SPLC vs. single-port robotic cholecystectomy (SPCr) using the single-port platform for the da Vinci Si robot system (Intuitive). They had an outcome of interest such as operative time (OT), intra-(IO), and postoperative (PO) complications, readmission rate, hospital stay, and cost. Skin-to-skin OT between the two techniques was similar; however, robot *docking* time was not considered. IO and PO complications were similar in both groups, so the authors conclude that using the da Vinci Si robot does not reduce the number of complications. The other outcomes, such as readmission, hospital stay, and conversions, are the same. There is an essential difference in the cost, with the robotic technique being significantly more expensive: 6,053.53 vs. 2,352.72 US dollars.

In a study by Fuertes-Guiró and Girabent-Farrés,¹² the cost of surgery and surgical time by comparing SPLC vs. MPLC were analyzed; in this study, they performed a meta-analysis to compare only these two aspects. They conclude that any surgical technique should include the cost-opportunity variable. Likewise, they report that the cost of both surgical techniques is the same, but from the point of view of surgical time, SPLC is at a disadvantage since the extra time used to perform it could be used to perform other procedures. This last aspect could be relevant for its use in public institutional settings, where optimizing surgical time, anesthesia, and the use of operating rooms is essential.

CONCLUSION

While the multiport technique is sufficient (and therefore considered in many cases the

gold standard) to meet minimally invasive requirements, SPLC offers additional benefits in terms of postoperative pain (73.6% with low analgesic consumption), cost, the level playing field in terms of hospital stay (97.2% of our patients had less than 48 hours of hospital stay) and surgical time (average of 85 minutes after obtaining the learning curve).

Our surgical team already has extensive experience in various single-port surgeries in addition to SPLC, with a total of 254 procedures, including appendectomies, Hiatal surgery, colonic resections, inguinal hernias, and scheduled and urgent gynecological procedures. We consider pelvis surgery and appendix surgery the ideal techniques to begin the practice of single-port surgery. Given that the patients were predominantly operated on privately, the SPLC does represent significant savings by dispensing with disposable trocars, whose cost is always higher than that of the single-port platform.

Regarding the future of SPLC, we think the technique is again considered an option, partly because a new robot designed exclusively for a single port has been developed. Undoubtedly, SPLC, which we could now call conventional SPLC without robot, as described in our study, represents a significant saving in several aspects such as equipment, instrumentation, and training, offering the same advantages; therefore, it should be a tool at the disposal of general surgeons trained in minimally invasive surgery.

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Annex 1: Satisfaction questionnaire.				
Please indicate the option most closely matches your post-discharge experience following your surgery for each column				
	Indifferent	Not satisfied	Satisfied	Very satisfied
1) Pain related to surgery	Indifferent to pain	Severe	Moderate	Mild
2) Return to normal activities	Indifferent	More than 2 weeks	1 to 2 weeks	Less than 1 week
3) Scar appearance one month after surgery.	Indifferent	Not satisfied	Satisfied	Very satisfied
4) Feeling of well-being	Indifferent	Bad	Good	Very good
5) Would you recommend this technique to anyone who requires it?	Indifferent	Definitely not	Yes	Definitely yes

Experience in the surgical management of cholelithiasis in the Surgery Service I of the Ruiz y Paez University Hospital Complex

Experiencia en el manejo quirúrgico de la colelitiasis en el Servicio de Cirugía I del Complejo Hospitalario Universitario Ruiz y Páez

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ABSTRACT

Objective: to determine the experience in the surgical management of cholelithiasis or biliary tract lithiasis in the Surgery Service I of the Ruiz y Paez University Hospital Complex from January 2017 to October 2019. **Material and methods:** this was a prospective, field, analytical, cross-section study. **Results:** the most frequent postoperative diagnosis was cholelithiasis with 70.20% of cases; in 65.38% of patients, clips were used as surgical management of cholelithiasis, and the total number of patients with laparoscopic cholecystectomy was 89.10%. The most common approach to the abdominal cavity was pneumoperitoneum insufflation through the Veress needle plus conventional trocars, having 80.45%. Most patients had a hospital stay between 24 to 48 hours with 83.01%; 94.60% of patients with laparoscopic cholecystectomy (n = 278) had no complications; surgical mortality associated with biliary pathology only occurred in one patient with laparoscopic cholecystectomy performance, represented by 0.32% of the total. **Conclusions:** surgical experience in laparoscopic surgery makes this operative technique the best alternative in treating acute gallbladder disease due to the lower risk of complications and shorter recovery rate.

RESUMEN

Objetivo: Determinar la experiencia en el manejo quirúrgico de la colelitiasis o litiasis de vías biliares en el Servicio de Cirugía I del Complejo Hospitalario Universitario Ruiz y Páez, de enero de 2017 a octubre de 2019. **Material y métodos:** Fue un estudio de tipo prospectivo, de campo, analítico y de corte transversal. **Resultados:** El diagnóstico postoperatorio más frecuente fue colelitiasis con 70.20% de casos, en 65.38% de los pacientes se emplearon clips como manejo quirúrgico de la colelitiasis, el total de pacientes con colecistectomía laparoscópica fue de 89.10%, el abordaje a la cavidad abdominal más común fue en pacientes con insuflación de neumoperitoneo a través de aguja de Veress más trocares convencionales, que tuvo el 80.45%; la mayoría de los pacientes tuvieron una estancia hospitalaria entre 24 a 48 horas con 83.01%; 94.60% de los pacientes con colecistectomía laparoscópica (n = 278) no presentaron complicaciones; la mortalidad quirúrgica asociada con patología biliar sólo se presentó en un paciente con realización de colecistectomía laparoscópica, representado por 0.32% del total. **Conclusiones:** La experiencia quirúrgica en cirugía laparoscópica hace que esta técnica operativa sea la mejor alternativa en el tratamiento de la enfermedad vesicular de curso agudo por menor riesgo de complicaciones y tasa de recuperación en menor tiempo.



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INTRODUCTION

The patient suffering from acute cholecystitis usually goes to the emergency services, where a clinical, laboratory, and ultrasound evaluation is performed. Once the diagnosis is established, the patient should be hospitalized, an intravenous line should be placed to administer solutions to maintain water and electrolyte balance, analgesics, oral feeding should be suspended, and a nasogastric tube should be placed if associated with vomiting and ileus due to pain. Antibiotics treat infectious complications and prevent surgical wound infections; the classic scheme combines ampicillin and gentamicin. In diabetic patients, metronidazole is used for anaerobes, associated with ciprofloxacin which is eliminated by the biliary route.¹ This association is helpful if there is associated cholangitis. The definitive treatment of acute cholecystitis is surgical by laparoscopic or conventional cholecystectomy.^{1,2}

The indication for surgical treatment will depend on the time elapsed, the evolution of cholecystitis, and the operative risk. Surgical therapy within the first three days of the onset of the clinical picture is advisable for all patients in operability conditions.^{1,3}

Early emergency cholecystectomy can be performed like elective cholecystectomy since the alterations of the gallbladder hilum allow recognition of the elements. The initial edema of the process contributes to facilitating vesicular dissection.^{4,5} After a week of evolution, this procedure is more challenging to perform due to hypervascularization and fibrosis of the gallbladder, which, together with the firm adhesions to neighboring organs, form a tumor or inflammatory plastron makes the removal of the gallbladder technically difficult, with the possibility of causing a lesion in the biliary tract due to the distortion of the biliary anatomy.⁶⁻¹⁰

The importance of the diagnosis, medical treatment, and surgical alternatives of acute cholecystitis is a source of great controversy, especially since the 60s when Essehig popularized early surgical treatment. Years later, these guidelines for its management were better directed by multiple authors, and in different media, as in our hospital since 1975.¹⁰⁻¹³

Currently, there are very few detractors of early surgery, convinced of the benefits of surgical treatment performed within the first 72 hours of the onset of acute symptoms, to find the gallbladder inflammation in the edema phase and that dissection is performed with minimal difficulty, as opposed to the progression that this may have towards degrees of greater surgical difficulty, such as the gangrenous phase or organized inflammation.^{14,15}

With the advent of laparoscopic surgery or video surgery in 1987, cholecystectomy was considered the “golden operation” of this new technique; however, acute gallbladder disease was initially a contraindication to be performed with it. The progress in implementing modern equipment and instruments, and the surgical experience in laparoscopic surgery, make this operative technique a new alternative in treating acute gallbladder disease.¹⁶⁻¹⁸ About the cholecystectomy technique, the laparoscopic route is increasingly used, which has been possible due to the more excellent experience of the surgical centers. When laparoscopic cholecystectomy began, acute cholecystitis was a contraindication due to the risk of injuring the biliary tract to the high number of conversions. Nevertheless, the conventional approach is still helpful in many places where the necessary experience, equipment, and instruments are unavailable.^{19,20}

Generally, the gallbladder is distended and does not allow its apprehension. No time should be wasted and go directly to the puncture and partial evacuation of its contents. This allows better manipulation and the possibility of performing a vesicular cholangiography. Ideally, a total cholecystectomy should be performed. Still, a Pribram-style partial cholecystectomy should be performed in unfavorable anatomical conditions, leaving a vesicular cap to fulgurate the mucosa and avoid hepatic bleeding.^{21,22} When it is impossible to recognize the elements of the hepatic hilum, another recourse is to perform a partial cholecystectomy leaving a distal part of the bassinet drained to the outside. Treating complicated acute cholecystitis (such as free perforation to the peritoneal cavity, sepsis, and intestinal obstruction due to biliary ileus) requires urgent surgery.²¹⁻²³

Cholecystectomy is a valuable procedure in patients at high operative risk because it allows vesicular drainage with the consequent improvement of the clinical picture. Percutaneous transhepatic cholecystectomy is performed under local anesthesia, by puncture, following the Seldinger technique guided by ultrasound or computed tomography. A pigtail catheter is placed, which temporarily or definitively resolves this severe condition, with a morbidity of 35% and a mortality of 21%. The tube must be left in place for a prolonged period (about two months or more) until the inflammatory process has subsided. It happens with some frequency that little bile drains during the first few days due to the embedded calculus, and when the inflammation decreases, the calculus is mobilized and allows bile drainage. The procedure's mortality is high due to patient conditions and not the procedure itself. Morbidity is low, the main complications being hemorrhage and coleperitoneum.^{24,25}

There is considerable controversy about the timing of laparoscopic cholecystectomy for acute cholecystitis. Although early open cholecystectomy does not involve an increase in morbidity or mortality over late cholecystectomy, it increases the risks of additional complications from gallstones; there is concern about increased morbidity rates in laparoscopic cholecystectomy performed as an emergency procedure and about the increased rate of conversion to open procedure during the acute phase. Although one of the main reasons for conversion in early laparoscopic cholecystectomy is inflammation obscuring the view of Calot's triangle, fibrotic adhesions are the main reason for conversion in the late treatment group. Severe inflammation is also one of the leading causes of bile duct injury. There are reports that hospital stay is more extended for early cholecystectomy.²⁶⁻²⁹

Only about 30% of laparoscopic cholecystectomies in the United States are performed during acute cholecystitis. Only 20% of surgeons in the United Kingdom perform laparoscopic cholecystectomy during acute cholecystitis. Three previous meta-analyses related to the topic were identified.²⁹ Two of these included open and laparoscopic cholecystectomy for comparison. The first

had only two trials. The second meta-analysis included three trials. Both meta-analyses included a Chandler et al. trial examining two different early treatment surgical strategies. The most recent meta-analysis by Lau and his team also had three studies. One was the study by Serralta et al. in which allocation was based on surgeon experience and, consequently, cannot be considered a randomized trial. However, none of the three meta-analyses found a significant difference in morbidity between early and late laparoscopic cholecystectomy in patients with acute cholecystitis.³⁰⁻³³

Given all that has been argued and considering the high incidence of this problem, the lack of relevant statistical information in the region, as well as the repercussions from the biopsychosocial point of view that patients may present, and the absence of this type of work in the area, it was decided to conduct this research to analyze the surgical management of patients with this diagnosis who attended the Surgery Service of the Complejo Hospitalario Universitario Ruiz y Paez, Venezuela. It was decided to carry out this research to analyze the surgical management of the gallbladder in patients with this diagnosis who attended the Surgery Service of the Complejo Hospitalario Universitario Ruiz y Paez, Venezuela, to evaluate the complications of the different surgical techniques used and to be able to use laparoscopic cholecystectomy as the gold standard in our health center.

MATERIAL AND METHODS

Type of Study: prospective, field, analytical and cross-sectional study.

Universe: represented by all patients attended at the Surgery Service I Complejo Hospitalario Universitario Ruiz y Paez, Venezuela, from January 2017 to October 2019.

Sample: was represented by all patients with a diagnosis of biliary tract lithiasis who met the inclusion criteria.

Inclusion criteria: 1) patients of both sexes with a diagnosis of biliary tract lithiasis who underwent surgery; 2) patients who voluntarily agreed to participate in the study through a signed consent form.

Exclusion criteria: patients with other digestive tract pathologies other than biliary tract lithiasis, chronic pathologies that could affect the natural evolution of the disease, and those who did not agree to participate voluntarily in the study through a signed consent form.

Procedures: to obtain the desired information for the research, it was necessary to comply with the following activities: patients were given a signed consent form to approve their participation in the study.

An instrument was then created and completed with the data obtained from each patient who was part of the study. The instrument, elaborated by the researcher, allowed recording of the necessary data for the research work using an interrogation, a physical evaluation of the patient, and surgical findings during the procedure. The variables to be included during the research were to compare the series' characteristics and surgical results and to know the therapeutic efficacy of conventional and laparoscopic cholecystectomy. Postoperative diagnosis, the material used in surgical management, abdominal cavity approach technique, postoperative hospital stay, macroscopic surgical findings, postoperative complications, surgery performed by specialist or resident, and surgical mortality were evaluated.

Statistical management: the SPSS statistical package for Windows, version 22.0, was used

for the statistical management of the study results, and the data were processed with descriptive statistics and presented in single- and double-entry simple frequency tables with numbers and percentages. The chi-square test (χ^2) was used with a p-value < 0.05 to consider a statistically significant relationship between the variables.

RESULTS

The total number of patients with laparoscopic cholecystectomy was 89.10% (n = 278), the most common abdominal cavity approach used was by Veress needle (n = 251), followed by Hasson trocar in 8.65% (n = 27); while conventional cholecystectomy was performed in 10.90% of patients (n = 34), in them the subcostal transverse incision was used in 8.33% (N = 26) and the Kocher incision in 2.57% (N = 8) (Table 1).

When evaluating the relationship between hospital stay and type of surgery, it was obtained that in patients with conventional cholecystectomy, it was 10.90% (n = 34). The most common length of stay was an average of 72 hours with 7.05% (n = 22), followed by longer than 72 hours with 2.88% (n = 9); while in patients with laparoscopic cholecystectomy was 89.10% (n = 278), the most common hospital stay time was an average of 48 hours 82.05% (n = 256), followed by 48 to 72 hours 5.45% (n = 17); it is noteworthy that all patients

Table 1: Distribution according to the abdominal cavity approach technique in conventional and laparoscopic cholecystectomy in patients with bile duct lithiasis. N = 312.

Surgical technique	Cholecystectomy				Total	
	Conventional		Laparoscopic		N	%
	n	%	n	%		
Veress needle	0	0.00	251	80.45	251	80.45
Hasson trocar	0	0.00	27	8.65	27	8.65
Subcostal transverse incision	26	8.33	0	0.00	26	8.33
Kocher incision	8	2.57	0	0.00	8	2.57
Total	34	10.90	278	89.10	312	100.00

Statistical value 21.023, critical value 27.621, p = 0.01 (significant), gl (degrees of freedom) 4.

Table 2: Distribution according to postoperative hospital stay between conventional and laparoscopic cholecystectomy in patients with biliary tract lithiasis. N = 312.

Hospital stay (h)	Cholecystectomy				Total	
	Conventional		Laparoscopic			
	n	%	n	%	N	%
< 24	0	0.00	2	0.64	2	0.64
24 a 48	3	0.96	256	82.05	259	83.01
48 a 72	22	7.05	17	5.45	39	12.50
> 72	9	2.88	3	0.96	12	3.85
Total	34	10.90	278	89.10	379	100.00

Statistical value 13.259, critical value 16.114, $p = 0.021$ (significant), gl (degrees of freedom) 4.

who lasted less than 24 hours belonged to this group (Table 2).

In relation to the macroscopic surgical findings in surgery for biliary tract lithiasis in the patients under study, there was evidence of: scleroatrophic gallbladder in 5.45% ($n = 17$), peritoneal adhesions in 27.24% ($n = 85$), adhesions of Calot's triangle in 11.54% ($n = 36$), calculi larger than 0.5 cm in 60.58% ($n = 189$) and smaller than 0.5 cm in 39.42% ($n = 123$), dilated common bile duct in 3.52% ($n = 11$) and wall thickness less than 4 mm in 57.05% ($n = 178$) and greater than or equal to 4 mm in 42.95% ($n = 134$) (Table 3).

In patients with laparoscopic cholecystectomy ($n = 278$), 94.60% ($n = 263$) had no complications. Compared to patients who underwent conventional cholecystectomy ($n = 34$), 58.82% ($n = 20$) had no postoperative complications. The prevailing complication was subhepatic abscess in 14.71% ($n = 5$), followed by surgical site infection in 11.76% ($n = 4$), biliary fistula and bile duct injury with 5.88% ($n = 2$) each, and bleeding of the gallbladder bed in 2.94% ($n = 1$). Surgical mortality associated with patients with cholelithiasis or bile duct lithiasis only occurred in one patient who underwent laparoscopic cholecystectomy, representing 0.32% ($n = 1$) of the total, caused by the most common complication: subhepatic abscess (Table 4).

DISCUSSION

The most frequent postoperative diagnosis in the patients of this study was cholelithiasis, with 70.20% of cases, followed by calculous hydrocholecystitis (10.26%) and calculous pycholecystitis (8.01%). This data correlates with that described by Castro and collaborators³⁴ in their research to characterize the operated patients and identify the factors associated with the complications of acute cholecystitis in the Rafael Uribe Clinic of Cali (Colombia), where the postoperative diagnosis in 53.7% of the cases was vesicular lithiasis, followed by hydrocholecystitis (22%) and piocholecystitis (20.4%). They concluded that in the operative findings of this group of patients, it was found, as expected, that the most frequent was the presence of calculi inside the gallbladder, single or multiple, since it is a known fact that the primary etiology of cholecystitis is calculi.

In 65.38% of the patients, clips were used for surgical management of the artery and cystic duct continued with 0 silk ligation (16.35%) and 2-0 silk ligation (10.26%), and 0 polyglycolic acid ligation (8.01%). Data are consistent with a meta-analysis published by Portela and his team³⁵ to evaluate the economic impact of recovery in laparoscopic cholecystectomy performed at "Gustavo Aldereguía Lima" University Hospital, Cienfuegos, with a total of 180 operated patients. In 85% of the cases,

clips were used; among its benefits, it was described as an easy procedure to perform, it respects the principles of safe surgery, it does not need autoclave sterilization, and only the high-level disinfection policy attributable to the endoscopic instruments is applied.

Of the total number of patients with laparoscopic cholecystectomy (89.10%), the

most common approach to the abdominal cavity was in patients with pneumoperitoneum insufflation through the Veress needle plus conventional trocars in 80.45%, followed by the Hasson trocar approach in 8.65%. In comparison, in patients with conventional cholecystectomy (10.90%), the subcostal transverse incision was used in 8.33%, and the

Table 3: Distribution according to macroscopic surgical findings in surgery for biliary tract lithiasis.

Surgical findings		n	%
Scleroatrophic gallbladder	Yes	17	5.45
	No	295	94.55
Peritoneal adhesions	Yes	85	27.24
	No	227	72.76
Calot's triangle adhesions	Yes	36	11.54
	No	276	88.46
Calculi (cm)	< 0.5	123	39.42
	≥ 5	189	60.58
Dilated common bile duct	Yes	11	3.52
	No	301	96.48
Wall thickness (mm)	≥ 4	134	42.95
	< 4	178	57.05

Table 4: Distribution according to postoperative complications of conventional and laparoscopic cholecystectomy.

Complications	Cholecystectomy			
	Conventional		Laparoscopic	
	n	%	n	%
Did not present	20	58.82	263	94.60
Subhepatic abscesses	5	14.71	9	3.24
Operative site infection	4	11.76	3	0.72
Bleeding of the vesicular bed	1	2.94	3	1.17
Bile duct injury	2	5.88	0	0.00
Biliary fistula	2	5.88	0	0.00
Total	34	100.00	278	100.00
Mortality	0	0.00	1	0.32
Yes	34	10.90	277	88.78
No	0	0.00	1	0.32
Total	34	10.90	278	89.10

Kocher incision in 2.57%. Data described by Galloso and his group,³⁶ in the publication of an article on the basic and specialized instruments in the video laparoscopic cholecystectomy performed at Provincial Hospital "Docente Julio R. Alfonso Medina", Matanzas, Cuba, in which they describe that the Veress needle is used to approach the abdomen blindly and introduce the CO₂, and thus perform the pneumoperitoneum, which facilitates the surgical intervention in a 4:1 ratio, it has a particular device so that when perforating the aponeurosis the tip of the needle is retracted, avoiding injury to the anatomical structures of the abdominal cavity, allowing the boom and implementation of this technique between 80 and 85% of cases.

On the other hand, most patients had a mean hospital stay of 24 to 48 hours with 83.01%, continuing between 48 to 72 hours in 12.50%, more than 72 hours in 3.85%, and, finally, less than 24 hours in 0.64%. Similar data to those obtained by Cordero and colleagues³⁷ in their study to observe the association of the type of cholecystectomy with the time of post-surgical hospital stay in the Emergency Department, General Hospital of Boca del Río, Veracruz, Mexico, where 54.1% had a post-surgical stay between 24 to 48 hours, 18.6% less than 24 hours and 14.3% between 48 to 72 hours, thus reporting that the reduction of the hospital stay favors the rapid reintegration of the patient to his daily activities, determined by several factors, mainly by the presence of nosocomial infections, postoperative complications and the type of surgery used. Likewise, in the study by Estepa and collaborators³⁸ on cholecystectomy in the surgical treatment of gallbladder lithiasis, most patients operated, 141 (95.9%), had a stay of fewer than 48 hours.

About the macroscopic surgical findings in surgery for biliary tract lithiasis in the study patients, there was evidence of scleroatrophic gallbladder in 5.45%, peritoneal adhesions in 27.24%, adhesions of Calot's triangle in 11.54%, calculi larger than 0.5 cm in 60.58% and smaller than 0.5 cm in 39.42%, dilated common bile duct in 3.52%, and wall thickness less than 4 mm in 57.05% and greater than or equal to 4 mm in 42.95%. Data partially related to the

results of Pizarro,³⁹ to determine the prevalence and risk factors associated with conversion from laparoscopic cholecystectomy to conventional cholecystectomy in the Surgery Service of the Central Hospital of the Peruvian Air Force, an association was found with the thickness of the gallbladder wall greater than or equal to 4 mm in 43.7% of patients with gallbladder lithiasis, scleroatrophic gallbladder in 5.7%, adhesions in 27.6% during the transoperative period. Gomez and his team,⁴⁰ in their research to evaluate the size of the bile duct in patients with gallbladder pathology, demonstrated that the average size of the common bile duct during cholecystectomy can be found slightly dilated in 15 to 22.5% of cases.

Montalvo and his group⁴¹ in their research to know the frequency of gallbladder lesions, through the definitive study of pathological anatomy, about the number of patients with gallbladder lithiasis (184 cases), when reviewing the size of the stones, they reported from 0.1 to 0.5 cm in 82 patients (46%), from 0.6 to 1.0 cm in 46 patients (25%) and from 1.0 to 2.0 cm in 27 patients (15%).

Álvarez and collaborators⁴² quote what Steven Strasberg already described in 2002 about difficult laparoscopic cholecystectomy that Calot's triangle is a surgical plane delimited by the cystic duct, the main biliary tract, and the free edge of the hepatic segment IVb, indicating that one of the most frequent causes of conversion to open surgery found in the scientific literature are dense adhesions in Calot's triangle (12.3%), concluding that, given how aberrant the anatomy of the biliary tract can be, there is no better way to ensure the integrity of the biliary tract than a meticulous and very gentle dissection of the elements of Calot's triangle. The surgeon must provide the anatomical repairs or perform a cholangiography before ligating or clipping the vascular structures. One of the requirements to achieve the critical view of safety is that Calot's triangle must be perfectly cleaned of fat and fibrous tissue without it being necessary to expose the common bile duct.

In patients with laparoscopic cholecystectomy (n = 278), 94.60% had no complications. The most common complication in this group was a subhepatic abscess in

3.24%, then bleeding of the gallbladder bed in 1.08%, infection of the operative site in 0.72%, and bile duct injury in 0.00%. Compared to the patients who underwent conventional cholecystectomy (n = 34), 58.82% had no adverse effects. The prevailing complication was a subhepatic abscess in 14.71%, followed by surgical site infection in 11.76%, biliary fistula and bile duct injury with 5.88% each, and bleeding of the gallbladder bed in 2.94%. Data that partially correlate with the research of Cordero and his group³⁷ indicate that post-surgical complications are a cause of concern at the hospital level; those that occur through laparoscopic cholecystectomy can also occur in open cholecystectomy, but their frequency varies. This study found that the prevalence of postoperative complications in patients undergoing laparoscopic cholecystectomy (4.7%) was significantly lower than in those undergoing conventional cholecystectomy (12.6%). For the conventional group, surgical wound infection showed the highest prevalence (50%), followed by urinary tract infection (18.7%), while in the laparoscopic cholecystectomy group, only one complication occurred.

Data that correlate with the study by García and Ramírez,⁴³ that compared the laparoscopic cholecystectomy technique against the open cholecystectomy technique in acute gallbladder pathology, at the General Hospital "Dr. Darío Fernández Fierro", ISSSTE, Mexico City, Mexico. In the group analysis for patients undergoing laparoscopic cholecystectomy, the following results were obtained: in the post-surgical length of stay, the mean was 2.15 days with a minimum of one day and a maximum of five days of post-surgical hospital stay: 12 (23%) patients required one day of post-surgical stay, 27 (52%) needed two days, nine (17%) three days, one (4%) two days and only three (6%) stayed five days. For patients who underwent open cholecystectomy, the results were as follows: for the postoperative length of stay, the mean was 3.8 days with a minimum of one day and a maximum of six days of postoperative hospital stay; two (3%) patients required one day of postoperative stay, 20 (33%) needed two days, 25 (42%) three days, eight (13%) four days,

while five patients stayed more than five days, due to surgical wound infection in three cases and two due to evisceration. Similarly, Estepa and colleagues³⁸ state that the average hospital stay for laparoscopic cholecystectomy is 1.6 versus 4.3 days for open cholecystectomy, while Garcia showed that the length of hospital stay is longer among postoperative patients for open versus laparoscopic cholecystectomy (p = 0.0038).

In a study on the complications of biliary surgery at the Hospital Universitario Marqués de Valdecilla, Santander, it is difficult to establish an absolute mortality figure for each biliary surgery procedure. Still, taking cholecystectomy as a reference, mean values for the open procedure concerning the laparoscopic approach are 0-1.8 versus 0-0.5% each, respectively; however, these will depend on several factors, mainly the presence of comorbidities in the patient.⁴⁴

CONCLUSIONS

The most frequent postoperative diagnosis in patients under study was vesicular lithiasis.

Clips were used for surgical management of cholelithiasis in most patients.

In patients with laparoscopic cholecystectomy, the most common approach to the abdominal cavity used was the Veress needle and, in conventional surgery, the transverse subcostal incision.

Most patients had a hospital stay of 24 to 48 hours.

About the macroscopic surgical findings in surgery for biliary tract lithiasis in the patients under study, the most significant results were peritoneal adhesions, stones larger than 0.5 cm, and wall thickness less than 4 mm.

Complications of laparoscopic cholecystectomy were categorized as minor complications, which can also occur in open cholecystectomy, but their frequency varies, being higher in the second group.

Hospital stay was longer in patients with conventional cholecystectomy compared to the laparoscopic surgery group, with statistical significance between variables.

As the study period elapsed, a higher frequency of laparoscopic surgeries performed

by second and third-year postgraduate residents became evident.

Surgical mortality associated with biliary pathology is infrequent and mainly associated with the patient's comorbidities.

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Fournier's gangrene

Gangrena de Fournier

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Palabras clave:

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ABSTRACT

Fournier's gangrene is a rare, life-threatening surgical emergency consisting of necrotizing fasciitis of the external genitalia, perineal, and perianal region. It often arises from an infection in the anorectal area that progresses rapidly and has a mortality of up to 40%, even with adequate treatment. Treatment consists of one or more emergency surgical interventions with debridement of devitalized tissue and specific antibiotic therapy.

RESUMEN

La gangrena de Fournier es una emergencia quirúrgica rara que pone en peligro la vida, consiste en una fasciitis necrosante de los genitales externos, de la región perineal y/o perianal. Con frecuencia proviene de una infección en la región anorrectal que progresa rápidamente y tiene una mortalidad de hasta 40%, incluso con tratamiento adecuado. El tratamiento consiste en una o varias intervenciones quirúrgicas de urgencia con desbridamiento del tejido desvitalizado y antibioterapia específica.

INTRODUCTION

Fournier's gangrene was first described by the French venereologist Jean-Alfred Fournier in 1883 when he recorded a case of sudden-onset idiopathic gangrene in a previously healthy young man.

It is a rare disease that represents < 0.02% of total hospital admissions. As described by Auerbach et al, it occurs in approximately 1.6 cases per 100,000 people and in 0.25 women per 100,000 people per year. This condition affects both sexes, but usually occurs in men, with a 10:1 ratio with respect to women. It occurs less frequently in women because venous and lymphatic drainage of the perineum occurs vaginally.

The average age of presentation is 50 years, but it manifests in an extensive range from 42 to 70 years of age, and the risk of presentation increases with age.¹⁻³

It is considered a medical-surgical emergency due to its rapid progression, 2 to 3 cm per hour. It is characterized as a very aggressive type 1 necrotizing fasciitis of the perineal, genital, and perianal regions, with a high morbimortality reported in the literature to be up to 80% in the absence of timely treatment. For a long time, it was considered an idiopathic condition; however, as described by Singh and collaborators and Chernyadyev and his team, less than a quarter of the cases are classified in this way since most of them are caused by an underlying infection that can be found in the anorectal region in 30-50%, in the urogenital region in 20-40% and skin of external genitalia in 20%; it has also been described that trauma in these areas can be a predisposing cause.⁴⁻⁷

There are several predisposing factors for the development of Fournier's gangrene, which have as underlying cause an alteration

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of the immune system that creates a favorable environment for the development of infections such as diabetes (more frequent), chronic alcoholism, malnutrition, immunosuppression (chemotherapy, steroids, malignancy), disease by human immunodeficiency virus, lymphoproliferative syndromes, among others.^{5,7}

It is a pathology that frequently requires admission to the Intensive Care Unit (ICU), multiple surgical interventions, and involves high economic costs. Jiménez-Pacheco and collaborators calculated the approximate global health care cost of a patient with Fournier's gangrene in a hospital in Granada, Spain, concluding that it is more than 25,108.67 euros, that is, 627,716.75 Mexican pesos, according to the current exchange rate.⁸

ETIOLOGY

Fournier's gangrene is a polymicrobial infection in 54 to 80% of cases, according to the studies by Luján et al. and Gadler. The most isolated microorganisms are those found in the perineum and external genitalia, which are aerobic and anaerobic bacteria that act synergistically, causing tissue necrosis (Table 1). The most reported bacterium is *Escherichia coli*.⁹⁻¹³

Table 1: Microorganisms most frequently involved in Fournier's gangrene.

According to oxygen requirements	Bacteria (%)
Anaerobes	<i>Bacteroides spp.</i> (38.6)
	<i>Streptococcus spp.</i> (37.1)
	<i>Enterococcus spp.</i> (27.1)
	<i>Staphylococcus spp.</i> (25.7)
	<i>Proteus spp.</i> (18.6)
Aerobes	<i>Escherichia coli</i> (40.0)
	<i>Pseudomonas spp.</i> (24.3)
	<i>Klebsiella pneumoniae</i> (20.0)

Source: Yilmazlar T et al¹³ and Ersay A et al.¹⁴

Several predisposing factors have been significantly related to the development of Fournier's gangrene, which has as a common basis an alteration in the immune system that creates a favorable environment for the development of infections; these factors include diabetes, systemic arterial hypertension, obesity (BMI > 30), smoking and immunosuppression, mainly.^{2,6,13,14}

Diabetes is considered the most prevalent comorbidity in these patients, reported in up to 60%, as described by Voelzke and colleagues, Vargas and his team, and Hatipoglu and colleagues.^{7,15-19}

Fournier's gangrene has a multifactorial origin; local factors include urological pathology (surgery, urinary tract infection, paraphimosis, urethral stricture, traumatic catheterization), anorectal pathology (abscesses, surgery, rectal trauma), dermatologic (purulent skin infections, allergic reactions), proctologic (perirectal abscess, perianal abscess), scrotal or vulvar cellulitis or abscess, hidradenitis, Bartholinitis, and pressure ulcers.¹⁷⁻¹⁹

Depending on the microbiological agent, necrotic soft tissue infections can be categorized into four groups: **type 1 (polymicrobial)** is the most common type and accounts for more than 50% of infections. The synergistic action of aerobic, anaerobic, and facultative anaerobic bacteria exists. It usually affects immunocompromised patients or those with severe comorbidities, affecting the trunk and perineum; **type 2 (monomicrobial)** may be more aggressive than type 1 and is less common; group A β -hemolytic *Streptococcus* is the most common agent and occurs more frequently with a history of trauma or recent surgery; **type 3 (clostridial myonecrosis)**, responsible for less than 5% of infections, is related to *Clostridium perfringens* and *Aeromonas hydrophila*, *Clostridium perfringens* is the bacterium most frequently involved in traumatic injuries. A common clinical finding in these cases is crackled due to gas production by these bacteria. It affects extremities, trunk, and perineum and spreads rapidly, resulting in multiple organ failure and mortality within 24 hours without treatment. **Type 4 (fungal)**, secondary to *Candida spp.* and *Zygomycetes*, usually in immunocompromised patients

and after trauma, affects extremities, trunk, and perineum. It is aggressive and rapidly progressive.^{2,11,18}

PATHOPHYSIOLOGY

A localized primary infection allows the entry of commensal bacteria into the perineum, causing an inflammatory reaction that causes obliterative endarteritis in the affected area, resulting in thrombosis of small subcutaneous vessels and necrosis of the affected tissue that will subsequently cause low oxygen concentrations and growth of anaerobic bacteria. Aerobic and anaerobic bacteria act synergistically, producing enzymes such as collagenase, heparinase, hyaluronidase, streptokinase, and streptodornase, which destroy the affected tissue. Aerobic microorganisms produce vascular thrombosis and dermal necrosis due to heparinase and collagenase activity. The impaired activity of phagocytic leukocytes due to hypoxia in necrotic tissue is responsible for the spread of infection since oxygen is necessary to produce antibacterial substances by leukocytes.^{5,19}

CLINICAL MANIFESTATIONS

The presentation depends on the stage of infection, the patient's comorbidities, and general health status. There may be a prodromal period with symptoms such as genital discomfort, pruritus, and fever for days, sometimes weeks, before more severe symptoms occur.

Fournier's disease has an insidious course, in most cases presenting with scrotal or vulvar pain that usually does not correspond to clinical findings, edema, cellulitis, and erythema, which may be accompanied by a foul odor, crepitus, and systemic data such as fever, hypotension, and tachycardia; pruritus, pain, and malaise usually worsen three to five days before patients go to the hospital, progressing to blistering, ischemia and necrotic lesions. Initially, the superficial skin is intact while the necrotizing process spreads into the fasciae, making timely diagnosis difficult. The infection spreads 2.5 cm per hour without showing changes in the skin. After a few

hours, hyperthermia in the genitals and tissue necrosis begin. As described by Hernandez and collaborators, urination becomes painful and difficult.^{20,21}

Subsequently, it is characterized by skin, subcutaneous tissue, and muscle necrosis, which can cause sepsis and multiorgan failure that can lead to death.^{10,19} Local hypoxia causes infarction of the regional nerves so that initially there is pain and later anesthesia of the area, as shown in *Figures 1 and 2*.^{6,18}

The superficial fascia of the perineum or Colles' fascia covers the region's muscles, is continued by Dartos' fascia of the penis and scrotum in men and the vulva in women, and by Scarpa's fascia of the anterior abdomen. These fascial planes are united and facilitate the rapid spread of infection. In the male, the internal and external spermatic fasciae, and the vessels of the retroperitoneum, independent of the vessels of the urogenital and anogenital region, protect the testis from infection. Buck's fascia lining the urethra and the corpus cavernosum give additional protection to this area.¹⁸

DIAGNOSIS

Diagnosis is based on clinical findings of inflammation and necrosis of the affected area, crepitus, foul odor, and fever.¹²

Plain radiography may show subcutaneous emphysema extending from the perineum and external genitalia to the inguinal region, thigh, and anterior abdominal wall. Ultrasound shows subcutaneous emphysema and echogenic areas with a "dirty shadow" in the scrotal or perineal region. The computed tomography (CT) shows subcutaneous air and heterogeneous density in the area with a thickened and edematous scrotal or vulvar wall. These studies help to differentiate a necrotizing infection from other pathologies. MRI shows subcutaneous emphysema, thickening of the scrotal wall, and fluid accumulation and helps to determine the extent of the disease. Ultrasound or CT are sufficient diagnostic methods.^{5,12,19}

Imaging studies can help establish the extent of the necrotic process but should not delay the initiation of treatment, as this is associated with increased mortality.⁵



Figure 1: Diabetic patient with early-stage Fournier gangrene.

Of laboratory studies, blood biometry evaluates the degree of systemic inflammatory response and infection or concomitant anemia, thrombocytopenia, or thrombocytosis; the blood chemistry is important to evaluate renal function, C-reactive protein, blood cultures, and, as reported by Mehanic and collaborators and Novoa-Parra and his team, procalcitonin is very useful in the prediction of septic shock in patients with Fournier's gangrene, and has even proved to be a more effective method than the scales currently used for its diagnosis; a low procalcitonin level would help us to rule out its diagnosis early.^{6,10,22,23}

The histological examination will reveal necrosis of the superficial and deep fasciae, fibrinoid coagulation in the vascular lumen, infiltration of polymorphonuclear cells in the tissues, and necrotic detritus. Venous thrombosis of the affected tissues is very significant.⁶

Scoring systems have been developed for the diagnosis and prognosis of Fournier gangrene, such as the LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) scale, which includes variables that will help differentiate necrotizing fasciitis from other soft tissue infections; values for diagnosis range from 0-13 and prognosis: low risk equal to or less than five points,

intermediate six to seven points, high risk similar to or greater than eight points, with a probability of necrotizing soft tissue infection of < 50%, 50-75% and > 75% respectively (Table 2).²⁴⁻²⁶

The Fournier gangrene severity index (FGSI) determines the risk of mortality; it was created in 1995 by Laor et al. and is the most used scale, with a sensitivity of 65-88% and specificity of 70-100% (Table 3). This index assesses body temperature, heart rate, respiratory rate, sodium, potassium, creatinine, bicarbonate, leukocytes, and hematocrit; a score > 9 is associated with a 75% probability of death, equal to or less than nine is associated with a 78% probability of survival.^{12,13,20,27,28}

Differential diagnoses should be made with dermatological and systemic pathologies such as scrotal cellulitis, testicular torsion or abscess, acute epididymitis, balanitis, strangulated inguinoscrotal hernia, vasculitis, occlusive vascular syndromes, polyarteritis nodosa, erythema necrolytic migrans, herpes simplex, and warfarin necrosis.^{5,29}

TREATMENT

The key to treatment consists of three fundamental principles: 1) hemodynamic stabilization (urgent resuscitation with intravenous fluids, acid-base, and metabolic stabilization), 2) empirical broad-spectrum



Figure 2: Advanced stage of Fournier's gangrene. Source: Caliskan S et al.¹¹

antibiotic therapy, and 3) debridement of necrotic tissue. The goals of treatment are to reduce systemic toxicity, halt the progression of necrosis, and eliminate the causative microorganism.^{5,6}

All patients should undergo surgical debridement within the first 12 hours of admission; this step is crucial to stop the progression of the infection, according to Singh and collaborators, and a delay of a few hours to initiate debridement has been associated with a significant increase in mortality in these patients, so it is considered the most important factor for survival.^{5,6,12,17,19,20} On average, 3.5 surgical procedures per patient are required for adequate infection control.⁵

Empirical antibiotic therapy directed to the most frequently involved microorganisms

should be initiated. According to the recommendations of Carruyo and his team, initial management should be done with three groups of antibiotics: 1) third-generation cephalosporins or aminoglycosides to cover Gram-negative aerobic microorganisms, 2) benzathine penicillin or amoxicillin to cover *Streptococcus* type microorganisms and 3) metronidazole or clindamycin to cover anaerobic microorganisms; in contrast to Chennamsetty and collaborators who likewise recommend a triple scheme of empirical antibiotic therapy, but include: 1) penicillin or third-generation cephalosporins, 2) aminoglycosides, and 3) metronidazole or clindamycin; they also recommend adding vancomycin in case of suspected *S. aureus* infection.³⁰⁻³² It is recommended to perform a culture and antibiogram of the lesion to modify the antibiotic therapy or continue with the established one.

Debridement continues until all necrotic tissue has been removed and healthy granulation tissue is established in the wound, removing all necrotic and devitalized tissue as soon as possible; postponing increases the risk of death. Characteristic features during debridement include the absence of bleeding secondary to thrombosis of blood vessels, foul odor, grayish discoloration of soft tissues due to necrosis, fluid such as "dirty water" pus, and detachment of tissues with digital dissection.^{5,6,12,17,19,20,30-32}

The overall mortality of Fournier's gangrene has been described as 20-40% in most follow-ups, but Sorensen reported it at 88%.⁴ Caliskan et al. report that adequate debridement reduces mortality by up to 16%. A second look surgery at 24 hours is recommended; in case of deterioration of the patient's clinical condition, it should be performed earlier.^{6,12,15,17,19}

Alternative methods such as VAC therapy® (*vacuum-assisted closure*) or therapy with recommended negative pressure of 50 to 125 mmHg, which is used in the treatment of many chronic wounds, as it stimulates the blood supply in the affected region and promotes the migration of inflammatory cells with the formation of granulation tissue. Hyperbaric oxygen therapies may accelerate

Table 2: LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) scale for the diagnosis and prognosis of Fournier's gangrene.

Variable	Score
C-reactive protein (mg/dl)	
< 15	0
> 15	4
Leukocyte count (per mm ³)	
< 15,000	0
15,000-25,000	1
> 25,000	2
Hemoglobin (g/dl)	
> 13.5	0
11-13.5	1
< 11	2
Sodium (mmol/l)	
> 135	0
< 135	2
Creatinine (mg/dl)	
< 1.6	0
> 1.6	2
Glucose (mg/dl)	
< 180	0
> 180	1

Modified from: Liao C et al.²⁴

Table 3: Fournier gangrene severity index.

Variable	High abnormal values				Normal	Low abnormal values			
	+4	+3	+2	+1		0	+1	+2	+3
Temperature (°C)	> 41	39-40.9	-	38.5-39	36-38.4	34-35.9	32-33.9	30-31.9	< 29
Heart rate	> 180	140-179	110-139	-	70-109	-	55-69	40-54	< 39
Respiratory frequency	> 50	35-49	-	25-34	12-24	10-11	6-9	-	< 5
Serum sodium (mmol/l)	> 180	160-170	266-159	350-354	130-149	-	120-129	111-119	< 110
Serum potassium (mmol/l)	> 7	6-6.9	-	5.5-5.9	3.5-5.4	3-3.4	2.5-2.9	-	< 3.5
Serum creatinine (mg/100/ml × 2 for acute renal failure)	> 3.5	2-3.4	1.5-1.9	-	0.6-1.4	-	< 0.6	-	-
Hematocrit	> 60	-	50-59.9	46-49.9	30-45.9	-	20-29.9	-	< 20
Leukocytes (total/mm ³ × 1,000)	> 40	-	20-39.9	15-19.9	3-14.9	-	1-2.9	-	< 1
Serum bicarbonate (venous, mmol/l)	> 53	41-51.9	-	32-40.9	22-31.9	-	18-21.9	15-17.9	< 15

Source: Laor E et al.²⁷

the speed of wound healing; oxygen therapy reduces leukocyte dysfunction caused by hypoxia and has a direct antibacterial effect against anaerobes; it has been observed to help some antibiotics penetrate bacteria better.^{7,20,33} According to the findings of Dr. Devia and collaborators, hyperbaric therapy, together with the negative pressure system, was shown to decrease mortality by up to 11.4%; however, Hatipoglu mentions that hyperbaric treatment has a high risk of cerebral and pulmonary complications, as well as increased costs, which limits its use.^{33,34}

The debridement area is usually located in regions close to the anus, so the wound must be protected from contamination by fecal matter, diverting the fecal matter to keep the wound clean. Usually, the fecal diversion is performed by colostomy when the scars are near the perianal region or by the fecal management system Flexi-Seal™, an alternative method that consists of the placement of a rectal tube that allows the exit of the matter through it to a collection bag. It is an economical and comfortable

alternative for the patient and avoids the need for colostomy.^{33,35}

PROGNOSIS

Despite treatment, mortality is reported to be 20-40%.⁴ The causes of death in these patients are severe sepsis, coagulopathies, acute renal failure, diabetic ketoacidosis, and multiorgan failure.^{20,35}

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Wilkie syndrome. Review of the literature

Síndrome de Wilkie. Revisión de la literatura

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ABSTRACT

A 48-year-old male presented at the time of admission with a seven-day history of oral intolerance, accompanied by nausea and vomiting of gastric contents on multiple occasions, progressive abdominal pain, and distension. Physical examination revealed that he was in pain, cachectic, with distension and generalized abdominal pain, tympanic on percussion. A simple phase abdominal CT scan was performed, showing excessive dilatation of the stomach without intestinal dilatation; the diagnostic approach was complemented with a contrast CT scan identifying aortomesenteric impingement. The patient received conservative treatment for 48 hours without improvement, so a laparoscopic duodenojejunal anastomosis procedure was performed. There is still debate about diagnosing and treating superior mesenteric artery impingement syndrome since symptoms do not always correlate well with abnormal anatomical findings in radiological studies and may not resolve completely after treatment.

RESUMEN

Masculino de 48 años que presenta al momento de su ingreso un cuadro de siete días de evolución con intolerancia a la vía oral, acompañado de náusea y vómito de contenido gástrico en múltiples ocasiones, dolor y distensión abdominal progresiva. A la exploración física con facies de dolor, caquético, distensión y dolor abdominal generalizado, timpanismo a la percusión. Se realiza tomografía abdominal en fase simple donde se observa dilatación excesiva del estómago sin dilatación intestinal, se complementa abordaje diagnóstico con tomografía contrastada identificando pinzamiento aortomesentérico. El paciente recibió tratamiento conservador por 48 horas sin mejoría, por lo que se lleva a cabo procedimiento duodeno-yeyuno anastomosis laparoscópica. En la actualidad aún existe controversia en torno al diagnóstico y tratamiento del síndrome de pinzamiento de la arteria mesentérica superior, ya que los síntomas no siempre se correlacionan bien con los hallazgos anatómicos anormales en los estudios radiológicos, y pueden no resolverse por completo después del tratamiento.

INTRODUCTION

The superior mesenteric artery syndrome is an unusual cause of upper intestinal obstruction, known by various names such as Wilkie syndrome, duodenal arteriomesenteric obstruction, and chronic duodenal ileus.¹

It is characterized by compression of the third portion of the duodenum due to the narrowing of the space between the superior mesenteric artery and the aorta, attributed to the loss of the mesenteric fat pad.^{2,3}

Symptoms do not always correlate with abnormal anatomic findings in radiological studies.³

The characteristics of at-risk patients are decreased acuity of the aortomesenteric angle due to weight loss (greater than 10 kg), leading to loss of the mesenteric fat pad.

The syndrome is commonly associated with severe and debilitating diseases such as neoplasms, malabsorption syndromes, acquired immune deficiency syndrome, trauma, and burns.⁴

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The syndrome is most often described after corrective spine surgery for scoliosis, which causes a reduction of the aortomesenteric angle; under this circumstance, it is called “cast syndrome”.⁵

Rarely it is associated with a short ligament of Treitz that suspends the duodenum in an abnormally cephalic position.⁴

On clinical evaluation, patients may present acutely (after surgery) or more frequently with progressive symptoms. Symptoms are consistent with proximal small bowel obstruction, postprandial epigastric pain, and early satiety, and those with more advanced obstruction may have nausea, vomiting of biliary contents, and weight loss.⁵

Symptoms may be relieved in some positions, such as left lateral decubitus, ventral decubitus, or kneeling. These positions eliminate the tension of the aortomesenteric angle.⁶

Physical examination findings are not specific but may include abdominal distention, epigastric pain, and peristaltic rumbling.

Laboratory tests may be normal, and liver function and blood chemistry tests do not show alterations; patients with severe vomiting may present electrolyte abnormalities characterized by mild hypokalemia and metabolic alkalosis.^{5,6}

Diagnosis is often delayed and can lead to cardiac conduction disturbances, gastric perforation, obstruction by a duodenal bezoar, gastric pneumatosis, and portal venous gas.⁶

Differential pathology includes other causes of upper intestinal obstruction such as diseases with altered duodenal motility, type 2 diabetes, systemic sclerosis, and intestinal pseudo-obstruction.⁷

Diagnostic studies require a high index of suspicion since symptoms may be nonspecific. Diagnostic imaging criteria include: 1) Duodenal obstruction with an abrupt cut in the third portion. 2) Aortomesenteric angle less than 25° (considered the most sensitive measure of the diagnosis). 3) Aortomesenteric distance less than 8 mm. 4) High fixation of the duodenum by the ligament of Treitz.⁸

The initial treatment goals are to relieve obstructive symptoms by gastrointestinal decompression with a nasogastric tube and water and electrolyte correction.⁹

Nutritional support is essential. Enteral nutrition is preferred, and if it cannot be achieved orally, endoscopic placement of a nanojoule tube is suggested; total parenteral nutrition may be necessary if enteral nutrition is not possible.⁶

Some surgical options are the Strong’s procedure, gastro-jejunal anastomosis, and duodenojejunal anastomosis.

Strong’s procedure consists of derotational surgery aimed at repositioning the third and fourth portions of the duodenum to the right of the superior mesenteric artery in the case of a short Treitz ligament.⁸

Each of the surgical approaches has advantages and disadvantages. Strong’s procedure maintains bowel integrity; however, failure occurs in 25% of patients. Gastro-jejunal anastomosis decompresses the stomach but does not relieve duodenal obstruction, leading to blind loop syndrome or peptic ulcer. It is generally accepted that duodenojejunal-anastomosis has superior results to the previous ones.^{9,10}

CLINICAL CASE

The patient was a 48-year-old male residing in a nursing home with a history of cerebellar ataxia of a three-month duration that conditions prostration and appendectomy with open technique ten years ago.

At the time of her admission, he had seven days of evolution with oral intolerance, accompanied by nausea and vomiting of gastric content on multiple occasions, abdominal pain, and postprandial distension.

On physical examination, he was found with pain facies, cachectic, abdominal distension, and pain on palpation in the epigastric region, tympanic on percussion, no evidence of peritoneal irritation, absence of peristalsis, mucous membranes, and integuments with suboptimal hydration, in addition to spastic extremities. Laboratory studies revealed leukocytosis and hypoalbuminemia.

An abdominal CT scan was performed in which gastric dilatation was identified with loss of gastric folds and decreased distance between the aorta and superior mesenteric artery, measuring 8.05 mm (*Figure 1*). The

sagittal section of the CT scan showed an acute aortomesenteric angle of 14.92° (Figure 2). Since his admission, he received management with gastric decompression through a nasogastric tube, water and electrolyte replacement, analgesics, and antibiotic therapy with a third-generation cephalosporin antibiotic; however, the obstruction persisted despite conservative management for 48 hours, so surgical management was proposed and accepted. A laparoscopic approach with five ports was performed; the transverse colon was mobilized, and the site of obstruction was seen as secondary to clamping of the superior

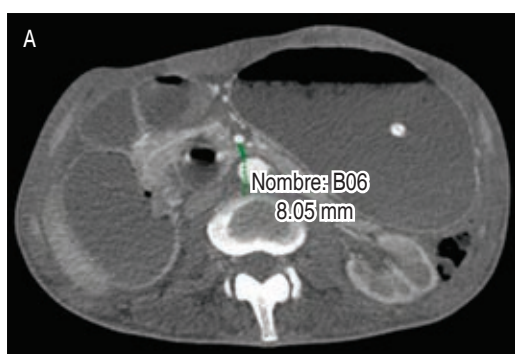


Figure 1: Contrast CT scan. **A)** Axial section showing a distance between the aorta and mesenteric artery of 8.05 mm. **B)** Coronal section showing gastric dilatation with loss of gastric folds and amputation of the third portion of the duodenum.



Figure 2: Contrast abdominal CT scan sagittal section, showing an acute aortomesenteric angle of 14.92° .

mesenteric artery between the third and fourth portion of the duodenum. A mechanical duodenojejunal-anastomosis was performed at 60 cm from the ligament of Treitz; the gastroenterostomy was closed in two planes with slow absorption monofilament suture for the first plane and non-absorbable for the second one. Postoperative evolution was good. He started drinking liquids at 24 hours and progressed to a soft diet at 48 hours. He was discharged home due to improvement 48 hours after the procedure. There have not been any subsequent clinical sequelae after two months. He has had adequate tolerance to the oral route, but the patient has not attended to control for post-surgical follow-up.

CONCLUSION

Willkie syndrome is a rare clinical entity whose diagnostic and therapeutic approach represents a clinical challenge. It is essential

to have a high clinical suspicion that allows identifying data of high intestinal obstruction and complementing it with laboratory and imaging studies that support the diagnosis and establish the most appropriate therapeutic approach for each case.

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Splenic aneurysm. Review of the literature

Aneurisma esplénico. Revisión de la literatura

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Keywords:

Aneurysm, splenic artery, splenectomy.

Palabras clave:

Aneurisma, arteria esplénica, esplenectomía.

ABSTRACT

Introduction: splenic artery aneurysm is an abnormal dilatation greater than 1 cm in diameter; it is the third most common intra-abdominal aneurysm and the most frequent visceral aneurysm. **Case report:** a 41-year-old female, after a car accident, presents progressive pain in the left hypochondrium; an ultrasound reports splenic artery aneurysm and cholelithiasis, and an angio-tomography confirms a splenic artery aneurysm. Selective embolization and placement of coils were performed, presenting abdominal pain and leukocytosis, and a new angio-tomography revealed splenic artery occlusion and splenic infarction. Hence, it warranted splenectomy and open cholecystectomy. **Discussion:** 95% of aneurysms are asymptomatic; the rest may present pain in the epigastrium and left hypochondrium. Generally, they are incidental findings on radiographs, ultrasound, or abdominal tomography. Intervention should be considered in some instances, the treatment of choice being embolization or stenting by endovascular approach. Conventional surgery is reserved for complicated aneurysms or in case of rupture. **Conclusion:** the endovascular approach is the treatment of choice for splenic aneurysms. We present an aneurysm at the level of the splenic hilum that received endovascular treatment, which caused splenic infarction, so it merited conventional splenectomy.

RESUMEN

Introducción: el aneurisma de la arteria esplénica es una dilatación anormal mayor de 1 cm de diámetro, es el tercer aneurisma intraabdominal más común y el aneurisma visceral más frecuente. **Caso clínico:** femenino de 41 años, posterior a accidente automovilístico presenta dolor progresivo en hipocondrio izquierdo; el ultrasonido reporta aneurisma de arteria esplénica y colelitiasis, la angiotomografía confirma aneurisma de arteria esplénica. Se realiza embolización selectiva y colocación de coils, pero se presenta nuevamente dolor abdominal y leucocitosis, nueva angiotomografía con oclusión de arteria esplénica e infarto esplénico, por lo que ameritó la realización de esplenectomía y colecistectomía abierta. **Discusión:** el 95% de los aneurismas son asintomáticos, el resto pueden presentar dolor en epigastrio y/o hipocondrio izquierdo. Generalmente, son hallazgos incidentales en radiografías, ultrasonidos o tomografías abdominales. Se debe considerar intervención en ciertos casos, el tratamiento de elección es la embolización o aplicación de stent por abordaje endovascular. La cirugía convencional se reserva para aneurismas complicados o en caso de ruptura. **Conclusión:** actualmente, el tratamiento de elección de los aneurismas esplénicos es el abordaje endovascular. Se presenta un aneurisma a nivel de hilio esplénico que recibió tratamiento endovascular, el cual condicionó infarto esplénico, por lo que ameritó esplenectomía convencional.

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INTRODUCTION

The splenic artery aneurysm consists of an abnormal dilatation of the splenic artery larger than 1 cm in diameter. The splenic artery is the third most common site of intra-abdominal aneurysms, preceded by the aneurysm of the abdominal aorta and iliac arteries. It is considered the most common

visceral artery aneurysm (60%), followed by the hepatic (20%), superior mesenteric (5.9%), and celiac (4%) arteries.^{1,2}

According to studies based on autopsies, its prevalence ranges from 0.2 to 10.4%; It is four times more common in women. However, it is three times more likely to present rupture in men. The exact etiology of this aneurysm is unknown. Still, it has been associated with trauma,

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hypertension, hormonal and hemodynamic alterations of pregnancy, portal hypertension, cirrhosis, Caroli syndrome, liver transplantation, pancreatitis, arterial degeneration, collagen diseases, and atherosclerosis. 80-99% of splenic artery aneurysms present atherosclerosis on histopathological examination, with or without calcification and mural thrombosis. However, it may be associated with the primary degeneration of the tunica media.^{1,3}

Most splenic aneurysms develop in the main trunk of the splenic artery. Aneurysms distal to the primary bifurcation are rare and occasionally involve small branches of the splenic hilum. True aneurysms of the splenic artery occur in up to 75% of cases in the distal third of the artery and 20% in the middle third. They are usually solitary and saccular. The size at diagnosis is, on average, 2.1 cm, rarely exceeding 3 cm, although splenic aneurysms up to 20 cm have been reported. Mycotic aneurysms are most frequently located at the artery's bifurcation level.^{1,3,4}

CLINICAL CASE

This was a 41-years old female patient with a history of hypothyroidism diagnosed at 21 years old, currently without medical treatment for 40 years old due to apparent control, diagnosis of uterine myomatosis at 40 years old, without treatment; history of two cesarean sections, being the last one at 23 years old, without complications. She suffered a car accident with rollover at age 40, without apparent organic damage. She began her current condition after a car accident one year earlier with intermittent, stabbing, non-radiating pain in the left hypochondrium, with no aggravating or extenuating factors; on physical examination, she presented pain in the left hypochondrium on deep palpation, with no other pathological findings. Ultrasound was performed with results compatible with an aneurysm of the splenic artery and cholelithiasis; the diagnostic approach was complemented with angiography of the abdominal aorta finding a splenic artery of standard caliber, with focal saccular dilatation in distal segment compatible with an aneurysm of 17.7×15.9 mm and neck of 5.5 mm, with mural thrombus of 2 mm, with

no signs of rupture; vesicular lithiasis and uterine myomatosis were also seen. With no apparent complications, selective embolization with coil placement was performed in conjunction with angiography (*Figure 1*). In the immediate follow-up, the patient presented abdominal pain and leukocytosis; a new angio-tomography was performed with data suggestive of splenic artery occlusion and splenic infarction (*Figure 2*). Due to the findings mentioned above, it was decided to perform splenectomy and conventional cholecystectomy using a surgical approach with a midline supraumbilical incision, with the following findings: Thin-walled gallbladder, multiple calculi inside of 5-10 mm approximately, cystic artery of 2 mm, cystic duct of 3 mm, spleen of 13×10 cm approximately, with multiple ischemic areas, an aneurysm of the splenic artery at the level of the splenic hilum, posterior to its bifurcation (*Figure 3*). The postoperative course was without complications, so she was discharged three days after surgery and received the corresponding vaccination for patients with splenectomy. The histopathological report included findings of splenic artery aneurysm with atherosclerosis,

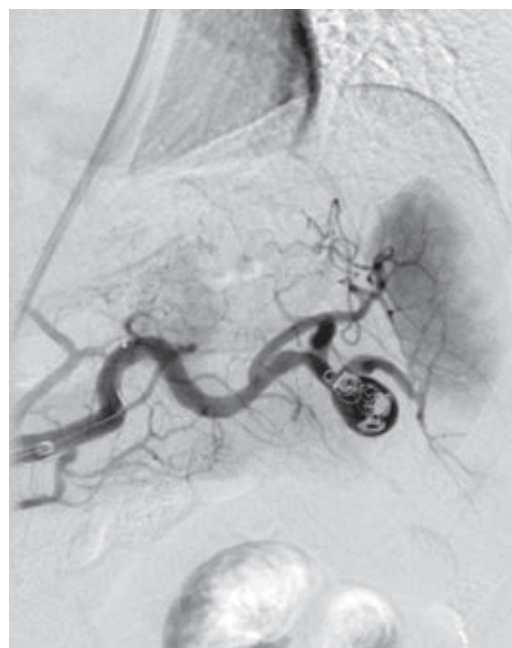


Figure 1: Arteriography after selective embolization and coil placement.

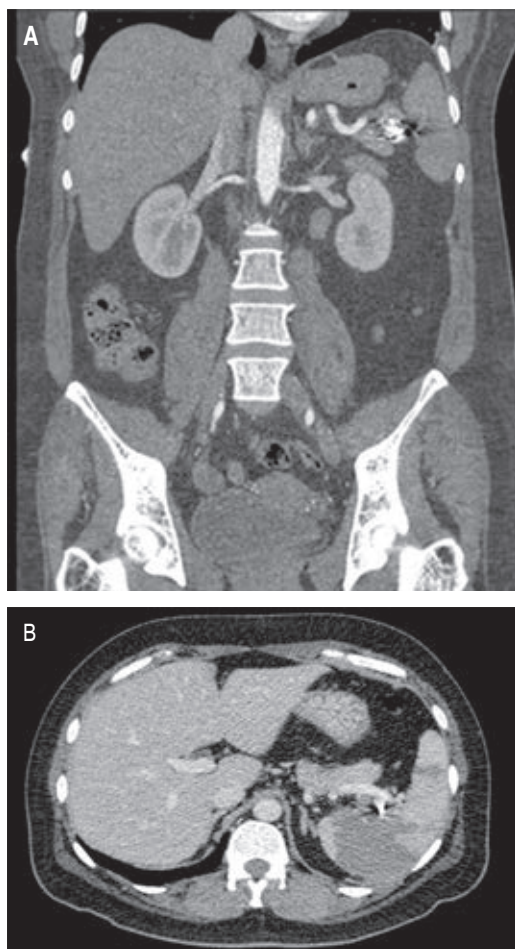


Figure 2: Abdominal angio-tomography. **A)** Coronal section showing metallic density material corresponding to coils located in the distal segment of the splenic artery prior to the splenic hilum. **B)** Opacification and contrast uptake are observed at the splenic level in an irregular heterogeneous form both in the arterial and venous phase, showing an extensive area involving most of the splenic parenchyma from the hilum, only respecting the upper and lower poles compatible with infarction.

splenic parenchyma with congestive vessels, and chronic calculous cholecystitis.

LITERATURE REVIEW

Visceral artery aneurysms are infrequent, representing 0.1-0.2% of all aneurysms; however, splenic artery aneurysms are the most frequent visceral artery aneurysms (60%)

and the third most common intra-abdominal aneurysms.²

This pathology remains asymptomatic in up to 95% of patients. It may go unnoticed in the physical examination due to the location of the splenic artery until the moment of rupture. Only 20% of splenic aneurysms are symptomatic, presenting mainly abdominal pain in the epigastrium or left upper quadrant; other symptoms may include anorexia, nausea, or vomiting, which are often attributed to a coexisting hiatal hernia or other pathologies such as cholelithiasis and peptic ulcer. Rarely a soft pulsatile mass may be detected on physical examination. Splenic aneurysm rupture is rare but is associated with high mortality. The risk of rupture varies from 2-3% in the most recent series and increases with pregnancy, portal hypertension, liver cirrhosis, and liver transplantation.^{1,2,4}

Most cases of rupture are sudden, causing immediate circulatory collapse, and 25% of them will present a double rupture phenomenon, which is characterized by containment of the initial rupture of the aneurysm by the omentum or by clots blocking Winslow’s hiatus; this is followed by a rupture into the peritoneal cavity, hours or days later. The second rupture has a high mortality risk and severe hemodynamic collapse. The patient may present with severe pain in the epigastrium, left hypochondrium, left shoulder (Kehr’s sign), and hemodynamic instability at the time of the rupture. Sometimes rupture within the splenic vein results in an arteriovenous fistula and portal hypertension. Thus, a high-flow arteriovenous fistula can produce a “mesenteric steal syndrome”, resulting in small bowel ischemia.^{5,6}

Generally, the splenic aneurysm is an incidental finding in a simple abdominal radiograph, observing a calcified curvilinear lesion in relation to the splenic artery or during an ultrasound or abdominal tomography. Very small lesions are visualized only by angiography. On ultrasound imaging, splenic aneurysms are visualized as hypoechoic masses in the left upper quadrant of the abdomen. They are visualized on a computerized tomography scan as a well-defined, low-density mass with intense enhancement in the residual lumen

after intravenous contrast administration, which confirms the diagnosis. The CT scan allows visualizing the shape and location of the splenic aneurysm directly, completely, and satisfactorily, the extent of the lesion, and its relationship with the associated vascular structures.^{4,7}

Symptomatic splenic artery aneurysms should always be treated. Indications for treatment of an asymptomatic splenic aneurysm are diameter greater than 2 cm, pseudoaneurysms, portal hypertension, portocaval shunt, medial arterial fibrodysplasia, arteriosclerosis, progressive enlargement, preoperative preparation for liver transplantation and in pregnant patients or women of childbearing age.⁸⁻¹⁰ Non-operative treatment is reserved for critically ill patients when the aneurysms are smaller than 2 cm in diameter and in women who do not plan to become pregnant shortly; however, the latter is not an absolute criterion; it consists of close evolutionary surveillance using periodic controls with computerized tomography, or ultrasound scans every six to 12 months.^{10,11}

There is no agreement on the treatment of choice in cases of asymptomatic patients. In the case of symptomatic splenic aneurysms, treatment should be immediate, either by conventional, laparoscopic, or endovascular surgical techniques. The decision should be based on the clinical condition of the patient, the possible approaches to the abdomen, the situation of the splenic artery, the consent to the procedure, and the available resources.^{8,12}

Endovascular treatment is indicated in high-risk cases, hostile abdomen, and distal lesions. Some options are splenic artery embolization with coils and functional exclusion, placement of a stent covering the neck of the aneurysm, and embolization with locks for hilar aneurysm with spleen preservation. The advantages are minimal invasion, rapid recovery, and preservation of the flow to the spleen, but it requires radiation and the use of contrast. Another alternative is the injection of fibrin glue into the aneurysmal sac. It is essential to consider whether to preserve the spleen since splenic infarction predisposes patients to infection.⁸ Theoretically, a combination of stenting and coil embolization is more appropriate for these aneurysms than other endovascular methods. Embolization is considered the first

line of treatment in asymptomatic aneurysms, in patients difficult to manage surgically or in pseudoaneurysms. It is contraindicated in cases of aneurysms of the splenic hilum or in instances of tortuosity of the artery, in which open surgery is preferred. The objective of an embolization is the occlusion of blood vessels using numerous embolic agents, each with different properties and uses. This is the basis of mechanical obstruction, platelet activation, and activation of the patient's coagulation cascade to obstruct the vessels completely. Coils are among the most widely used embolic agents, varying in diameter from submillimeter to several centimeters; their shape is also very variable (straight, helical, spiral, and three-dimensional), and they also have a thrombogenic coating; they are placed using a guide catheter that accesses the aneurysm. Most coils have small fibers attached to the metal component, which provoke a thrombogenic response with subsequent vessel occlusion. Different series report a 66.7 to 92% success rate with this technique. However, patients should be observed after surgery for possible complications such as infarction due to coil migration, splenic abscess, aneurysm rupture, pancreatitis, and rarely recanalization.^{10,13,14} Coil embolization of the splenic artery can

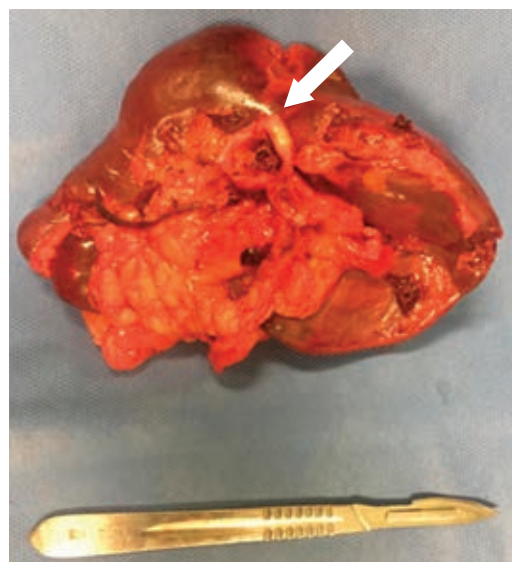


Figure 3: Surgical specimen. Spleen 13 × 9 × 4.5 cm and splenic artery aneurysm with coils (arrow).

cause a splenic infarction, mainly after distal embolization or in the splenic hilum, with a reported incidence of 25%. Symptoms vary from abdominal pain and low-grade fever to sepsis, pancreatitis, infection, or abscesses of the splenic parenchyma.¹⁴ Open surgery was the gold standard of treatment until the end of the 20th century and is generally indicated in low-risk patients for trunk lesions or when aneurysms are also present in the aorta or intestinal arteries and in patients in whom endovascular treatment has failed. Conventional surgery consists of raffia of the aneurysm, double ligation of the splenic artery with or without splenectomy, aneurysmectomy with arterial reimplantation, or grafts that can also be performed.⁸ In the proximal third, aneurysmectomy will be performed; in the middle third aneurysmal exclusion is preferred, as well as splenoaneurysmectomy if it is in the distal third.^{2,10}

Although the literature mentions that only 20% of patients with splenic aneurysms have symptoms, the presence of pain in the left hypochondrium of a long evolution led to requests for complementary studies in this patient. An ultrasound was performed as an initial approach, reporting findings compatible with splenic artery aneurysm and cholelithiasis, so, following the study protocol mentioned in the literature, we proceeded to perform an angio-tomography of the abdominal aorta to have a complete picture of the case, visualize the size and location of the lesion and its relationships and thus properly the therapeutic plan.

Being a patient who presented symptoms associated with the pathology, it was decided to initiate treatment in the least invasive way, performing selective embolization and placement of coils by the Angiology Service. However, she presented a torpid post-surgical evolution, requiring a new angio-tomography, in which an extensive area compatible with infarction was visualized, offering a poor response to minimally invasive treatment. So, it was decided to carry out a more invasive treatment and scheduled splenectomy and conventional cholecystectomy. The literature refers to the next step in the treatment of this patient, a laparoscopic intervention secondary

to the failure of minimally invasive treatment. However, laparoscopy was unavailable in our unit then, so the treatment was performed by open or conventional surgery.

CONCLUSION

Although splenic artery aneurysms are primarily asymptomatic, up to 95% of patients, in this case, we present a patient whose reason for consultation was chronic pain, up to a year of evolution, in the left hypochondrium. In most cases, these aneurysms are incidental findings in imaging studies performed on patients for various reasons. Once the splenic aneurysm was suspected by ultrasound imaging, the study of the patient was complemented with an angio-tomography so that the best treatment for her specific situation could be decided. The treatment of choice should be by endovascular approach, so it is expected to obtain the highest probability of success in the least invasive way with the resources available in the institution. However, open splenectomy was required due to the lack of minimally invasive equipment available. It is vital to conduct good questioning, physical examination, and complementary studies since the characteristics of the aneurysm and the urgency of treatment will decide the course of action to follow.

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Perforated jejunal diverticulitis: an infrequent cause of acute abdomen

Diverticulitis yeyunal perforada: causa infrecuente de abdomen agudo

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Diverticulum, jejunum, acute abdomen, laparotomy.

Palabras clave:

Divertículo, yeyuno, abdomen agudo, laparotomía.

ABSTRACT

Although intestinal diverticula are infrequent, their perforation causes high mortality associated with delayed diagnosis, and their most common location is the jejunum. Treatment consists of water and electrolyte replacement, broad-spectrum antibiotic therapy, and surgical management, including resection of the intestinal segment where the diverticulum is located, and subsequent anastomosis. Since it is a rare pathology, it is essential to remember to suspect the disease and start medical-surgical treatment immediately. The case of a patient diagnosed with perforated jejunal diverticulum is presented.

RESUMEN

Aunque los divertículos intestinales son infrecuentes, su perforación condiciona una elevada mortalidad asociada a retraso en el diagnóstico, su localización más habitual es el yeyuno. El tratamiento consiste en reposición hidroelectrolítica, antibioticoterapia de amplio espectro y manejo quirúrgico que incluye resección del segmento intestinal donde se encuentra el divertículo y anastomosis. Al tratarse de una patología poco frecuente, es importante tenerla en mente, con la finalidad de sospechar la enfermedad e instaurar el tratamiento médico-quirúrgico de forma inmediata. Se presenta el caso de una paciente con diagnóstico de divertículo yeyunal perforado.

INTRODUCTION

Intestinal diverticula are uncommon, with an incidence reported in the literature of 0.1 to 4.6%.¹⁻⁶ Eighty percent correspond to the proximal jejunum, 15% to the ileum (of which 75% to the proximal jejunum, 20% to the distal jejunum, and 5% to the ileon)^{7,8} and 5% to both.⁹⁻¹¹ They are herniations of the intestinal wall and can be true or false depending on the presence or absence of all intestinal layers. They are more prevalent in men and elderly patients. The presentation is usually asymptomatic, but they may sometimes present with nonspecific gastrointestinal symptoms. In a smaller percentage, they may present complications such as bleeding, obstruction, and perforation, with a mortality of up to

40%.^{5,8} Pre-surgical diagnosis continues to be challenging due to the difficulty in identifying them in imaging studies or the inaccessibility of the most sensitive ones. Therefore, in the clinical presentation of acute abdomen and the absence of a confirmatory diagnostic test, it is necessary to resort to diagnostic laparoscopy or exploratory laparotomy based on the available resources and the surgeon's experience.

We present the case of a 101-year-old female patient who presented to the emergency department with acute abdominal symptoms caused by perforation of a jejunal diverticulum.

CLINICAL CASE

It was a 101-year-old female patient with a personal history of acute myocardial infarction,

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open appendectomy, and cholecystectomy, as well as wall plasty. She denied previous gastrointestinal symptoms.

Her current condition began four days before her evaluation, with colicky pain in the mesogastrium of moderate intensity, progressively increasing until it became generalized, accompanied by nausea. She self-medicated with diclofenac and acetylsalicylic acid, without specifying the dosage, without improvement of symptoms, adding headache and bowel movements of decreased consistency on three occasions, without mucus or blood. Physical examination revealed intense generalized pain, chills, asthenia, and adynamia. She presented arterial hypotension and tachycardia. The abdomen with abdominal distension, peristalsis decreased in frequency and intensity, muscle rigidity, pain on palpation, and Blumberg's sign present.

Laboratory studies reported leukopenia (3.07×10^9 l), neutrophilia (84%), hyperprocalcitoninemia (2.29 ng/ml), metabolic acidosis (pH 7.31, $p\text{CO}_2$ 27.9 mmHg, HCO_3 15.8 mmHg) and hyperlactatemia (5.90 mmol/l). The rest of the laboratory tests were within normal ranges. A simple tomography of the abdomen showed pneumobilia, pneumoperitoneum, and a transition zone associated with the "whirlpool sign" in jejunum topography in a closed loop (Figure 1); and free fluid in the right parietocolic gutter (Figure 2).

Exploratory laparotomy was performed, where 1,000 ml of free intestinal fluid in the

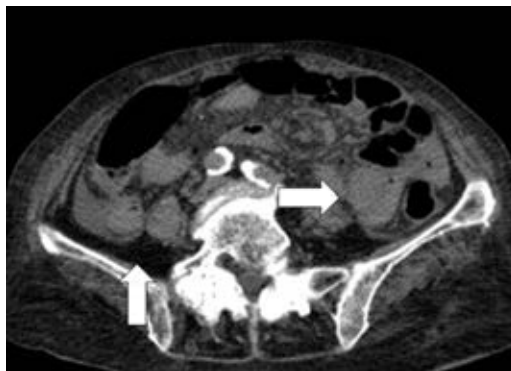


Figure 1: CT scan of the abdomen showing pneumoperitoneum and free fluid in the parietocolic gutter (white arrow).



Figure 2: Simple tomography of the abdomen, axial section, showing the "whirlpool" sign, clinical data of high intestinal occlusion or intestinal malrotation (white arrow).

cavity, intestinal loops with fibrin plaques, perforation of 1 cm in a jejunal diverticulum of approximately 6×4 cm, 50 cm from the angle of Treitz, with multiple diverticula in about 80 cm of the jejunum perforation were seen. Initially, primary closure was performed, and then intestinal resection of approximately 90 cm, with jejunum-jejunum end-terminal anastomosis in two planes.

She initially received postoperative management in the Intermediate Care Unit with parenteral nutrition. She started a progressive diet on the third postoperative day until she reached her daily requirements. She was discharged home on the seventh day due to improvement and was followed up in the outpatient clinic showing an adequate evolution.

The histopathological report corroborated the clinical diagnosis, showing a thin wall with congestion and perforated diverticular disease leading to acute peritonitis (Figures 3 to 7).

LITERATURE REVIEW

An intestinal diverticulum is a sacular protrusion of the intestinal wall that is usually acquired at the sites of greatest weakness (where blood vessels penetrate). If it involves only the mucosal and submucosal layers, without a muscular layer, a pseudodiverticulum is considered.^{6,8,11-13} This formation at sites of weakness explains its location at the mesenteric

border.^{1,2,14} In the small intestine, they are most frequently observed in the duodenum (80%), occurring in up to 10-20% of people,¹⁵ followed by the jejunum and ileum (20%),¹² occur in 1% of the population,¹⁵ where they are usually multiple, with jejunal location and close to the angle of Treitz.¹⁴ In contrast, those of ileal location are usually single and smaller.^{9,11} This is explained by the larger diameter of the blood vessels in the proximal jejunum.^{1,11,16}

Diverticula usually accompany them in other sites in up to 90%,^{5,16} as in the colon (30-75%), duodenum (15-42%), bladder (012%), and esophagus (2%),^{10,11,14} so they should be intentionally looked for when observing them in the transoperative phase.

It has a male predominance of 1.5:1 and is most frequently observed between the sixth and seventh decades of life.^{3,6,8-11,13,14}

The etiopathogenesis is not yet well defined, but the cause is suspected to originate from intestinal dyskinesia.^{11,16} Disorders of the myenteric plexus can result in uncoordinated smooth muscle activity, producing high pressure in localized areas of the small bowel,^{1-3,7,8,11,12,17} being considered pulsatile diverticula. This causes two situations predisposing to inflammation: stasis of intestinal contents within the diverticulum and neck



Figure 3: Pathology specimen consisting of 40 cm jejunum with perforated jejunal diverticulum, with suture material (white arrow).

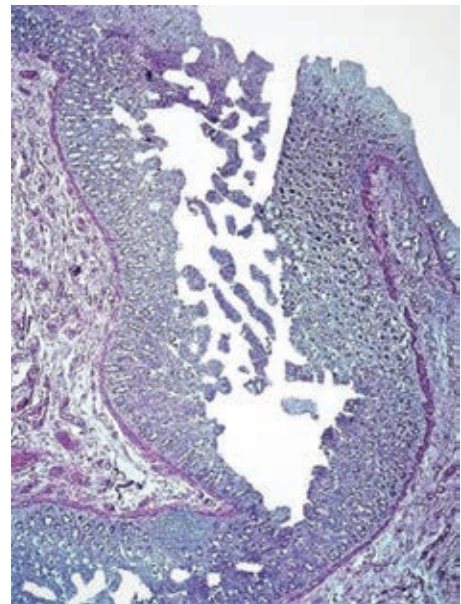


Figure 4: The invaginated mucosa between the wall, is observed forming the diverticulum.

obstruction secondary to mucosal edema, which favor intradiverticular microbial growth.⁶

They can be associated with smooth muscle or myenteric plexus diseases that interfere with normal peristalsis, such as progressive systemic sclerosis, visceral neuropathies, or myopathies.^{10,11,14,18} Some authors have described a familial relationship based on genetic predisposition.²

It has also been speculated that a vegetarian diet rich in fiber decreases the risk of diverticular disease by decreasing water reabsorption, resulting in soft stools and, thus, a lower intraluminal pressure.³

Some reports suggest an association with cocaine and steroidal and nonsteroidal anti-inflammatory drugs.^{8,18}

Patients are usually asymptomatic.^{1,13,14} About 15-40% may present with chronic nonspecific gastrointestinal symptoms, such as diarrhea and abdominal pain (42%),³ constipation, dyspepsia, occasional nausea and vomiting, bloating, malabsorption, weight loss, and anemia, among others,^{1,11,13,14,17,19} which may be associated with pseudo-obstruction or bacterial overgrowth,^{2,8} secondary to alterations in intestinal motility.¹⁴

COMPLICATIONS

Complications may occur in 10-40% of patients,^{1,2,8,14} with diverticulitis being the most frequent (2-6%),⁶ followed by hemorrhage (5-33%) and intestinal obstruction (2.3-4.6%).^{2,3} Perforation may occur in 2-7%.^{2,10} Other complications described are volvulus,¹⁵ obstruction, hepatic abscesses, spontaneous pneumoperitoneum, steatorrhea, or megaloblastic anemia.¹⁴ Abscesses can be found in the root of the mesentery, secondary to perforation of the diverticula located in this area.¹⁴

The clinical presentation of perforation may be localized or generalized peritonitis.¹ The causes of perforation have been associated with necrotizing inflammatory reaction (82%), foreign body impaction (6%), and blunt abdominal trauma (12%).^{1,6,7,14}

Perforation mortality is up to 40%.¹⁻³ Some poor prognostic factors are advanced age, comorbidities, peritonitis, delayed diagnosis, and therapeutic management.² The clinical presentation usually is localized abdominal pain (39% in the left flank), abdominal rigidity, fever, leukocytosis, and elevated C-reactive protein.²

Intestinal obstruction is the least frequent complication (2.3-4.6%) and is related to other mechanisms, such as extrinsic compression by a pseudotumor secondary to diverticulitis; volvulus due to adhesions following repeated episodes of oligo symptomatic diverticulitis and fibrous stenosis of the bowel following one

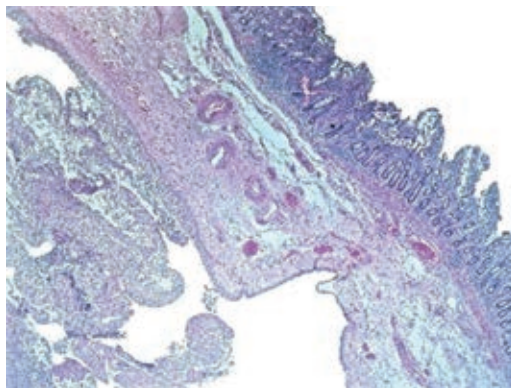


Figure 5: A jejunal diverticulum is observed, without a muscular wall and only mucosa.

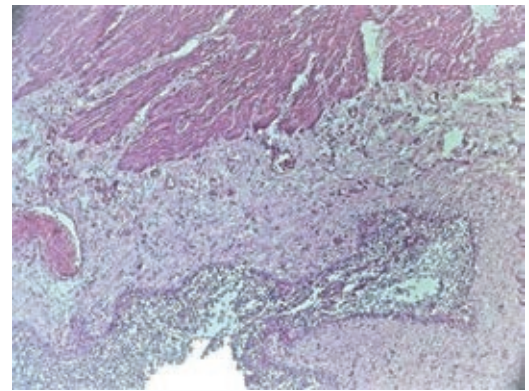


Figure 6: The muscular wall subserosal serous is observed, covered with neutrophils and fibrin, indicating an inflammatory process causing peritonitis.

or more attacks of diverticulitis.⁶ One report describes the association with a giant fecalith.²⁰ Conservative treatment has not proven useful, so management is surgical with bowel resection and resection of the involved adhesion in case of stenosis, necrosis, or perforation.⁶

Diverticular hemorrhage (2-8.1%) can be caused by diverticulitis, a diverticular ulcer, enterolith, or intake of NSAIDs.^{6,21,22} Treatment is usually surgical, but there are reports describing conservative management with successful results.^{22,23} In the last decade, endoscopic treatment has gained relevance, with increasingly better results; it is performed using enteroscopy with a balloon, double balloon, or a spiral, with new techniques still under study.²⁴ Cases of successful treatment of active bleeding of a diverticulum have been reported,²⁵ while in others, its usefulness is as a preoperative diagnosis.²⁶

Other less frequent complications have been described, such as hepatic resection secondary to adhesion of the diverticulum to the hepatic border and the presence of ectopic pancreatic tissue inside the diverticulum.^{27,28}

Pre-surgical diagnosis has been established in only 20% of patients due to the mesenteric location of the diverticula.⁸ The most helpful study is computerized tomography,^{1-5,14,23} which can detect complications such as pneumoperitoneum and active bleeding.² Diverticula can be seen as protrusions of the small bowel containing air or fluid, the air surrounding the mesentery, inflammatory

masses, and a hyperdense image of the mesentery.^{1,3} The size varies from millimeters to more than 5 cm, depending on the location, as they can be smaller in the ileum.² In the case of uncomplicated diverticulitis, thickening of the diverticular wall and striation of the mesenteric fat can be observed. There may be an association with the thickening of the intestinal wall.²

The characteristics of a perforated diverticulum are most frequently the presence of fluid and gas; sometimes, perforation can be observed.^{2,5} In severe cases, these findings may not be visible; however, the presence of inflammatory reaction at the mesenteric border and the presence of other jejunoileal diverticula suggest the diagnosis.^{2,5}

In the case of hemorrhage, the indicated study is contrast tomography, where contrast extravasation can be observed in the arterial or portal phase of a diverticulum, obtaining its exact distance from the Treitz angle, which can be helpful for the surgeon.² In cases of minimal bleeding and hemodynamically stable patients, conservative management can be performed with a double-balloon, single balloon, and spiral endoscopy. Ultraselective embolization is possible in hemodynamically unstable patients in whom surgery cannot be performed.²



Figure 7: Part of the jejunal diverticulum can be seen with a decreased muscular wall caused by peritonitis.

Some false complications can also be observed, such as free gas in the cavity, associated with the typical passage of air through a semi-permeable membrane such as the intestinal wall, without data of acute abdomen;^{2,6} and absence of contrast enhancement of the diverticular wall, since it is virtual, which can simulate ischemia.²

Other valuable studies are plain radiography, which can show pneumoperitoneum and hydro-aerial levels in the diverticula, barium transit, capsule endoscopy, scintigraphy, arteriography,¹⁴ enteroscopy, or enteroresonance.^{10,16} Multidetector computerized tomography (MDCT) with double contrast is the most sensitive study for the diagnosis of the disease and its complications, according to some reports, where a focal and asymmetric thickening of the intestinal wall or an inflammatory process or abscess adjacent to a jejunal loop with edema of the surrounding mesenteric fat can be observed.^{3,6,13} However, its inaccessibility limits its usefulness.

Enteroclysis or enteroresonance shows contrast-retaining sacculations, and its diagnostic utility has been described as the modality of choice for small diverticula.^{10,11,26} However, its use is limited to cases where it is impossible to establish the diagnosis with the methods of choice.⁶

Only symptomatic cases should be treated, including intestinal motility regulators, and, in the case of diverticulitis, antibiotics may be used.¹⁴ Some authors suggest preventive surgical management.⁶ Emergency surgical treatment is performed in 8-30% of patients with complicated jejunal diverticulosis.⁶ It is indicated in case of failure or impossibility of percutaneous drainage and generalized peritonitis.⁶ It includes intestinal resection of the affected segment and primary end-to-end anastomosis and radio-guided percutaneous drainage in case of localized collections.^{1,2,5-8,10,12-14,17,19,29} This resection is also mandatory in patients with a large diverticulum and dilated and hypertrophic bowel loops due to complications.⁶ Stoma resection can also be considered in patients with hemodynamic instability or high risk.⁶

In case of extensive diverticulosis, resection should be limited to the segment with the perforated diverticulum to avoid short bowel syndrome.^{6,15,18} Invagination or local excision techniques are contraindicated due to these methods' high morbidity and mortality rates.^{1,4,6-8}

The approach continues to be exploratory laparotomy. Some cases report the usefulness of the laparoscopic approach; however, its use is not established due to the lack of experience because of the low frequency of this pathology.^{30,31}

The mortality rate of surgical treatment is 0-5%. Some poor prognostic factors are advanced age, associated comorbidities, peritonitis, delay in diagnosis (40%), and the time between perforation and surgery.⁶

CONCLUSION

Intestinal diverticula are infrequent, and most cases are asymptomatic; however, those patients who develop symptoms may present with nonspecific symptoms. Those with suspected complications should be evaluated comprehensively. In the clinical case described, the patient was admitted to the emergency department hemodynamically stable, with data of systemic inflammatory response and acute abdomen, fulfilling the most frequent age group of presentation. During the anamnesis, the patient denied previous gastrointestinal symptoms, debuting with perforation of the intestinal diverticulum. Surgical treatment was the approach of choice, associated with intestinal resection and not only diverticulectomy, since it has shown a worse prognosis, presenting favorable clinical evolution despite age.

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Epiphrenic esophageal diverticulum

Divertículo esofágico epifrénico

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Palabras clave:

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miotomía.

ABSTRACT

Esophageal diverticula have an incidence of 0.06 to 4%; the epiphrenic diverticulum represents 15% of all esophageal diverticula. Most patients are asymptomatic; however, their importance lies in the fact that they can present severe complications such as fistulas to the trachea, hemorrhages, vocal cord paralysis, foreign body retention, and increased risk of cancer. There are different treatments, the most used surgical ones, with a success rate of 74 to 100%. The following is the case of a patient diagnosed with an epiphrenic esophageal diverticulum.

RESUMEN

Los divertículos esofágicos tienen una incidencia de 0.06 a 4%; el divertículo epifrénico representa 15% de todos los divertículos esofágicos. La mayoría de los pacientes cursan asintomáticos; sin embargo, su importancia radica en que pueden presentar complicaciones severas como fístulas a tráquea, hemorragias, parálisis de cuerdas vocales, retención de cuerpo extraño y mayor riesgo de cáncer. Existen diferentes tratamientos, el quirúrgico es el más utilizado, con una tasa de éxito de 74 a 100%. A continuación, se presenta el caso de una paciente a quien se le diagnostica un divertículo esofágico epifrénico.

INTRODUCTION

Esophageal diverticula are rare, have an incidence of 0.06 to 4%, and can present as pharyngoesophageal or mid and distal esophageal diverticula, the latter also called epiphrenic, representing 15% of all diverticula.¹

Epiphrenic diverticulum is a pulsation diverticulum in which there is a herniation of the mucosal and submucosal layers through the muscular layers. It is located 10 cm from the esophagogastric junction. Most patients are asymptomatic. However, its importance lies in severe complications such as fistulas to the trachea, hemorrhages, vocal cord paralysis, foreign body retention, and increased risk of cancer (0.3 to 7%, 1.8%, and 0.6%, respectively) may occur.^{1,2}

The pathophysiology is associated with an esophageal motility disorder in 75 to 100%; the most common are achalasia

and diffuse esophageal spasm; the usual symptoms are dysphagia, regurgitation, reflux, heartburn, and pulmonary symptoms; these symptoms are more associated with the motor disorder rather than the presence of the diverticulum.³

Epiphrenic diverticula occur mainly in the right posterolateral aspect of the esophagus; they usually measure from 1 to 14 cm (mean 7.4 cm); for their diagnosis, it is necessary to perform a barium esophagogram, endoscopy, esophageal manometry and, in some cases, computerized tomography scan.⁴

There are different management methods; the most used is surgical, with a success rate of 74 to 100%, with a morbidity of 15%, having as the most feared complication esophageal leakage with mediastinitis, which presents with a mortality of 3%. Due to this, new endoscopic treatments have emerged, such as peroral endoscopic myotomy and POEM, where

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diverticular septotomy and cardiomyotomy are performed, with good results.⁵⁻⁷

Because this pathology is very rare, there is no consensus on the standardized approach and management. The most common approach is left thoracotomy, with diverticulectomy, esophago-cardiomyotomy, and partial fundoplication, followed by the abdominal approach by laparoscopy and, finally, the mixed approach with laparoscopic and thoracoscopic approaches.⁸

Following is the case of a 66-year-old female patient diagnosed with epiphrenic diverticulum.

CLINICAL CASE

A 66-year-old female patient with no significant personal history manifests pain in the epigastrium, burning type, with retrosternal irradiation, regurgitations, and heartburn, symptoms that improve with the use of proton pump inhibitor and sucralfate; this treatment has been taken chronically, with events of remissions and exacerbations, so

a study protocol is initiated on suspicion of gastroesophageal reflux. Endoscopy was requested, which reported probable esophageal dysmotility type A of achalasia and mild antral gastritis (*Figure 1*). With this result, an imaging contrast study and manometry were requested.

The esophago-gastroduodenal series reported the esophagogastric junction of infra diaphragmatic location, being observed filiform, with a length of 9 mm, and barium passage with a caliber of 14 mm. In addition, a large right posterolateral epiphrenic diverticulum of 5.6 × 7.8 cm with a neck of 2.9 cm was observed (*Figure 2*).

Manometry reported normal upper esophageal sphincter tone and complete relaxation, adequate esophageal motility, type 1 esophagogastric junction, with lower esophageal sphincter, normal average basal pressure, and regular esophagogastric junction relaxation (*Figure 3*).

Once the protocol was completed, it was decided to perform surgery using a laparoscopic and transabdominal approach, placing two 10 mm ports, two 5 mm ports, and the hepatic separator, as traditionally used for fundoplication. We started dissecting the *pars flaccida* and, subsequently, short vessels were dissected, a retro esophageal window was created, and a 1/4-inch Penrose was placed for traction to perform an adequate dissection of the diaphragmatic pillars and the esophagus. Once dissected, we found a right posterolateral diverticulum 3 cm from the gastroesophageal junction, which measured 3 × 3 cm, the adhesions to it were dissected, and the vagus nerve was separated. A cut was made with a linear stapler and EGIA purple cartridge, and the diaphragmatic pillars were closed with an X stitch with a 2/0 prolene suture. A laparoscopic fundoplication Nissen type was performed, placing calibration probe number 40 French, with a size of 5 cm and fixed with three simple stitches of 2/0 prolene suture. The procedure was finished (*Figure 4*).

The patient had a good evolution, starting the oral route at 48 hours postoperatively and being discharged at 72 hours; the postoperative diet was managed progressively from liquids to baby food, then soft and finely chopped, to finally continue with a complete diet.

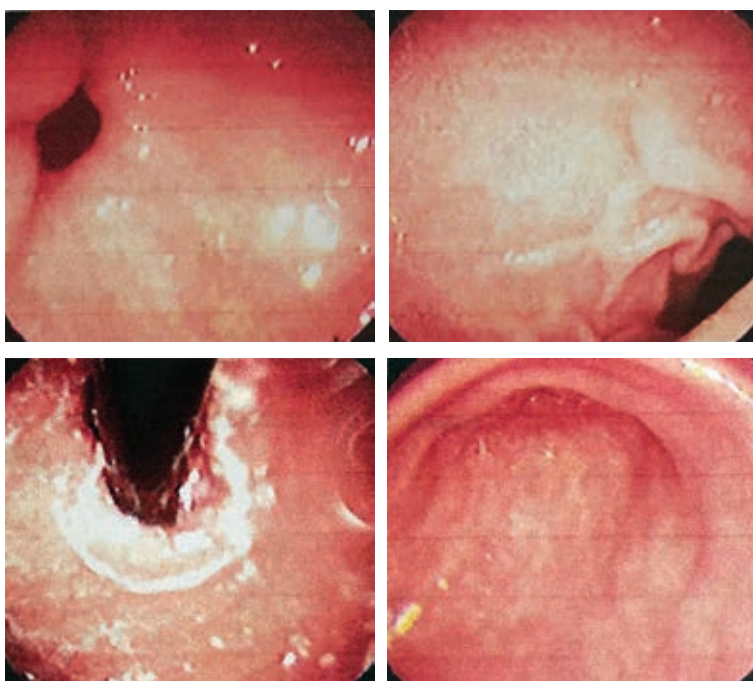


Figure 1: Endoscopy showing esophageal dysmotility of achalasia type and mild antral gastritis.

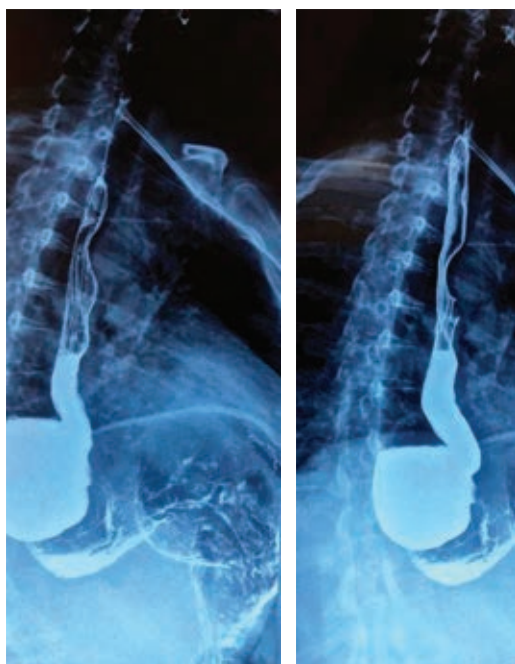


Figure 2: Esophago-gastroduodenal series showing the esophago-gastric junction located infra diaphragmatic, filiform, with a length of 9 mm, a barium passage caliber 14 mm, and a large right posterolateral epiphrenic diverticulum 5.6 × 7.8 cm with a neck of 2.9 cm.

Pathology reported the piece as a true diverticulum (Figure 5). In the outpatient follow-up, the patient had an adequate evolution, tolerated the diet, and did not present symptoms of gastroesophageal reflux.

DISCUSSION

Epiphrenic esophageal diverticulum is rare, with a prevalence of 0.0015 to 2%; because of this, there is little literature about it; it is considered to be caused by some esophageal pathology of pulsation; in 70-90% of the cases, it is accompanied by an esophageal motility disorder; the most common are achalasia and diffuse esophageal spasm.⁹ In the clinical case we present, the patient came for evaluation due to gastroesophageal reflux disease, so we initially requested an endoscopy where we found data of esophageal disease of pulsation type, thus initiating the protocol that led us to the need to request a manometry and esophagogastric series.

Currently, the laparoscopic approach is considered the procedure of choice; the diagnostic approach should include: endoscopy, manometry, and imaging contrast study; this will determine the location, distance of the hiatus, and size; a biopsy should be taken during endoscopy to rule out the presence of malignancy.¹⁰ In the case we present, the studies above were performed, finding a subphrenic diverticulum of the right posterolateral location near the hiatus without motor alterations. We decided to use the transabdominal approach.

There must be a consensus on the adequate surgical treatment for this pathology, thoracic and abdominal approaches, with or without myotomy, and which type of anti-reflux surgery should be performed. These procedures present morbidity from 8.7 to 25%, leaks from 0 to 18.2%, and mortality from 0 to 11.1%.^{11,12} In this case, due to the more excellent experience of the group in the abdominal approach, the laparoscopic approach was chosen for the treatment; since no motility disorder was found in the manometry, it was decided not to perform myotomy and to perform a Nissen type fundoplication, since this is the procedure of choice in anti-reflux surgery.

In a study of a series of case reports by Brandeis, we can observe that in all his patients, an approach very similar to ours was performed; in this study, they reported

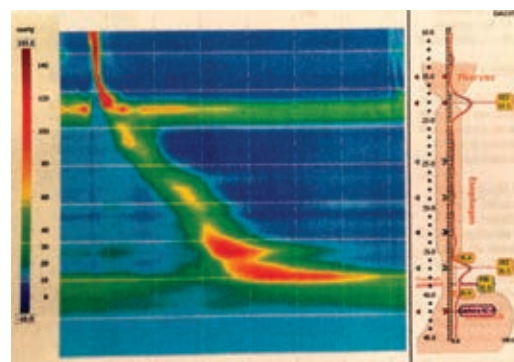


Figure 3: Esophageal manometry showing the upper esophageal sphincter with normal tone and complete relaxation, effective esophageal motility, lower esophageal sphincter with normal mean basal pressure, and obstruction to outflow from the gastroesophageal junction.

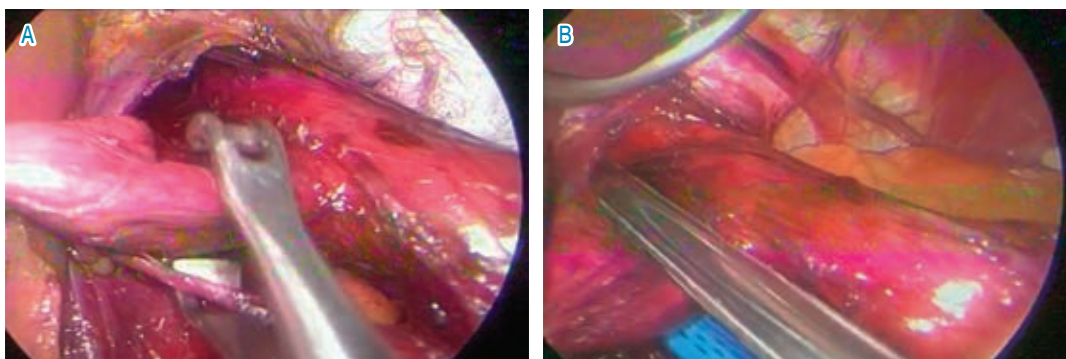


Figure 4: Surgical fields: A) Dissection of the esophageal diverticulum, located in the right posterolateral aspect. B) Diverticulum cut with a linear stapler.

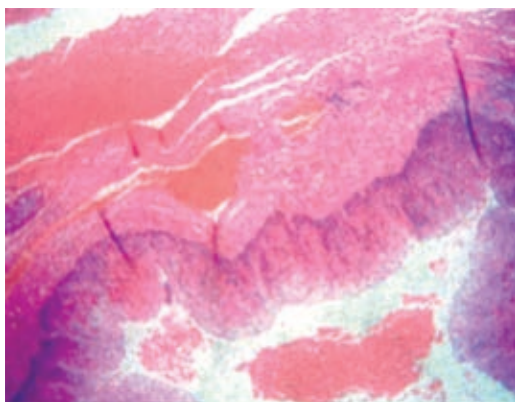


Figure 5: Pathology image of a true diverticulum; wall covered with non-keratinized stratified flat epithelium with regenerative changes, lamina propria, and blood vessels underneath, and smooth muscle bundles associated with edema.

a total of 27 patients, who underwent surgery in a period of 12 years, they found dysphagia (52%) and regurgitation (30%) as the primary symptom, 15 patients (56%) had hiatal hernia, and 26 (92%) had some alteration in esophageal motility. The average distance of the diverticulum was 4 cm from the gastroesophageal junction, the average diameter of the diverticulum was 3.3 cm, 81% of the patients were approached laparoscopically, only one was converted to open surgery due to adhesions, 26 underwent diverticulectomy, all underwent myotomy, and 25 underwent fundoplication; 21 patients (84%) underwent type Dor fundoplication.¹³

Surgical treatment consists of three elements: 1) myotomy, 2) diverticulectomy, and 3) fundoplication, and depending on the findings found in the studies, each of the steps is individualized. With this sequence, we seek to correct the motility disorder, remove the diverticulum, and avoid postoperative gastroesophageal reflux. Caution must be taken with the complications that may occur because some are usually serious such as esophageal leakage or rupture of the mucosa during surgery; we can find others, such as sepsis, pneumonia, and empyema; once identified, we must act quickly.^{14,15}

There is still controversy about when to perform diverticulectomy and when it is not necessary performing only myotomy. Thus, interest has arisen in the use of peroral endoscopic myotomy (POEM), which has shown promising results, up to a 95% success rate; however, it still needs to be considered as a first-line procedure.¹⁶

CONCLUSION

Epiphrenic diverticula are rare pathologies with a good prognosis with adequate treatment. However, there are no guidelines, consensus, or meta-analysis for their management, so we conclude that a complete study protocol should be performed on every patient and thus individualize the treatment according to each patient's needs and the surgeon's experience with the approach.

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Right inguinal hernia with the presence of a uterus, fallopian tube, and ovary associated with Mayer-Rokitansky-Küster-Hauser syndrome

Hernia inguinal derecha con presencia de útero, trompa de Falopio y ovario, asociada a síndrome de Mayer-Rokitansky-Küster-Hauser

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Keywords:

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Palabras clave:

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ABSTRACT

Introduction: abdominal wall hernia is a frequent pathology, with an estimated prevalence of nearly 5% in the general population; the most frequent presentation is inguinal type, accounting for about 70% of the total. Mayer-Rokitansky-Küster-Hauser syndrome is a rare congenital anomaly of the genital tract; its etiology is unknown. It usually presents primary amenorrhea in adolescent females with normal external genitalia and growth. It may be associated with other alterations, especially at the genitourinary level. **Clinical case:** 25-year-old female patient, with pathological history of primary amenorrhea and surgical history of left inguinal hernioplasty, with a history of protrusion in the right inguinal region of three years of evolution, which increases with physical exertion. Physical examination revealed a bump in the right inguinal region of approximately 5 cm in diameter with Valsalva, without color or inflammatory changes, auscultation showed normal bowel sounds, and palpation revealed a mass in the right iliac fossa of soft, depressible, painful, and reducible consistency. On gynecological examination, the patient with female phenotype and typical secondary sexual characteristics presented symmetrical labia majora and minor, permeable vaginal duct. The clinical diagnosis was an uncomplicated right inguinal hernia, surgical treatment was decided, and she was scheduled for elective surgery, finding the right inguinal hernia, the hernial sac containing the uterus, fallopian tube, and ipsilateral ovary.

RESUMEN

Introducción: La hernia de pared abdominal es una patología frecuente, se calcula que la prevalencia es cercana a 5% en la población general; la presentación más frecuente es de tipo inguinal, cerca de 70% del total. El síndrome de Mayer-Rokitansky-Küster-Hauser es una rara anomalía congénita del tracto genital, se desconoce su etiología. Por lo general se presenta como amenorrea primaria en mujeres adolescentes, con genitales externos y crecimiento normales. Puede asociar otras alteraciones, especialmente a nivel genitourinario. **Caso clínico:** Paciente femenino de 25 años, con antecedente patológico de amenorrea primaria y antecedente quirúrgico de hernioplastia inguinal izquierda, con historia de protrusión en región inguinal derecha de tres años de evolución, que aumenta al realizar esfuerzo físico. Al examen físico se observó protrusión en región inguinal derecha aproximadamente de 5 cm de diámetro con Valsalva, sin cambios de color o inflamatorios, a la auscultación presentó ruidos intestinales normales, a la palpación se detectó masa en fosa iliaca derecha de consistencia blanda, depresible, dolorosa, y reducible. En el examen ginecológico, paciente con fenotipo femenino y características sexuales secundarias normales presentó labios mayores y menores simétricos, conducto vaginal permeable. El diagnóstico clínico fue hernia inguinal derecha no complicada, se decidió tratamiento quirúrgico, y se programó para cirugía electiva que encontró hernia inguinal derecha, saco herniario que contiene el útero, trompa de Falopio y ovario ipsilateral.

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INTRODUCTION

A hernia is a defect in the continuity of the structures of the fasciae, muscles, or aponeurosis of the abdominal wall, which allows the protrusion of structures that do not usually pass through them.¹

Abdominal wall hernia is a frequent pathology; the prevalence is estimated to be close to 5% in the general population; the most frequent presentation is of the inguinal type, close to 70% of the total, which in turn is 25 times more frequent in men.² The presence of the uterus and adnexa in the sac of an inguinal hernia is an infrequent event, with less than 1% of cases.³

Mayer-Rokitansky-Küster-Hauser syndrome (MRKH syndrome) was first described by Mayer in 1829, followed by Rokitansky in 1838, Küster in 1910, and Hauser in 1961.⁴ It is a rare congenital anomaly of the genital tract of unknown etiology. It usually presents primary amenorrhea in adolescent females with normal external genitalia and growth. It may be associated with other alterations, especially at the genitourinary level.⁵

It is a rare disease that affects one in 5,000 women, whose main symptom is the absence of menarche of unknown origin, but characterized by the convergence of multiple factors, among which a probable

genetic cause, the lack of sex hormone receptors in the Müllerian ducts, as well as a deficit of the enzyme galactose-1-phosphate uridylyltransferase are not ruled out.⁶

Due to the infrequency of this pathology, we present the case of a 25-year-old woman who underwent elective surgery, finding the uterus, fallopian tube, and right ovary as contents of the hernial sac, together with bilateral renal ectopia, with the kidneys being in the pelvic cavity.

CLINICAL CASE PRESENTATION

A 25-year-old female patient from rural Honduras with a pathologic history of primary amenorrhea without previous evaluation and left inguinal plasty 13 years ago. She reports protrusion of a mass in the right inguinal region after three years of evolution, which increases with physical exertion and decreases with rest.

Physical examination revealed a hypochromic hypertrophic scar in the left inguinal region, an increase in volume in the right inguinal region of approximately 5 cm in diameter, with no change in color when performing the Valsalva maneuver, soft, depressible, painful, and reducible consistency. On gynecological examination, she had a female phenotype, symmetrical labia majora and minora, and a permeable vaginal canal. Laboratory studies were within normal parameters.

Surgical management was proposed, which she accepted. A longitudinal incision was made in the right inguinal region identifying an indirect inguinal hernia. A hernial sac was dissected, and its content was a hypoplastic right uterus, hypoplastic right fallopian tube, and ipsilateral dystrophic ovary, as shown in *Figures 1 and 2*. Due to the findings, joint management by gynecology was requested, who performed an abdominal exploration using a Pfannenstiel incision. The presence of the left ovary in the pelvic cavity was confirmed; digital release and reduction of the hernial content were performed, with reincorporation of the hernial content to the abdominopelvic cavity and subsequent inguinal repair with placement of polypropylene prosthetic mesh with Lichtenstein technique.

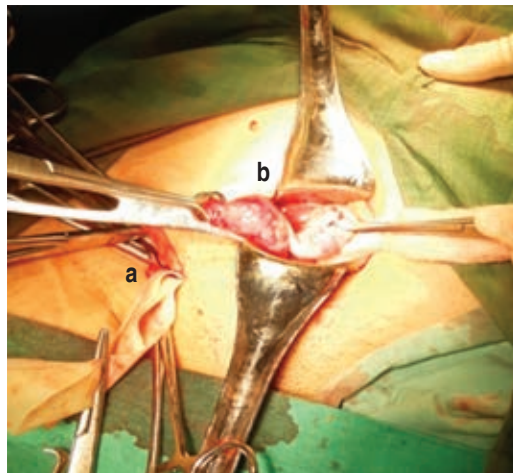


Figure 1: *a.* Incision in the right inguinal region (general surgery) for utero inguinal hernioplasty. *b.* Pfannenstiel incision (obstetrics and gynecology) for revision of pelvic organs.



Figure 2: a. Hypoplastic uterus. b. Right fallopian tube. c. Dystrophic ovary.

The postoperative diagnosis was a right inguinal hernia with the uterus, fallopian tube, and ipsilateral ovary, integrating a Mayer-Rokitansky-Küster-Hauser syndrome.

An abdominal ultrasound was performed to identify bilateral renal ectopia in the pelvic cavity to complete the diagnostic approach and rule out other associated anatomical alterations. She was discharged 48 hours after the procedure with a 30-day follow-up in the outpatient clinic, where she was found with an adequate evolution. She is currently under follow-up by gynecology for the management of Mayer-Rokitansky-Küster-Hauser syndrome.

DISCUSSION

Anatomically, the female inguinal canal has two main contents: *gubernaculum ovarii* and *processes vaginalis*. The former is a ligamentous structure that attaches to the uterine *cornua*. The latter is a small evagination of the parietal peritoneum that is typically effaced by the eighth month of embryological development.⁷ Müllerian ducts give rise to the uterus, fallopian tubes, and upper two-thirds of the vagina; the renal system forms from Wolf's ducts. The Müllerian ducts stop their development around the fifth week of

gestation and are vulnerable to alterations⁸ such as aplasia of the Müllerian ducts.⁹

The presence of the uterus within the hernia sac and the uterine adnexa is a rare pathology in an inguinal hernia; it appears as a palpable and asymptomatic inguinal mass that occurs early in life.^{4,10,11} Uterine adnexa are found in up to 31% of inguinal hernia sacs in girls, but as age advances, the frequency decreases; therefore, it is a rare finding in an adult female.^{7,12}

Mayer-Rokitansky-Küster-Hauser syndrome can be of two types: type I is associated with the isolated absence of the proximal two-thirds of the vagina. Type II is characterized by malformations such as aplasia or hypoplasia of Müllerian ducts, renal ectopia or agenesis, and dysplasia of cervicothoracic somites.⁹ This case was associated with type II because it coincides with its anatomical features, hypoplastic uterus, and vagina associated with bilateral pelvic ectopic kidneys.

Currently, this syndrome is the second most common cause of primary amenorrhea,⁹ and the first cause is gonadal dysgenesis.¹³

In 2010 Chacón-Barboza published a Mayer-Rokitansky-Küster-Hauser syndrome in a 27-year-old woman with female phenotype, breasts, and pubic hair with Tanner stage 4. In the gynecological examination, the vulva was macroscopically normal, and the vagina consisted of a closed pouch with a depth of 2 cm, without evidence of a uterine cervix.¹⁴

Riggall and Cantor reported the first case of inguinal hernia containing the uterus in 1980 in a woman with a female karyotype and phenotype; however, the hernial sac had only the uterus. An anatomic anomaly with primary weakness of the uterine and ovarian suspensory ligaments is suspected. Thomson offered a hypothesis: if there is a failure of fusion of the Müllerian ducts leading to excessive mobility of the ovaries plus non-fusion of the uterine *cornua*, the possibility of herniation of the entire uterus, ovary, and fallopian tube into the inguinal canal increases.³

On the other hand, Fowler theorized that elongated ovarian suspensory ligaments were a hernia's primary cause or secondary effect. Okada et al. suggested that weakness of the broad or ovarian suspensory ligaments may contribute to the inguinal ring herniation, which is exaggerated by increased intra-abdominal pressure.^{3,15}

An inguinal hernia with ovarian contents is not at risk for compression of its blood supply but torsion and infarction. Therefore, management aims at preserving ovarian function by repositioning the gonad to ensure an adequate source of oocyte and estrogen production. Repositioning and herniorrhaphy are advisable as soon as the condition is recognized, regardless of the Mullerian status. An open or laparoscopic approach can perform this repositioning.⁴

The management of Mayer-Rokitansky-Küster-Hauser is multidisciplinary, involving gynecological and psychological aspects. Psychological counseling is necessary to mitigate the emotional effects. Non-surgical creation of the vagina is the most common method, with daily manual self-dilation of the vaginal dimple. Surgery is considered in patients with failure of manual self-dilation or in patients who prefer the surgical creation of a vaginal canal to allow sexual intercourse. Surgical intervention in cases of inguinal hernia should be timely to prevent and relieve torsion, restore normal perfusion to the adnexa, and prevent subsequent infertility.

CONCLUSION

The management of an inguinal hernia should be adjusted to what is described in the different clinical guidelines; in the case of infrequent findings of the contents of the hernia sac, such as a hypotrophic uterus and adnexa, it is necessary to suspect rare pathologies and involve the gynecology department in the management. The diagnostic and therapeutic approach to Mayer-Rokitansky-Küster-Hauser syndrome is multidisciplinary.

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Emergent management of ruptured hepatocarcinoma

Manejo urgente de ruptura de hepatocarcinoma

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transcatheter arterial
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Palabras clave:

Hígado,
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resección tumoral,
embolización arterial
transcatéter.

ABSTRACT

In this paper, we report the case of an 84-year-old male patient who came to the emergency room with an acute abdomen. A simple and contrasted tomography of the abdomen and pelvis was performed where free fluid was observed in the cavity, and signs of liver cirrhosis, so it was decided to admit him. Subsequently, the patient showed signs of hypovolemic shock, for which emergency surgery was decided; a diagnostic laparoscopy and laparotomy were performed; a hemoperitoneum of approximately 2,000 ml was found. An incidental hepatic tumor in segment II was identified, for which it was decided to conduct a hepatic segmentectomy and drainage of the hemoperitoneum; the histopathological study reported hepatocellular carcinoma invading the capsule, with free edges. This case is presented because its treatment was adequate about previous studies, which show that the dissemination of cancer in the peritoneal cavity decreases with rapid drainage of the hemoperitoneum and the advantages described with resection of the hepatocarcinoma in the first surgical time.

RESUMEN

En el presente manuscrito se relata el caso de paciente masculino de 84 años, que acude a urgencias con abdomen agudo, se realiza una tomografía simple y contrastada de abdomen y pelvis, se observa líquido libre en la cavidad y signos de cirrosis hepática, por lo que se decide su ingreso. Posteriormente el paciente muestra signos de choque hipovolémico, por lo cual se decide intervención quirúrgica emergente, se realiza laparoscopia diagnóstica y laparotomía, se describe hemoperitoneo de 2,000 ml aproximadamente y un tumor hepático accidentado en el segmento II, para lo cual, se decide efectuar una segmentectomía hepática y drenaje del hemoperitoneo; el resultado del histopatológico reporta carcinoma hepatocelular que invade la cápsula, con bordes libres. Se presenta este caso debido a que su tratamiento fue adecuado en relación con los estudios realizados previamente, que demuestran que la diseminación del cáncer en la cavidad peritoneal disminuye con el drenaje rápido del hemoperitoneo y las ventajas descritas con la resección del hepatocarcinoma en el primer tiempo quirúrgico.

INTRODUCTION

Liver cancer represents the fourth most common cause of death among malignant neoplasms worldwide, with the World Health Organization estimating that by 2030, 1'000,000 people will die from this cause. The death rate increased from 7.2 to 10.3 per 1 million population in the United States between 2000 and 2016.¹

Mortality and hospitalization rates associated with hepatocellular carcinoma (HCC) also increased by 41% and 46%, respectively. In the United States, 15,000 new cases are diagnosed

each year.² Hepatocellular carcinoma is the sixth most common cancer in the world; however, in Asian and African countries, it is a health problem. For example, in Thailand, it is the most common cancer in men and the third most common in women; in most cases, there is an underlying liver disease such as cirrhosis related to hepatitis B, C, alcoholic cirrhosis, or non-alcoholic fatty liver disease.³ Patients with nonalcoholic fatty liver disease-related hepatocarcinoma usually have the following characteristics: high body mass index, dyslipidemia, type II diabetes, hypertension, or metabolic syndrome.⁴ Inflammatory cytokines,

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adipokines, insulin such as growth factor I, and lipotoxicity intermingle and may cross-react to develop hepatocellular carcinoma (HCC).³

Spontaneous HCC rupture occurs in 3 to 26% of all patients, and mortality rates are high, approximately 32 to 66.7%. The one-, three-, and five-year survival rates of patients with ruptured HCC were 54.2, 35, and 21.2%, respectively, compared to patients with unruptured HCC, the survival were 72.1, 47.3 and 33.9% within the same follow-up time. The available treatments for HCC rupture are hepatic resection, transcatheter arterial embolization (TAE), and conservative treatment (compensation of underlying cirrhosis). In selected patients, timely surgical resection can result in a good prognosis and long-term survival. TAE is a treatment alternative that can effectively induce hemostasis with success rates of 53-100%.³

PRESENTATION OF THE CASE

An 84 years-old male patient, with a history of hypothyroidism treated with levothyroxine 75 μ g orally every day, dyslipidemia treated with simvastatin 20 mg every day, prostatectomy 20 years ago, and surgery for vertebral fracture six years ago present sudden onset abdominal pain with 12 hours of evolution, located in the epigastrium and mesogastrium of intensity 9/10 on the visual analog scale (VAS), accompanied by abdominal distension and lipotimia.

On physical examination, the patient was conscious and oriented; on admission, vital signs were heart rate of 92 per minute, blood pressure of 102/80 mmHg, oxygen saturation of 94% with FiO_2 of 36%. The abdomen was distended with decreased hydroaerial sounds, and on palpation, there was evidence of involuntary muscle resistance with positive Dunphy's sign. Laboratory and imaging tests were performed with the following results: leukocytes: 14.7 K/ μ l, neutrophils: 77.7%, hemoglobin: 11.1 g/dl, hematocrit: 33.8%, platelets: 236,000 K/ μ l; arterial blood gases on admission showed a pH of 7.11, pCO_2 of 36 mmHg, PO_2 60 mmHg, HCO_3^- 11.40 mEq/l, base excess -17.20 mEq/l, and lactate 9.70 mmol/l. It was decided to administrate crystalloid solutions and to perform a CT scan

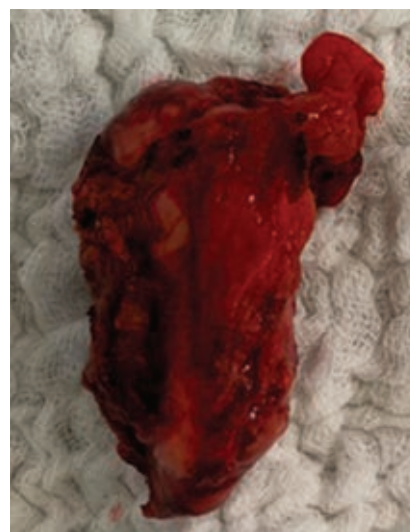


Figure 1: Segment II of the liver containing the tumor (HCC).

of the abdomen without contrast that showed a liver with a heterogeneous tomographic density of micronodular appearance, with a decrease in size of the right lobe, findings probably related to liver cirrhosis. In addition, perihepatic fluid in the perisplenic, and parietocolic gutters, and in the pelvic cavity was approximately 1,500 cm^3 (Figure 1). Subsequently, the patient again refers a sensation of weakness with the following vital signs: heart rate of 115 per minute, and blood pressure of 80/50 mmHg, so it was decided to transfer him to the operating room urgently. A laparoscopic surgery was started, but due to the findings, it was decided to convert to laparotomy during the trans-surgical procedure, where 2,000 ml of hemoperitoneum were identified. The hemoperitoneum was drained and hepatic segmentectomy of segment II was performed (Figure 2); two red blood cell packages were transfused during the trans-surgical procedure. The patient was transferred to the general ward with hemodynamic stability; however, in the control examinations hemoglobin was found to be 8.5 g/dl, so it was decided to transfuse two more packs of red blood cells and two packs of fresh frozen plasma, after which his evolution was without complications. The Jackson Pratt drainage was removed and on the fourth day of hospitalization, he was discharged with

oral paracetamol 1 gram every eight hours for five days.

The histopathology report of segment II of the liver concluded a hepatocellular carcinoma with the proliferation of cells arranged in a mixed pattern (trabecular, acinar, and clear cell) with invasion of the capsule (*Figure 3*) but with free borders, for which clinical oncology was consulted for follow-up and complementary treatment.

DISCUSSION

Hepatocellular carcinoma (HCC) is the most common primary malignant neoplasm of the liver worldwide; it represents 90% of liver neoplasms,⁵ with approximately 500,000 cases diagnosed per year. Spontaneous

rupture occurs in 20% of the cases producing hemoperitoneum, with which the mortality rate increases up to 25%.⁶ The imaging test of choice for diagnosis, treatment, and define the extension of liver tumors is the three-phase tomography, which has a diagnostic accuracy of 68 to 90%.⁵

The etiology of HCC rupture and subsequent hemorrhage has several hypotheses, including tumor growth and necrosis, rupture by division of the overlying normal liver parenchyma or erosion of a vessel, coagulopathy leading to the onset of spontaneous bleeding within the tumor, and increased pressure within the tumor due to blockage of hepatic venous branches due to cancer invasion.³

There are other more specific data related to HCC rupture in several studies, including advanced age, advanced cirrhosis, signs of portal hypertension, and large tumors.⁷

Generally, the source of HCC bleeding is one of the hepatic arteries; however, previously untreated liver tumors may have an extrahepatic collateral arterial supply, which could be a hidden source of bleeding, and close attention should be paid when treatment with TAE is decided and bleeding is not adequately controlled.⁸ HCC rupture constitutes a vital emergency and requires a high index of suspicion in patients with established liver cirrhosis who present abdominal pain and distension, and a rapid onset accompanied by a drop in hemoglobin, and arterial hypotension with evolution to hypovolemic shock due to massive intraperitoneal bleeding,⁹ as occurred in our

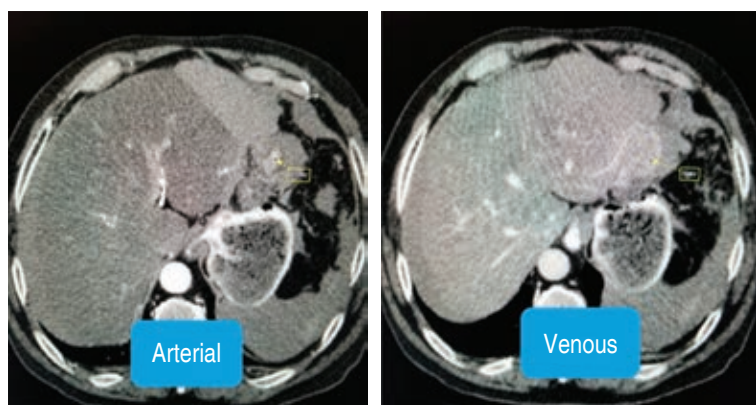


Figure 2: Computerized axial tomography of the abdomen and pelvis, axial section. The hepatic tumor is observed in segment II, with contrast uptake in the arterial phase and wash-out in the venous phase (wash out).

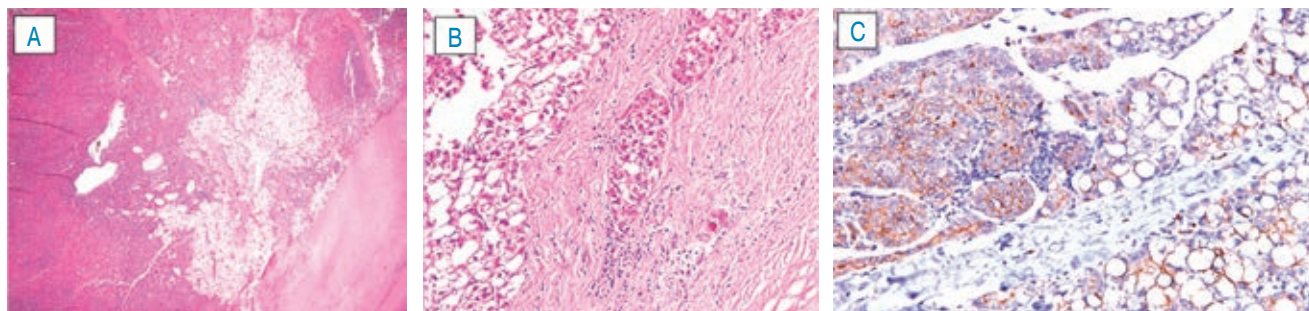


Figure 3: **A)** Mixed epithelial neoplasm (trabecular, glandular, and clear cells), surrounded by its capsule (H&E, 4×). **B)** Nests of epithelial cells infiltrating connective tissue (H&E, 20×). **C)** Polyclonal carcinoembryonic antigen: pericanalicular positive (immunohistochemistry, 10×).

patient. The only difference is that he had no previous diagnosis of cirrhosis or liver tumor.

The management of ruptured hepatocarcinoma depends on the hemodynamic status of the patient, the degree of tumor burden, and the underlying liver function. Transarterial embolization (TAE) has now been found to be an effective option to control bleeding in patients whose hemodynamics are impaired and provides a time to assess the patient's condition and tumor burden. This bridging strategy is now offered for subsequent definitive and curative surgical treatment in selected patients. TAE has a hemorrhage resolution rate of 53 to 100% of cases.³ Studies are comparing the three types of treatment whose results show greater survival in patients in whom hepatic resection was performed versus TAE or conservative management.⁶ Conservative treatment of ruptured HCC is rarely used alone; its indication is in hemodynamically stable patients with minimal blood loss or those without surgical indication and those receiving palliative treatment. In-hospital survival with this alternative is 49%, and only 1% survival at one year.⁷ In our case, it was decided to perform a hepatic resection because the patient came to our clinic with acute abdomen and hemodynamic alteration. In the trans-surgical examination, active bleeding was observed at the level of the hepatic tumor, for which reason the decision above was made.

It is generally assumed that spontaneous HCC rupture influences the prognosis of patients undergoing hepatic segmentectomy; there is still controversy on this, as extensive studies such as the one performed in Shanghai by Yang T et al. in 1,223 patients showed that perioperative morbidity and mortality rates were comparable in the ruptured versus unruptured HCC groups, indicating that hepatic segmentectomy does not increase the risk in selected patients and with expert surgeons. Peritoneal dissemination is common after curative resection of ruptured HCC, but early resection and removal of the hemoperitoneum reduce the occurrence of this dissemination. The reported mortality following partial hepatectomy in ruptured HCC is 7%.¹⁰

The timing of hepatic segmentectomy is also debated, as it depends on several

factors; for example, in Child-Pugh grade C patients, surgery is contraindicated. Other contraindications include tumor thrombosis of the central portal vein, intractable hepatic encephalopathy, severe coagulopathy, low-performance status, distant metastasis, and altered cardiac, renal, or pulmonary function that cannot tolerate the surgery above. In such cases, transarterial embolization (TAE) would be the first option. When the surgical resolution is decided, the discussion is whether to perform segmentectomy in a first stage or in several stages; higher mortality rates are described when it is performed in a single location; however, some studies show that the mortality of hepatic segmentectomy in a single stage is comparable with staged surgery if the patient's conditions allow it, and even more, advantages are reported when it is performed in a single stage with less peritoneal dissemination, better survival, a better quality of life and shorter hospital stay.¹¹

When investigating survival and recurrence of ruptured versus non-ruptured HCC in small studies, it was found that there was no statistically significant difference between these two groups, but in other larger groups, for example, Yang et al. with 5-year follow-up demonstrated that survival was only 16.8% in the ruptured HCC group compared with 50.5% in the non-ruptured group ($p < 0.001$). Recurrence was similar between patients with ruptured and non-ruptured HCC (73 vs. 60%; $p = 0.568$), but the mean time to recurrence was significantly shorter in the ruptured group (0.54 vs. 2.73 years; $p < 0.001$).¹²

CONCLUSIONS

HCC is the most frequent malignant tumor of the liver, and its rupture is a complication that requires emergency intervention.

Hepatic segmentectomy in the first surgical time is an option that offers advantages in terms of less cancer dissemination, a shorter hospital stay, and more prolonged survival compared to staged treatment.

Transarterial embolization is an option to be considered in selected patients and when interventionism is available because these patients could improve their hemodynamic stability quickly.

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The second journal of medical-military and trauma issues in Latin America (1875-1876)

La segunda revista de temas médico-militares y de trauma en Latinoamérica (1875-1876)

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Keywords:

Surgery, history, trauma, Larrey, journals, 19th century.

Palabras clave:

Cirugía, historia, trauma, Larrey, revistas, siglo XIX.

ABSTRACT

We describe the contents of the second journal of military medicine and trauma published in Latin America. Anales de la Asociación Larrey (the first was El Boletín del Cuerpo Médico Militar de la República Mexicana from 1857 to 1859, which could not be located), a journal of the same society that was edited by Dr. Manuel Saturnino Soriano and directed by Dr. Francisco Montes de Oca, from January 1875 to December 1876, which consisted of two volumes and 56 articles, being the three areas with more papers: trauma (14%), therapeutics (12%), and surgery (8%). The style of the articles is the description of cases and their clinical evolution, and it initiated the use of statistics only to describe births and vaccination processes. Its surprising disappearance does not detract from its value for physicians who wish to contribute to the progress of military medicine, trauma, and medicine in general.

RESUMEN

Describimos el contenido de la segunda revista de medicina militar y trauma en Latinoamérica, Anales de la Asociación Larrey (la primera fue El Boletín del Cuerpo Médico Militar de la República Mexicana de 1857 a 1859, no localizada), revista de la misma sociedad que fue editada por el Dr. Manuel Saturnino Soriano y dirigida por el Dr. Francisco Montes de Oca, de enero de 1875 a diciembre de 1876, que constó de dos volúmenes y 56 trabajos, las tres áreas con más trabajos fueron: la de trauma (14%), terapéutica (12%) y cirugía (8%). El estilo de los artículos es de descripción de casos y su evolución, inició el uso de estadística sólo para describir nacimientos y procesos de vacunación. Su sorpresiva desaparición no le quita su valor para los médicos que desean contribuir al progreso de la medicina militar, el trauma y la medicina en general.

INTRODUCTION

Our objective is to describe the contents of the second journal of military medicine and aspects of trauma in Mexico published in the 19th century, the background and most important characters that allowed, in a time of revolts and internal wars in our country,¹ to develop one of the first means of medical information dissemination of this type in the American continent. It is also relevant to describe the kind of techniques used in that historical moment, which meant a parallel development of trauma management, but with

proposals different from those of Europe.² This is part of a sequence of works within the history of surgery in Mexico, which seeks to recover the antecedents of relevant facts and rescue the surgical means and the characters that gave prestige to national surgery.

MEDICAL JOURNALS IN THE 19TH CENTURY

The first medical journal in the continent was *El Mercurio Volante*,^{3,4} founded by Dr. Ignacio Bartolache on October 17, 1772, with a limited edition of 16 issues, the last one published

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on February 10, 1773.⁵ At the beginning of the 19th century, the New England Journal of Medicine appeared in the United States in January 1812, being the longest continuously published medical journal in the world.⁶

According to the different authors, we can differentiate three periods in the writing of medical journals: from 1772 to 1864, when groups met to write, without a formal editorial committee and a determined continuity, manuscripts describing clinical cases. From 1864 to 1923, we found journals with a qualified committee, exchange with other journals in Europe and with continuity within the country, with a specific format and works with statistical studies of case series, the first journal of this type in our country being the *Gaceta Médica de México*.^{7,8} Finally, from 1923 to 2000, when physicians met in medical societies and institutions, we started to publish papers in a specific format with a multinational collegiate group. The tendency was to be read abroad.⁹ Perhaps it would be worthwhile to consider the computer era from 2000 when Mexico incorporated its collections into this new system.^{10,11}

Of the medical articles of the 18th century, the first trauma articles were written by military physicians of the units known as presidios in the northern border of the country and are the result of the Creole enlightenment of the 18th century. Specifically, it was the description of a case of skull trauma operated by trephine by Dr. Sebastián Barceló in 1793 in the so-called *Gazeta de México (sic)*.^{12,13} The other journals of the different medical academies of Mexico sporadically collected some work on trauma but without regularity.

UNKNOWN ANTECEDENT

The outstanding work of Dr. Pedro Vander Linden initiated not only improvements in the Military Health Service¹⁴ but also the academic renovation by pretending to find a military training hospital;¹⁵ at that time, the edition of the newspaper of the first Academy of Medicine was suspended, and there were no medical means of diffusion. Vander Linden conceived the idea of publishing a medical journal called *El Boletín del Cuerpo Médico Militar de la*

República Mexicana from 1857 to 1859.¹⁶ The first to document the existence of this medium was Dr. Soriano before the National Academy of Medicine in his memoir.¹⁷ Still, I have not been able to locate this copy. Dr. Soriano described that the following doctors collaborated in this journal: Alfaro, Armijo, Balderas, Bocanegra y Caro, Borrayo, Burguichani, Carrión, Echeveste, Franco, González Huidobro, Garmendia, Hidalgo, Miranda, Mellet, Morón, Marroquí Joaquín, Marroquí José María, Pacheco, Peña, Portilla, Rivadeneyra, Ruíz, Sarlat, Serrano, Néstor Tellechea, Trejo, Tamés, Urueta and Villalobos Manuel.¹⁷ Therefore, this bulletin would be the first military medicine published in Latin America.

BEGINNING AND END OF A GREAT PROJECT

According to Dr. Flores y Troncoso, the Larrey Association was born in August 1873, when three young military physicians (Rocha, Figueroa, and Labastida, senior army surgeons)



Figure 1: First page of the first volume of the journal *Annals of the Larrey Association*.

Table 1: Active members of the Larrey Medical-Surgical Association in 1875.³²

Full members of the Larrey Medical and Surgical Association Board of directors of the society	
President: Dr. Francisco Montes de Oca	Procurator: Dr. Manuel S. Soriano (journal administrator)
Vice-president: Dr. Francisco de P. Larrea	General Secretary: Dr. Manuel Rocha
Librarian: Dr. Fernando Malanco	Assistant Secretary: Dr. Rafael Caraza
Treasurer: Dr. Manuel Viñas	
Physicians	
Dr. Vicente Morales	Dr. José Espinosa y Moreno
Dr. Agustín Velasco	Dr. Carlos Fenelón
Dr. Juan N. Govantes	Dr. Tobías Núñez
Pharmacists	
Pharm. Francisco Patiño	Pharm. Antonio Santoyo
Veterinarians	
Vet. José Gómez	Vet. José de la Cruz Roja
Candidates	
Dr. José M. Lugo	Dr. Joaquín Morales
Dr. Prisciliano Figueroa	Dr. David Rios
Dr. Manuel Rocha	Dr. José M. Trys
Dr. Rafael Caraza	Dr. Eleno Cervantes
Dr. Santiago Robles	Dr. Ponciano Herrera
Dr. Francisco Blánquez	Dr. José Hermosillo
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Dr. Alejo G. Conde, Guadalajara	Dr. Juan Breña, San Luis Potosí
Dr. Ignacio Pombo, Veracruz	Dr. Luis Ponce, Tulancingo
Dr. Manuel Garmendia, Veracruz	Dr. Manuel P. Reyes, Saltillo
Dr. Ignacio G. Lozano, Coahuila	Dr. Miguel P. Cicero, Matamoros
Dr. Samuel L. Morales, Puebla	
Fees	
Baron Dr. Larrey (Nieto), Paris	Dr. Juan N. Navarro, New York, NY
Collaborators	
Dr. Eduardo Liceaga	

by initiative raised funds and founded a library in the Military Hospital of San Lucas (Mexico City), then suggested the idea of a “society” in August 1874. The newspaper appeared on January 1st, 1875 (Figure 1).¹⁸ During the two years it was published, it had members all over the country, some of them with a bright future, such as Dr. Eduardo Liceaga and Dr. Tobías Núñez (Table 1).

According to the journal, in its last issue, it announced that it had difficulties due to a lack of funds.¹⁹ Still, Dr. Francisco de Asís Flores y Troncoso stated in his book that it was a consequence of the triumph of the Revolution of 1876 and the subsequent changes in the personnel of the Military Medical Corps.¹⁸ Finally, unfortunately, the magazine disappeared.

JOURNAL CONTENTS

In the two short years of its publication, 61 papers were printed, 11 (18%) on trauma problems, although various topics were presented (Figure 2).

The paper entitled “Appreciation of the Sedillot procedure” describes the background and two cases operated by Dr. M.S. Labastida. Labastida, who describes perfectly how the distal third humeral pulse is searched in the arm, where the artery is dissected, and the “clot” is removed, from which we infer that it was a post-traumatic pseudoaneurysm, passing with two “blunt” Deschamps needles under the dissected artery and applying two ligatures, one distal and the other proximal to the lesion.²⁰ Dr. Rafael Caraza ratified with a stab wound of the axillary artery, making dissection in the axillary pit, and ligating a distal and a proximal portion of the vessel without complications after two months;²¹ remains the doubt of whether it really would be the axillary artery since he does not mention the amount to which it was ligated. Lopez-Arayza described the third case of pseudoaneurysm due to a sharp weapon injury on a lesion of the distal third radial artery under the same system.²² It is noteworthy that all four cases occurred in an urban environment in peaceful situations. In contrast, Espinoza’s work describes the

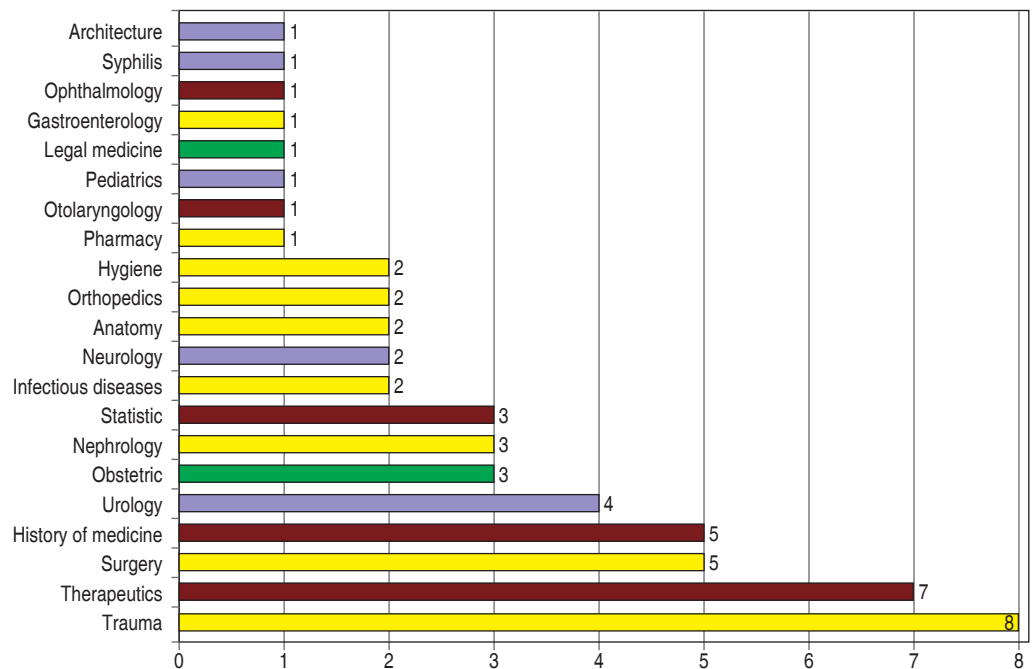


Figure 2:

Topics reviewed in the 56 articles of the journal Annals of the Larrey Association from 1875 to 1876.

management of humerus minute fractures; it is noteworthy that after observing that it was not a vascular lesion and that there was a loss of bone continuity, he bandaged the entire limb with sponges and took him on horseback to the hospital already in a state of shock; he splinted the extremity with two boards, which helped to stop the bleeding; a “cold water” irrigation system was used (this may be an exciting antecedent of Carrel’s design of the early 20th century), and the wound was explored to extract projectile splinters. He was driven three days by four stretcher bearers to Mexico City; cures were done twice a day with Labarraque’s solution, and after a month, he stopped suppurating with the described therapies.²³

Among the surgical works, three urological works stand out, such as a carving performed by Dr. Montes de Oca following the technique of Jacques Gilles Maisonneuve (1809-1897).²⁴ An interesting series was presented by Dr. Fenelon of nine ovarian cyst extractions by laparotomy, the largest of them measuring 56 by 61 cm, with deaths due to uncontrollable hemorrhage, advocating that they should be operated on at an “early” stage.²⁵

CONCLUSIONS

Although the edition of this journal lasted only two years, it meant the passport to the academic maturity of our surgical professionals for national surgery. It was not only a means of diffusion but also the consolidation of our country’s emergency system and the management of trauma.¹³ The existence of an independent media of the *Gaceta Médica de México* is the reflection of the intellectual maturity in the President Juárez era and the beginning of the Porfirian period, the fruit of the cultural contact of the German, French and Belgian currents of the Intervention era,²⁶ and of the unfortunate battles that enriched the surgical arsenal of trauma, which would open the age of the surgeon in the factories and the cities with vehicles of the coming century.²⁷

Regarding trauma management, we observed that initial management was given at the battlefield. The wounded person was transferred with daily cures along the way and the use of Labarraque liquor, already described in a previous paper,²⁸ the use of splints and transport until the definitive procedure was performed, between three and 15 days after wounding, unless there was sudden bleeding.

It is noteworthy that amputation was not the first instance²⁹ as was done in other countries at that time. The aim was to preserve the pelvic and thoracic limbs, unlike in other countries where, for vascular injuries, the first instance was immediate amputation.³⁰ Of the articles, some are true medical literary gems. Still, as they lack a title that describes their exact content, they can pass as inconsequential, such as that of Dr. Fenelón, that only bears the title “correspondence”,²⁵ losing the opportunity of the value of these manuscripts if they are not read carefully.

Despite the scarce edition of this journal and its heroic editor, Dr. Francisco Montes de Oca, who died in the campaign due to pneumonia in 1885,³¹ both were the seed of the next generation of trauma surgeons and military physicians who generated a group of mature surgeons capable of gathering their experience and contributing with original proposals.² There are no trauma statistics in this journal, even though the same editor, Dr. Manuel Saturnino Soriano, will be one of the first to publish works in this area with descriptive statistics.¹⁷

Unfortunately, many hemerographic and bibliographic collections are lost or belong to unavailable private collections. The study of our cultural heritage could be complemented by factional struggles, as Dr. Francisco de Asis Flores y Troncoso mentioned.¹⁷ The preservation of these resources in digital systems, such as the extraordinary compilation of the National Academy of Medicine in 2009 of the journal *Gaceta Médica de México*, should be a national priority in all cities of the country concerning all our collections of books and medical journals in Mexico, not only for the sake of preserving something historical but also because in many of them there are first works such as the pseudoaneurysms published in the journal *Anales de la Asociación Larrey*, which help us to understand our past so that, through history, we can even obtain new answers to our clinical problems in the centuries to come.

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- 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) acknowledgements, 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 considered necessary.
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TEXT

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 - 2) Objectives,
 - 3) Material and methods,
 - 4) Results, and
 - 5) Conclusions.
- Avoid the use of abbreviations, but if their use is indispensable, specify what they mean the first time

they are cited. Symbols and abbreviations of units of measurement in international use do not require specification of their meaning.

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References

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Examples, 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:

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