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Publication of negative results

Publicación de resultados negativos

Abilene C Escamilla Ortiz*

We are used to read positive results in scientific articles; it is rare to see negative results published, as they have more value for editors, readers or publishers, and are easier to cite.[1] Mostly they are driven by the "publish or perish" adage, where the winner is almost due to performance, the more quantity of articles published or if published in high impact journals.[2]

What are negative results? They are usually seen in studies that have small samples or a sample that is underpowered, or whose findings are inconclusive. They also occur when despite a good sample and a well-planned study, the results suggest no effect. And are also seen when instead of the expected result the opposite is observed.[1]

Why do researchers get negative results? They occur when the original hypothesis is not accurate and/or is based on false and incorrect assumptions. Negative results are also seen due to errors when choosing the right study or by not using the appropriate statistical test for the study. And they are also observed when the researcher failed to confirm the findings obtained in preliminary reports.[3]

WHY REPORT NEGATIVE OR INVALID RESULTS?

Publication of negative results by a colleague or by a group of recognized colleagues can lead to changes in the research study itself, e.g., if a drug is not helpful for a certain condition the reporting helps to avoid re-exposing subjects to the effects of that drug.[3]

DECIDING TO PUBLISH NEGATIVE RESULTS

If the pattern of results is negative, the statistical method should be reviewed. In that case, the study should be repeated several times to rule out technical failures, seek collaboration with other researchers, if possible, and increase the rigor of the research. If the results are in fact negative and worth reporting, they can be published, since they will have an impact on the results.[3]

The decision to publish negative results is not an easy task both for authors and editors. Several things must be taken into consideration, for example, the ethical issue of using animals, especially when having to repeat a study. The result must be conclusive.[3]

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WHERE TO PUBLISH NEGATIVE RESULTS?

There are many ways to do this, one of them is to share it with colleagues by publishing it on the company's website. Very few journals accept to publish negative results. Among them are *Positively Negative (PLOS One)*, *Journal of Negative Results in Biomedicine*, *Journal of Negative Results – Ecology and Evolutionary Biology*, and the *Journal of Pharmaceutical Negative Results*.

Publishing well-done controlled clinical studies can prevent other colleagues or researchers from spending energy, time, and resources on similar studies, reduce bias and avoid participants to use the same treatment.[3]

WHAT CAN WE DO TO ADDRESS THIS PROBLEM IN BIOMEDICAL PUBLICATIONS?

These studies can be published in a separate section of the journal where these peer-reviewed manuscripts are included, or in a special section that includes the methodology describing how the study was conducted. When the study is completed, the journal will either publish it in full, regardless of the findings, or include it in a separate section with an explanation of why it was rejected.[2]

In the *Cirujano General* journal we have not received this kind of manuscripts, but we are open to include a section for this kind of studies, pending they have a good methodology.

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ORIGINAL ARTICLE

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Practical classification of the severity and medical-surgical management of acute appendicitis

Clasificación práctica de la gravedad y manejo médico-quirúrgico de la apendicitis aguda

Juan Hernández-Orduña*

Keywords:
Appendicitis, classification, surgical management, complications, cecal appendix.

Palabras clave:
Apendicitis, clasificación, manejo quirúrgico, complicaciones, apéndice cecal.

ABSTRACT

Objective: To determine whether restructuring the macroscopic classification of acute appendicitis, according to the findings, can guide surgical management, directly impacting hospital stay, prognosis, complication rate and reinterventions. **Setting:** A public general hospital in the State of Mexico. **Design:** A prospective, cross-sectional, comparative, observational and analytical study. **Statistical analysis:** Descriptive statistics of demographic data comparing the appendicitis groups based on the suggested classification were used. Student's t test for continuous variables with a 95% confidence interval was used, along with the Excel data analysis system. A probability value < 0.05 was accepted as statistically significant. **Material and methods:** 182 patients admitted to the Emergency Department of the General Hospital of Atizapán in a period from November 2016 to October 2017 with painful abdominal syndrome suggestive of acute appendicitis, were studied. The classification suggested in evolutionary stages was applied by the author, relating it to the suggested management and contrasting it with the traditional classification and the liberal management of the other surgeons, assessing the presence of complications, re-interventions and days of hospital stay. **Results:** Patients with suggested management according to the new classification presented lower rates of infection and reintervention, compared to patients without suggested management in the classification presenting a higher rate of infections (41.1%), reinterventions (10.5%) and days of hospital stay (200-300% longer stay). **Conclusions:** This research allows us to recommend the use of this classification, since in addition to being accurate to assess the severity of acute appendicitis and its relationship with peritoneal cavity contamination, it serves as a guide to surgical management according to the intraoperative findings, decreasing, on the other hand, not only the rate of complications and days of hospital stay, but also reinterventions.

RESUMEN

Objetivo: *Determinar si la reestructuración en la clasificación macroscópica de la apendicitis aguda, de acuerdo con los hallazgos, puede guiar el manejo quirúrgico, impactando directamente en la estancia hospitalaria, el pronóstico, la tasa de complicaciones y las reintervenciones.* ***Sede:*** *Hospital General de Atizapán, ISEM.* ***Diseño:*** *Estudio prospectivo, transversal, comparativo, observacional y analítico.* ***Análisis estadísticos:*** *Se realizó estadística descriptiva de los datos demográficos, comparando los grupos de apendicitis con base en la clasificación sugerida, utilizando la t de Student para variables continuas con un intervalo de confianza de 95%, y el sistema análisis de datos de Excel. La probabilidad de < 0.05 fue aceptada como estadísticamente significativa.* ***Material y métodos:*** *Se estudiaron 182 pacientes que ingresaron al Servicio de Urgencias del Hospital General de Atizapán en un periodo de noviembre de 2016 a octubre de 2017, con síndrome doloroso abdominal sugestivo de apendicitis aguda; se les aplicó la clasificación sugerida en estadios evolutivos, por parte de los autores, relacionándola con el manejo sugerido y contrastándola con la clasificación tradicional y el manejo liberal de los demás cirujanos, valorando la presencia de complicaciones, reintervenciones y días de estancia hospitalaria.* ***Resultados:*** *Los pacientes con manejo sugerido de acuerdo con la nueva clasificación presentaron menor tasa de infección y de reintervención, comparado con los pacientes sin el manejo sugerido en la clasificación presentando una mayor tasa de infecciones (41.1%), reintervenciones (10.5%) y días de estancia hospitalaria (200-300% más de estancia).* ***Conclusiones:*** *Esta investigación nos permite recomendar el uso de esta clasificación, ya que además de ser precisa en la gravedad de la apendicitis aguda y su relación con la contaminación de la cavidad peritoneal, da guía al manejo quirúrgico de acuerdo con los hallazgos transoperatorios, disminuyendo no sólo la tasa de complicaciones y días de estancia hospitalaria, sino también las reintervenciones.*

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INTRODUCTION

Traditionally, the classification of acute appendicitis has include four phases according to the macroscopic anatomopathological intraoperative findings; however, these do not clearly define the severity of the contamination of the peritoneal cavity, nor its systemic repercussion in the patient.[1,2]

Classifying, meaning arranging by classes or types, is the logical operation that facilitates the exposition of thought in any activity and, therefore, allows us to guide decision making. The current classification of acute appendicitis into non-perforated and perforated seems more a description of the findings than a classification since it does not guide us in decision making. For example, a sealed stage 4 appendicitis is not the same as a stage 4 with free purulent material throughout the cavity or fecaloid material, and even with lesion to neighboring organs. Then, why classify and manage acute appendicitis in the same way? Complications after the initial management entail the need for imaging studies, invasive procedures, longer antibiotic use, and prolongation of hospital stay with reports of up to 58% in the rate of complications when the initial presentation of the picture is that of a perforated appendicitis.[3]

Due to the importance of this pathology because of its high frequency, it is necessary to reassess if the classification of acute appendicitis reflects its severity, so it may guide us to adequately perform the surgical intervention, and if this surgical conduct in each case has an impact on complications, reinterventions, and hospital stay.

Therefor the paradigm of complicated acute appendicitis must change, since it is not only the appendix, but there are two entities: the appendix and a peritoneal cavity. This way, a secondary peritonitis with the consequences that it implies, both local and systemic, must be managed properly, without propitiating or waiting for tertiary peritonitis or hostile abdomen, which can lead to septic shock and death.

Classifications of acute appendicitis

Over the years, the classification of acute appendicitis has been the subject of debate. The most traditionally used by surgeons is based on macroscopic observation of the surgical findings and is divided into four stages: stage 1 erythematous or catarrhal, stage 2 suppurative or phlegmonous, stage 3 necrotic, and stage 4 perforated. However, as is evident, this classification does not clearly define the severity of the pathology nor its repercussion in the peritoneal or systemic cavity.[1,4] Moreover, this classification lacks bibliographic support, so some authors have used other classifications, such as complicated or non-complicated acute appendicitis, perforated or non-perforated acute appendicitis. This shows that there is not a unified consensus for its classification. Therefore, other classifications have then been used: clinical-etiological (non-obstructive perforated or non-perforated, obstructive perforated or non-perforated, and by vascular obstruction); evolutive (without perforation or with perforation, with local or diffuse peritonitis added); and topographic according to the anatomical variants of the appendicular tip.[5]

Maingot in 2008 clearly defines the extent of the disease, especially in complicated cases, opening a door to the management for each phase. The disease extension may be 1) non-perforated acute appendicitis and 2) Perforated; and a) with local abscess and b) generalized peritonitis. However, it is not the same an acute appendicitis with free fecaliths than without them, with free fecal matter or without it, and in how many quadrants is found or if it is generalized. Also, the state of adjacent tissues, which can be ileus or cecum; if it is necrotic or with wide perforations; and more importantly the systemic state of the patient, should be considered.[6]

In 2003, Dr. Gilberto Guzman classified appendicitis according to surgical findings in the following manner which is very similar to Maingot's classification: grade 0 without appendicitis; Ia edematous and ingurgitated appendix; Ib abscessed or phlegmonous appendix; Ic necrotic appendix without perforation; II perforated appendix with localized abscess; and III appendicitis complicated with generalized peritonitis. This classification is an adaptation of Maingot's and,

like him, focuses only on the appendix without emphasizing adjacent tissues involvement and the management in each case.[7]

Recently the classification proposed by the Mexican Association of General Surgery, which includes I) Acute appendicitis, divided into 1) Nonperforated, subdivided as a) edematous, hyperemic, b) abscessed, phlegmonous, c) necrotic; 2) Perforated, subdivided as a) abscessed with localized peritonitis and b) generalized peritonitis; and 3) Acute reactive appendicitis and II) Chronic appendicitis, defines the extent of cavity contamination. However, this classification does not define the extent of peri-appendicular tissues or the patient's systemic status. Neither does it guide us in the decision-making process of surgical and post-surgical management.[8]

In 2012, Gomes proposed a classification according to laparoscopic findings into: grade 0 (normal appearing appendix); grade 1 (appendix with hyperemia and edema); grade 2 (fibrinous exudate); grade 3A (segmental necrosis); grade 3B (basal necrosis); grade 4A (abscess); grade 4B (regional peritonitis); and grade 5 (diffuse peritonitis).[9] The goal of this new system was to provide a standardized classification to allow a more uniform patient stratification for appendicitis investigation and to help determine the optimal management according to the grade assigned. In 2015, the same author Gomes gave a proposal for a new acute appendicitis classification system based on clinical, and imaging and laparoscopic findings. He classified appendicitis into 1) uncomplicated acute appendicitis, subdivided into grade 0, normal appearing appendix (endo-appendicitis/peri-appendicitis); grade 1 inflamed appendix (hyperemia, fibrin edema with no or very little pericholecystic fluid). 2) complicated acute appendicitis subdivided into grade 2 necrosis, A - segmental necrosis, (without or little pericolic fluid), B - base necrosis, (without or little pericolic fluid); grade 3 - inflammatory tumor. A - A phlegmon. B - Abscess less than 5 cm in diameter without peritoneal free air. C - Abscess greater than 5 cm in diameter without peritoneal free air, and grade 4 - perforated - diffuse peritonitis with or without peritoneal free air. This classification was born out of the author's observation that a new comprehensive classification system for acute appendicitis was needed because treatment options for complicated cases of acute appendicitis now include non-surgical modalities.[10]

The percentage of complications increases according to the type of acute appendicitis and its degree of evolution. Most frequent complications are infectious, wall abscesses, and intraperitoneal abscesses, but tertiary peritonitis and hostile abdomen may also be observed, which can lead to abdominal sepsis and septic shock.[11,12]

MATERIAL AND METHODS

A prospective, cross-sectional, observational, and analytical study was conducted in 182 patients admitted to the General Hospital of Atizapán in the period between November 2016 and October 2017 with the diagnosis of probable acute appendicitis.

The study protocol was approved by the Research and Ethics Committees of the *Hospital General de Atizapán, Estado de México*. Attached is the authorization sheet by the head of teaching and research, dated September 29, 2016. The confidentiality of the information obtained was always respected with strict respect for human dignity.

The present study did not imply any risk for the patients, since only the classification proposed by the author was applied, correlating it with the surgical finding in relation to the stage, surgical management, and rate of complications, as well as days of hospital stay without influencing the decision of the Surgeon assigned to the Emergency Department regarding medical decision or surgical intervention. The management performed was compared with that suggested, and contrasted according to evolution, complications, and days of hospital stay.

The aim of this new system was to provide a standardized classification to allow a more uniform patient stratification for the investigation of appendicitis, and to help determine the optimal management according to stage. To this end, surgical management was suggested according to the stage of the classification and to be able to compare whether it leads to a surgical procedure.

Descriptive statistics of demographic data were done, and analytical statistics were performed to compare the appendicitis groups using the Student's t test on continuous variables to assess the suggested classification, with a 95% confidence interval, using the Excel data analysis system. A probability value < 0.05 was accepted as statistically significant.

Suggested classification

The importance of a classification is to provide guidelines for surgical management, homogenize treatment, predict complications according to surgical findings and facilitate the healing process in the evolution of the patient, and to contribute to the teaching and learning process of surgical residents. In this way, management can be decided, reducing unnecessary prolonged in-hospital stay.

The logical operation that facilitates the exposition of thought in any activity to guide decision making is to group the elements following some criteria and then classify them.[13] In acute appendicitis the ideal classification system should be designed to meet the following conditions:

1. To provide an accurate description of the state of the lesion of the cecal appendix, surrounding tissues, and the degree of contamination of the peritoneal cavity.
2. To determine the most appropriate surgical treatment according to the degree of injury.
3. It should be useful in the calculation of the prognosis in the event of a possible complication.
4. That it complies with the recommendations for the surgical management of complicated acute appendicitis.
5. To establish norms for the prevention of surgical site infection, tertiary peritonitis, or hostile abdomen.

Therefore, the following classification of acute appendicitis is suggested, correlating

Table 1: Comprehensive classification of severity and suggested management of acute appendicitis.

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
• Acute appendicitis without perforation a. Erythematous, edematous b. Absceded c. Necrotic	• Acute perforated appendicitis with localized abscess	• Perforated acute appendicitis with generalized purulent peritonitis	• Perforated acute appendicitis with generalized purulent peritonitis + free fecaliths	• Acute perforated appendicitis with generalized peritonitis and ileal or cecal necrosis
Suggested handling	**Suggested handling**	**Suggested handling**	**Suggested handling**	**Suggested handling**
• Appendectomy and drying	• Appendectomy, drying and drainage	• Appendectomy, cavity lavage (without drainage)	• Appendectomy + exhaustive lavage and new systematic laparotomy within 48 hours according to the intervention criteria	• Appendectomy + right hemicolectomy with and/or ileal de-functionalization + exhaustive lavage and new systematic laparotomy within 48 hours according to reintervention criteria
1	2	3	4	5

Source: Study data.

it with surgical management *(Table 1)*. The findings are determined by the surgeon intraoperatively and will be described according to the classification used.

Support for suggested management

Use of antimicrobials: Antibiotic treatment should be started as soon as the indication for surgery is given and in case of severe sepsis or septic shock.[2,14] In the first hours of treatment, the aim of antibiotic therapy is to limit bacteremia and reduce the frequency of residual abscesses.[2,15] Antibiotic management should ideally cover aerobic and anaerobic microorganisms. Then, according to the guidelines, cultures should be taken to direct therapy. The use of antimicrobials should be continued with intravenous management until a minimum of 24 hours if there is no fever nor leukocytosis, besides an adequate general condition of the patient with a reestablished intestinal function.[4]

Surgical treatment: Antibiotic therapy contributes to improve the prognosis,[15] but it is not enough to achieve cure. An adequate surgical procedure is essential to control the origin of the infection. The fundamental objective in the surgical treatment of acute appendicitis complicated with secondary peritonitis is to control the cause of peritoneal contamination and the prevention of residual sepsis.

Drainage of the surgical site: Drains should be left in place to evacuate an undrained or insufficiently drained abscess or to establish a controlled fistula. Other than these indications, the placement of drains is ineffective in generalized peritonitis, as fibrin rapidly surrounds the drains along their intraperitoneal course and effectively block their outflow effect.[1] It is usually not necessary to leave drains in place if adequate cleansing of the abdominal cavity has been performed.[8]

Intraoperative peritoneal lavage for generalized peritonitis: The reduction of the bacterial inoculum in the abdominal cavity may be attained by aspiration of purulent material and by exploring the cul-de-sac and parieto-colic slides, as well as the subphrenic and subhepatic spaces. Intraoperative lavage with warm saline is a procedure generally performed during laparotomy for diffuse peritonitis. The addition of antibiotics to the lavage fluid does not seem to influence the evolution of the intraabdominal contamination.[16]

Lavage of the entire abdominal cavity should be performed until the fluid is clear, which results in excellent survival and minimal residual sepsis in patients with generalized peritonitis. The amount of peritoneal lavage fluid required varies from patient to patient. In some cases, it may be as much as 10 to 15 liters in severe postoperative stercoraceous peritonitis.[17,18]

Currently, not as much washing solutions are used. Today, only 3 to 5 liters are used according to some studies that, although they were performed on animals, have been taken as guidelines. They mention that it must be considered that peritoneal lavage alters the abdominal cavity local defense mechanisms. Saline solution acts as a co-adjuvant to alter phagocytosis and leukocyte migration in the abdominal cavity[19] so the addition of antibiotics or antiseptics to the lavage fluid alters neutrophil chemotaxis, inhibits their microbicidal activity[20] and increases the formation of postoperative adhesions.[21]

Once the abdominal lavage is completed, strict drying of the abdominal cavity is important because the residual saline solution dilutes the bacterial opsonins, leaves the bacteria in suspension in a liquid medium, reduces phagocytosis, and allows bacterial proliferation.

The use of an ion selectivity electrolyzed solution for intraoperative peritoneal lavage has recently been reported. Between 6 to 10 liters of the corresponding solution were used. They were previously heated at 37 ºC until macroscopic contamination was completely eliminated.[22] At our hospital we do not have any experience with the use of these type of solutions.

Reinterventions: In the most severe infections, particularly postoperative infections, there is no means to effectively drain the entire peritoneal cavity.[23] Two approaches have been proposed: on-demand re-interventions, which do not provide complete satisfaction due to the delay in revision sometimes observed in complex critical patients, and systematic re-

interventions scheduled every 24-48 hours until a macroscopically clean peritoneal cavity is achieved.[24] The criteria for reintervention are conditional *(Table 2)*. Strict compliance with the formal criteria for reintervention makes it possible before cardiocirculatory accidents secondary to toxic-infectious shock occur. The first manifestations of peritoneal infection, secondary to the loss of hermeticity of the appendicular stump closure or an incidental lesion, as in tertiary peritonitis occur very early, almost always within three days after the operation. Most often, the first manifestation is fever, followed by diarrhea, gastric hypersecretion and stasis, hiccups, isolated tachycardia, significant decrease in diuresis and, finally, lack of resumption of intestinal transit or secondary interruption.[17]

Management of the causative lesion: Occasionally, adjacent cecal necrosis, a lesion of the last portion of the small bowel, or both, is discovered; in either case, treatment consists of an ileocolic resection with ileostomy and terminal colostomy. In a patient in shock, tissue perfusion, including intestinal perfusion, is altered. In these circumstances, the risk of dehiscence of a new suture is high. The same risk of suture dehiscence exists after performing a digestive anastomosis in a septic environment. Therefore, in such situations, it seems prudent to forego immediate digestive continuity in favor of ostomies.[15]

Prevention of residual sepsis and surgical site infection: To prevent residual sepsis in a patient operated on for appendicitis complicated by generalized peritonitis, especially with the formation of residual abscesses, the fundamental objective must be to help the defense mechanisms of the peritoneum to recover their normal function. From the initial intervention, a very careful cleaning and debridement of all the fibrinopurulent material found should be carried out.

On the other hand, removal of abdominal hair has been mentioned as a general measure to prevent surgical site infection (SSI), which

Table 2: Criteria for reintervention in peritonitis.

Criteria for conservative behaviour	Criteria for conservative behavior	Criteria for rapid reintervention	Criteria for rapid reintervention
• Diuresis preserved (+ 40 ml/hour) • Stable cardiocirculatory state without the need for vasopressor amines and, above all, without having to progressively increase the doses • Lack of general toxic and infectious signs • Lack of abdominal signs of diffusion; intestinal transit preserved or restored and decreased nasogastric tube fluid output	• Rapid disappearance of the alarm sign that led to a suspected diagnosis of postoperative peritonitis • Slightly elevated neutrophil polymorphonuclear count or, if clearly elevated, a marked drop in values compared to the previous figure • Easily correctable functional renal failure • Lack of indication for assisted ventilation or prolongation of ventilation in a patient without preoperative respiratory failure	• Oligo-anuria • Insufficient cardiocirculatory status with increasing deterioration • Insufficient cardiocirculatory status with increasing deterioration • Lack of satisfactory clinical and laboratory response to intensive medical treatment • Abdominal signs of propagation; lack of resumption of intestinal transit or secondary arrest	• Elevated rate of leukocytosis • Persistence of renal failure despite intensive medical treatment or worsening of renal failure • Need for assisted ventilation

Source: Study data.
Adapted from: Parc Y, et al.[17]

should be done immediately before the operation.[25] Proper skin preparation at the time of the operative procedure with an antiseptic agent is a well-established preventive measure.[26] Gentle tissue handling, protection of wound edges with compresses, thorough contamination cleansing, complete removal of necrotic or devitalized tissues, and avoidance of dead spaces are important to prevent infection. Finally, avoiding hypothermia, maintaining high tissue oxygen concentrations, and avoiding hyperglycemia have been mentioned in relation to the prevention of SSI.[27,28]

Application of the suggested management according to stage

A. Stage 1: There is scarce presence of bacteria in the peri-appendicular fluid, so the suggested treatment is appendectomy, drying of the cavity, and antimicrobial management for two days with intravenous (IV) antibiotics. In our hospital we use in the first instance metronidazole 500 mg IV every eight hours or clindamycin 600 mg IV every eight hours in conjunction with ceftriaxone or cefotaxime 1 g IV every 12 hours. In children, the dose of each antibiotic is calculated according to their weight. The use of antimicrobials should be continued with intravenous management until a minimum of 24 hours if there is no fever nor leukocytosis, the patient is in general good conditions and his/her intestinal function is restablished.[4]
B. Stage 2: Perforated appendix with localized abscess. The suggested treatment is appendectomy, drying, and drainage in the cruciate area and IV antimicrobials for three to four days.
C. Stage 3: Perforated appendicitis with generalized purulent peritonitis. The suggested treatment is appendectomy and lavage of the peritoneal cavity without drains left in place, and IV antimicrobials for five to seven days (see surgical site drainage in management rationale).
D. Stage 4: Perforated appendix with generalized purulent peritonitis and free fecaliths. The treatment consists of appendectomy with exhaustive lavage of the peritoneal cavity without drains left in place, reoperation after 48 hours for a new abdominal cavity lavage according to the criteria for reoperation and clinical evolution (see drainage of the surgical area).
E. Stage 5: Perforated appendix stage 4 plus necrosis of ileum or cecum. The treatment includes a right hemicolectomy with abdominal cavity lavage and ileostomy or ileocolonic anastomosis (based on cavity contamination and whether septic shock is present), and a peritoneal cavity lavage without drainage, with reoperation after 48 hours for a new abdominal cavity lavage according to the criteria for reoperation and clinical evolution (see surgical site drainage).

RESULTS

All the descriptive statistical results were presented in the article, since it was a double study including both the diagnostic scale and the classification at the same time.[29]

Of the 182 cases reviewed, 110 were male and 72 were female, with a male/female ratio of 1.5/1. The most frequent age range was between 10 and 25 years.

The time of evolution of the clinical picture before admission to the hospital was two to three days on average, except in complicated cases, which took an average of 15 days.

The most common symptom was right iliac fossa pain, pain migration (90%), nausea or vomiting (90%). The least common symptom was anorexia (18%). The most detected signs were McBurney's (98.6%) and Von Blumberg's (90%).

The following post-surgical complications occurred: 19% with surgical site infection, reoperation in nine cases due to organ-space type surgical site infection (an already established classification of surgical site infection that divides it into superficial, deep and organ-space with presence of abscess, either in superficial fasciae, deep or in cavity). Appendicitis certified with ultrasound (USG) with evidence of residual abscess, plus clinical condition of fever, bloating and explosive diarrhea. Two cases required hemicolectomy and stoma; they had an evolution time of 15-20 days and presence of necrosis and perforation of the cecum.

Of the patients, 8.7% of appendicitis were not diagnosed by pathology and the most complicated conditions with the longest evolution time due to early diagnosis were 26.37%, being more frequent in cases of children, women and the elderly, which led to more days of hospital stay, surgical and postsurgical complications, as well as higher hospital costs.

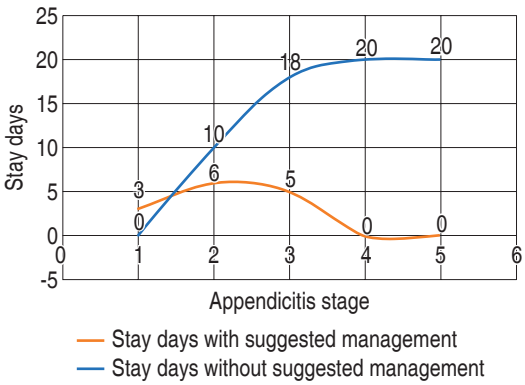
Of the 182 cases reviewed in relation to the appendicular stage corroborated by histopathological study, we observed a higher frequency of stage 4 (stage 2). The following post-surgical complications occurred: 34 cases (19%) with surgical site infection, reoperation in nine cases (4.9%) due to organ-space type surgical site infection (already established classification of surgical site infection that divides it into superficial, deep and organ-space with presence of abscess, either in superficial fasciae, deep or in cavity).[30] Two cases (1.09%) with prolonged evolution time of 15-20 days, which led to necrosis and perforation of the cecum, required hemicolectomy and stoma.

In relation to the proposed classification and its direct relationship with the suggested surgical management, data are shown in *Table 3* and *Figures 1 to 3*, from which we first deduce that of the 81 cases in stage one, the complication and reoperation rate is very low or nil. For stage two, the rate of infections is very low with the suggested management with only one case of surgical site infection that required wound healing procedures and six days of stay; compared to the 24 cases, where the management is not the suggested one. Two cases required reintervention due to organ space infection, with findings of intestinal inter-loop, pelvic and right subphrenic abscesses. In this stage, 47.8% of the 71 cases were complicated, and 13% of the total of 182 cases. This 47.8% of complicated cases occurred more frequently

Table 3: Relation of cases of acute appendicitis by stage, complications and days of hospital stay based on the suggested classification and management.

	Stage/ patients	Complica-tions	Reinter-ventions	Days of stay
Patients with suggested management	1/81	0	0	3
	2/46	1	0	6
	3/3	0	0	5
	4/0	0	0	0
	5/0	0	0	0
Patients without suggested management	1/0	0	0	0
	2/25	25	2	7-10
	3/5	5	3	12-18
	4/4	2	2	15-20
	5/2	2	2	15-20
p-value		0.22664	0.021312	0.044950

Source: Study data.



Days of stay in acute appendicitis (two-sample t-tests)

	With suggested management	No suggested management
Mean	2.8	13.6
Variance	7.7	74.8
Remarks	5	5
Hypothetical difference of means	0	
Degrees of freedom	5	
t-test	-2.65877621	
p-value (test) one-tailed	0.02247496	
Critical value of t-test (one-tailed)	2.01504837	
p (two-tailed test)	0.044950	
Critical value of t (two-tailed)	2.57058184	

Figure 1: *Days of stay of patients with stage 1, 2, 3, 3, 4 and 5 acute appendicitis with suggested management and without suggested management according to the proposed classification.*
Source: Study data.

in patients without the suggested management according to the stage and required a longer hospital stay, from seven to 10 days, for wound healing procedures and longer antibiotic administration. On the other hand, although we only had two reinterventions, they occurred in those who did not undergo the suggested management and the hospital stay increased to 12-15 days with the consequent hospital expense in all items: two surgeries, more days in bed, longer antibiotic use, intravenous solutions, man-hours, etc.

In stage 3, the five cases without suggested management presented complications of superficial and deep surgical site infection, and in three cases reoperation was required due to residual abscess and systemic inflammatory response, with a longer hospital stay of 12-18 days and higher overall hospital costs.

In stage 4 and 5, where the suggested management was not performed, four cases were found that required reintervention due to organ space infection, hospital stay of 15 to 20 days with a higher cost and the risk of greater morbidity and mortality for the patient.

In summary, we had 85 cases in stage 2-5 (corresponding to stage IV), of which 35 cases (41.1%) presented complications, were not staged as peritonitis secondary to complicated acute appendicitis and were not managed as suggested. Nine cases (10.5%) required reoperation, with an increase in hospital costs specially with a higher risk of morbidity and mortality. The hospital stay for these cases was 15 to 20 days, which is 200-300% more than in uncomplicated cases (three to five days). Not to mention the pending reconnection of intestinal transit, which will take more days of hospital stay.

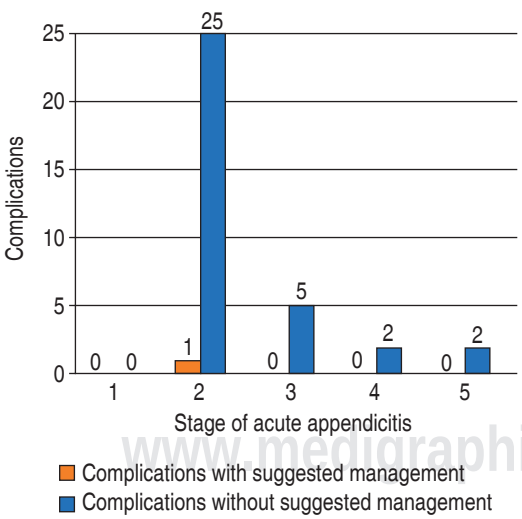
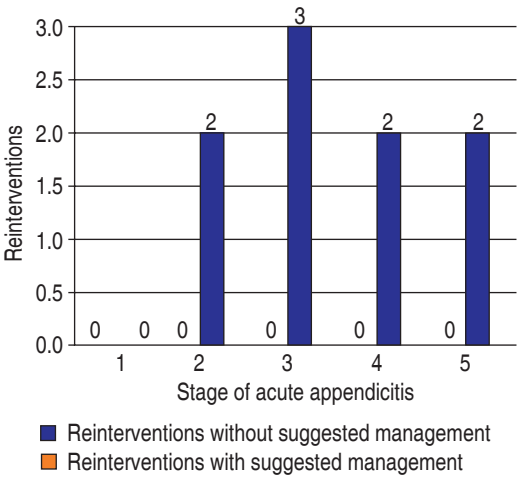


Figure 2: *Complication rate of patients with stage 1, 2, 3, 3, 4 and 5 acute appendicitis with suggested management and without suggested management according to the proposed classification.*
Source: Study data.



T-tests for two samples. Reinterventions of patients with acute appendicitis.

	With suggested management	Without suggested management
Mean	0	1.8
Variance	0	1.2
Observations	5	5
Hypothetical difference of means	0	
Grades of freedom	4	
t-test	-3.67423461	
p-value (one-tail)	0.01065582	
Critical t-test (one-tail)	2.13184679	
p-value (two-tails)	0.021312	
Critical t-test (two-tails)	2.77644511	

Figure 3: *Rate of re-interventions of patients with stage 1, 2, 3, 4 and 5 acute appendicitis with suggested management and without suggested management according to the proposed classification.*
Source: study data.

DISCUSSION

In relation to the suggested classification, we did not find much literature, only four articles suggesting a new classification, already contemplating that macroscopic classification is not adequate if it does not relate to severity to surgical management.

Gilberto Guzmán-Valdivia in 2003[7] suggested a useful classification in acute appendicitis dividing it into 3 grades from non-perforated appendicitis to perforated appendicitis with generalized peritonitis, mentioning at the same time surgical management with important results in the rate of complications and hospital stay. However, it does not consider or does not define whether the peritoneal contamination was purulent or fecaloid and whether the cecum or ileum were injured, so we consider our classification more specific and complete.

On the other hand, in 2015, Sergio David Castañeda[3] suggested changing the macroscopic classification of acute appendicitis, assessing whether it has any influence on the length of hospital stay and complication rate given the change in postoperative antibiotic management. He observed a decrease in the number of hospital days/year and in the number of antibiotic doses/year and reduction in the number of complications. He concluded that the change in the macroscopic classification and the new definition of perforated appendicitis has led to reduce the hospital stay and the number of antibiotics used without a significant impact on the rate of complications, giving greater emphasis on the use of antibiotics. In our classification, we go beyond the use of antibiotics with prevention of surgical site infection, tertiary peritonitis, and hostile abdomen.

In 2012, Gomes[9] proposed a classification according to laparoscopic findings; however, it was limited by its exclusive focus on intraoperative aspects, i.e., it continues with macroscopic description only seen during the laparoscopy procedure. In 2015, this same author[10] gave a new proposal for a new classification system for acute appendicitis based on clinical, imaging, and laparoscopic findings without any mention regarding the degree of peritoneal cavity contamination and its management, focusing on antibiotic management in early stages, with three days of management and in advanced or complicated up to 10 days of antimicrobials. But they did not mention the peritoneal cavity management, which in this proposal we do consider.

The suggested classification presented in this study indicates that it is possible to homogenize the characteristics of the surgical findings, to stage them, and gives us a guideline to decide an adequate surgical management considering the stage of the appendix, the peritoneal cavity, and the general condition of the patient. As can be seen in the graphs, the Student's t test showed a significant statistical p value < 0.05, which gives us the guideline to suggest this classification. In *Figure 1* we can observe that the mean number of days of stay in patients with suggested management was 2.8 days compared to 13.6 days in cases without the suggested management and p value = 0.04, barely significant. In *Figure 2* we found a higher rate of complications in stage 2 patients without suggested management with a mean of 6.8 compared to 0.2 in patients with suggested management. And in *Figure 3* we observed a higher rate of reinterventions in stages 2, 3, 4 and 5 without the suggested management with mean of 1.8 compared to 0 in patients with the suggested management, with a p value = 0.02.

CONCLUSIONS

The objective of this new classification system was to provide a standardized form to allow a more uniform patient stratification to guide the optimal management according to the stage, which was achieved by obtaining statistically significant results. Therefore, this publication allows us to recommend the use of this classification which, in addition to being clear in defining the severity of acute appendicitis, is directly related to the degree of contamination of the peritoneal cavity and damage of adjacent tissues and guides surgical management according to the interoperative findings. It helps to reduce hospital stay days, and therefore costs, by preventing complications, guiding us with the general and specific criteria of cavity management to avoid complications, reinterventions, and higher risk of mortality. It facilitates the healing process in the evolution of the patient, as well as the teaching-learning process of surgical residents.

It is left for the consideration of all surgeons, with the sole intention of favoring our work, the care of our patients and the teaching-learning process of all residents, by providing clarity on the severity to guide the surgical management based on the findings.

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ORIGINAL ARTICLE

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Analysis of compliance with antibiotic prophylaxis in elective laparoscopic cholecystectomy in a hospital in Mexico

Análisis del cumplimiento de profilaxis antibiótica en colecistectomía laparoscópica electiva en un hospital de México

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Keywords:
Cholecystectomy, healthcare-associated infection, surgical site infections, laparoscopy, preoperative antibiotic prophylaxis.

Palabras clave:
Colecistectomía, infección asociada a la asistencia sanitaria, infección del sitio quirúrgico, laparoscopia, profilaxis antibiótica preoperatoria.

ABSTRACT

Introduction: The administration of preoperative antibiotic prophylaxis reduces the risk of surgical site infections. however, despite the existence of pre-established recommendations for its use, these are often not followed. **Objective:** To describe the compliance and results of preoperative antibiotic prophylaxis in patients undergoing elective laparoscopic cholecystectomy in our institution. **Material and methods:** An observational, longitudinal prospective and descriptive study was performed including patients undergoing elective laparoscopic cholecystectomy within our hospital from July 1 to December 31, 2018, in search of the development of surgical site infections and other complications. **Results:** 97% of patients (n = 162) were administered preoperative antibiotic prophylaxis. A correct prescription was found in only 54% of cases (n = 87). Only 1% of patients (n = 2) had surgical site infection. **Conclusions:** In our study, despite a low correct prescription of preoperative antibiotic prophylaxis, only 1% developed surgical site infection. Therefore, we support the arguments of some clinical practice guidelines not to prescribe it systematically, but to select patients according to their characteristics and risks.

RESUMEN

Introducción: *La administración de profilaxis antibiótica preoperatoria reduce el riesgo de infecciones del sitio quirúrgico; sin embargo, pese a que existen recomendaciones preestablecidas para su uso, éstas con frecuencia no se cumplen.* ***Objetivo:*** *Describir el cumplimiento y resultados de la profilaxis antibiótica preoperatoria en pacientes sometidos a colecistectomía laparoscópica electiva dentro de nuestra institución.* ***Material y métodos:*** *Se realizó un estudio observacional, longitudinal prospectivo y descriptivo que incluyó a los pacientes sometidos a colecistectomía laparoscópica electiva dentro de nuestro hospital del 1 de julio al 31 de diciembre de 2018 en busca del desarrollo de infecciones del sitio quirúrgico y otras complicaciones.* ***Resultados:*** *Al 97% de los pacientes (n = 162) se les administró profilaxis antibiótica preoperatoria, encontrándose una prescripción correcta en sólo 54% de los casos (n = 87). Solamente 1% de los pacientes (n = 2) presentó infección del sitio quirúrgico.* ***Conclusiones:*** *En nuestro estudio, pese a existir una baja prescripción correcta de profilaxis antibiótica preoperatoria, sólo 1% desarrolló infección del sitio quirúrgico, razón por la cual apoyamos los argumentos de algunas guías de práctica clínica de no prescribirla de manera sistemática, sino seleccionando a los pacientes de acuerdo con sus características y riesgos.*

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INTRODUCTION

Surgery site infections (SSIs) are defined as "surgical procedure-related infections that occur near the incision site within the first 30 days of the surgical procedure or within the first 90 days of an implant placement",[1] while healthcare-associated infections (HAIs) are

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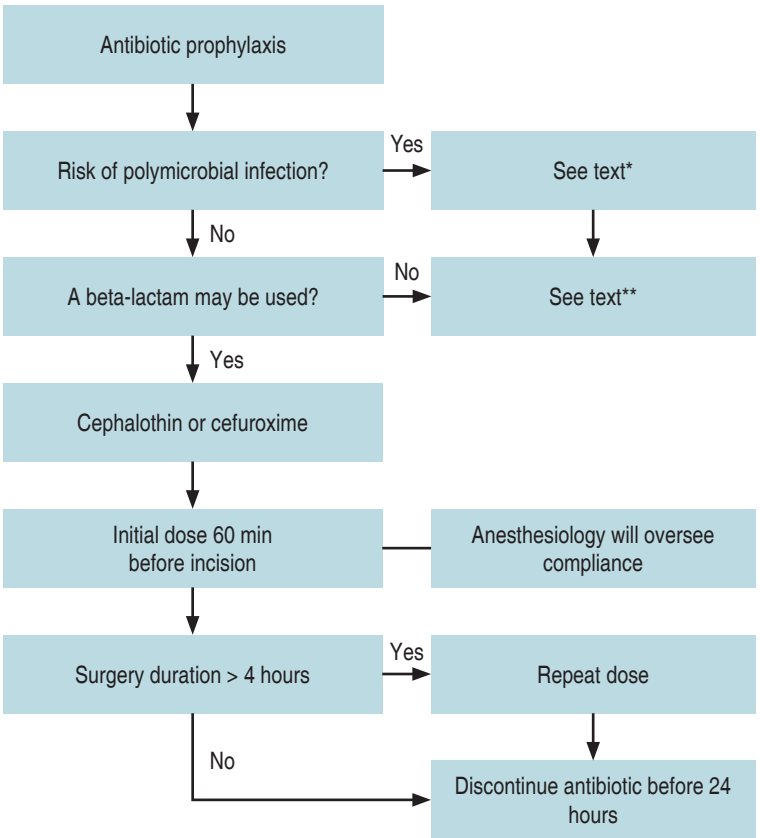
defined as "infections that patients acquire while receiving medical care". SSIs are the most frequently occurring HAI in low- and middle-income countries (LMICs), affecting up to one in three patients undergoing surgical procedures, and although they are seen less frequently in middle- and high-income countries (MHICs), they are still the second most frequent type of HAI in Europe and North America.[2]



* Antibiotics recommended:

1. First choice:
   a. Cephalothin 1 gram intravenously within 60 minutes prior to incision.
   b. Cefuroxime 1.5 grams intravenously within 60 minutes prior to incision.
2. Alternative:
   a. Ampicillin/sulbactam 2 grams/1 gram intravenously within 60 minutes prior to incision.
   b. Cephalothin + metronidazole 500 mg intravenously or clindamycin 600 mg intravenously within 60 minutes prior to incision.

** Option in case the use of β-lactams is contraindicated: vancomycin 1-gram intravenous infusion within 120 minutes before the incision.

Figure 1: *Flow chart for preoperative antibiotic prophylaxis. Diagram developed from our hospital guide for surgical antibiotic prophylaxis.*

Preoperative antibiotic prophylaxis (PAP) is defined as "the prevention of infectious complications through the effective administration of antibiotics prior to contamination during a surgical procedure".[3] It combats bacterial contamination of tissues that under normal conditions are free of microorganisms and prevents endogenous or exogenous flora entering the surgical area from multiplying and favoring the development of infection.[4,5] In the vast majority of surgical procedures, the effective administration of PAP is usually recommended and, although institutions such as the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC),[1] the National Institute for Health and Care Excellence (NICE),[6] and the Infectious Diseases Society of America (IDSA),[3] among others, have published clinical practice guidelines (CPG) with precise recommendations on its management, it has been shown that these are not complied with on a daily basis and that PAP is often administered inefficiently and arbitrarily.[7] In our country, the Mexican Social Security Institute (IMSS), through the CPG "Prevention and diagnosis of surgical site infection", oversees the recommendations that are specifically applied in our territory,[8] and each hospital must adapt to those recommendations according to its antimicrobial resistance profile *(Figure 1)*. Adhering to them by making good use of antibiotics reduces antimicrobial resistance and improves the patient's prognosis.[9]

Elective laparoscopic cholecystectomy (LEC) is the most frequently performed abdominal procedure worldwide and is the treatment of choice for patients with cholelithiasis and acute cholecystitis.[10] Because of this, there have been multiple studies that have presented controversial results on the development of infections in this procedure. In 2010, Sanabria et al. conducted a Cochrane review that included 11 randomized clinical trials with 1,664 patients concluding that the clinical evidence was not sufficient to support or refute the use of PAP.[11] On the other hand, in 2018, Sajid and

his team conducted a systematic review and meta-analysis that included 25 randomized clinical trials with 6,138 patients with the same objective, obtaining statistically significant results in the control group and evidencing the importance of a correct PAP,[12] so it is evident the need to conduct new studies that have the ability to provide an enlightening answer to this problem.

The aim of this article was to analyze the PAP compliance of patients undergoing CLE in a tertiary hospital in Mexico City.

MATERIAL AND METHODS

An observational, prospective and descriptive longitudinal study was conducted, which was submitted for review by the Hospital Bioethics and Research Committee of our institution and was approved with the number 2018EXT295. The clinical records of all patients who underwent CLE within a third level hospital in Mexico City during the period between July 1 and December 31, 2018, were reviewed in search of the development of post-surgical complications.

All patients older than one year who underwent CLE within the study time were included (n = 227), while those whose trans-surgical findings conditioned the administration of antibiotics therapeutically were excluded (n = 60). It was not necessary to eliminate clinical records due to ambiguity or lack of information. A total of 167 clinical records were considered for the analysis. The study variables

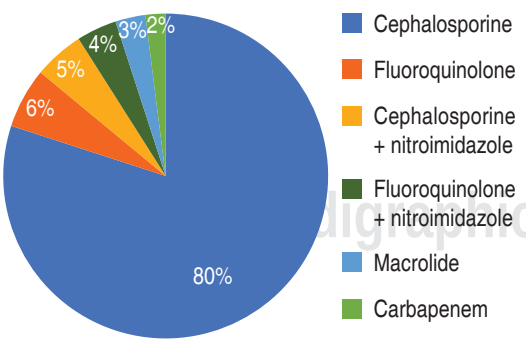


Figure 2: *Groups of antibiotics most frequently administered as part of preoperative antibiotic prophylaxis. Figure elaborated from our results.*

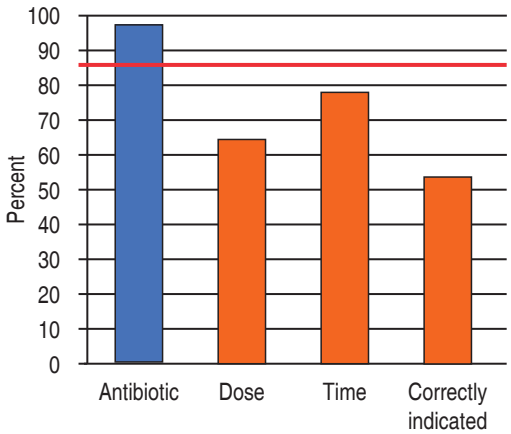


Figure 3: *Prescription of preoperative antibiotic prophylaxis (antibiotic, dose, and time). Figure elaborated from our results.*

were gender, age, allergies, comorbidities (smoking, overweight, obesity, type 2 diabetes and immunosuppression), diagnosis, PAP (antibiotic, dose, and time), development of ISQ, Clavien-Dindo scale, days of in-hospital stay (DEIH) and readmission. The information from the medical records was captured in electronic format for statistical analysis, which was carried out with the Statistical Package for the Social Sciences (SPSS) v.24 software to obtain measures of central tendency and dispersion.

RESULTS

Of the patients who underwent CLE, 44% were male and 56% were female. The mean age was 48 years (SD ± 15.36). The most common admission diagnosis was cholelithiasis in 88% (n = 147) of the cases, followed by polyposis in 9% (n = 15), dyskinesia in 2% (n = 3), and others 1% (n = 2).

Of the patients, 43% (n = 72) reported active smoking, while the most common comorbidities were overweight in 67% (n = 112) of cases, obesity in 26% (n = 43), type 2 diabetes in 15% (n = 25) and immunosuppression in 4% (n = 7).

Of the patients, 14% (n = 23) reported being allergic to at least one antibiotic, with penicillin allergy being the most common in 57% (n = 13) of the cases.

Ninety-seven percent (n = 162) of patients were administered PAP, with cephalosporins being the most frequently administered antibiotic group in 80% (n = 130) of cases *(Figure 2)*.

The dose was correct in 65% of the cases for which antibiotics were indicated (n = 105), while the time for adequate administration was met in 78% of the patients (n = 126) *(Figure 3)*; however, when analyzing the three PAP variables (correct time, antibiotic used and adequate posology), the latter was correctly indicated in only 54% (n = 87) of the cases.

Of the patients, 2% (n = 4) had postsurgical complications: 1% (n = 2) had surgical site infection and 1% (n = 2) had other complications, while only one patient was classified as grade IV on the Clavien-Dindo scale (anaphylaxis).

The mean in-hospital length of stay was 2.05 days (SD ± 1.22) and readmission was necessary in only 2% (n = 3) of cases.

Additionally, information on 3% (n = 5) of patients who underwent CLE but did not have PAP administered on the surgeon's indication, is shown in *Table 1*.

DISCUSSION

SSIs and the complications arising from them are a frequent and potentially lethal problem that represents a significant increase in morbidity and mortality, hospital length of stay and healthcare costs,[13] and can be associated with any type of surgical procedure. In 2013, the European Centre for Disease Control and Prevention (ECDC) conducted a study in 16 countries where it reported that the highest cumulative incidence according to the type of surgical procedure was presented by colon surgery with 9.5 cases per 100 operations, followed by coronary revascularization surgery with 3.5 cases, cesarean section with 2.9 cases and cholecystectomy with 1.4 cases.[14] The cumulative frequency of SSI in LSC in our hospital for the study period was 1.19 cases per 100 LSC operations. In the results it is mentioned that 1% corresponds to two patients out of 167 studied, so the numbers do not coincide, and they are slightly lower than those reported in the literature.

In our study, 93% of patients who underwent CLE were overweight or obese, 43% smoked, 15% had type 2 diabetes, and 4% were immunosuppressed, significantly increasing the risk of developing SSI.

Recent research has contrasted the information shown in different guides with respect to the principles established in the literature and experimentally, showing the lack of knowledge and arbitrary use of various antibiotics in multiple surgical centers.[15] As a general rule, the time of administration of PAP should be one hour prior to the surgical incision, being usually a first or second generation cephalosporin the antibiotic of choice *(Table 2)*, while as an alternative for patients with a history of known allergy to penicillin, vancomycin or clindamycin can be administered.[8,16] In addition, periodic evaluation of the epidemiological and microbiological situation of each institution, the availability of supplies

Table 1: Summary of the clinical history of patients who did not receive preoperative antibiotic prophylaxis.

Patient	Age	Sex	Diagnosis	Comorbidity	Allergies	PAP	SSI	IHSD	Reinstatement
1	48	Female	Polyposis	Overweight	Denied	No	No	2	No
2	50	Male	Polyposis	Overweight	Denied	No	No	2	No
3	29	Female	Cholelithiasis	Overweight	Denied	No	No	4	No
4	43	Female	Cholelithiasis	None	Denied	No	No	2	No
5	55	Female	Cholelithiasis	Overweight and T2D	Denied	No	No	1	No

PAP = preoperative antibiotic prophylaxis; SSI = surgical site infection; IHSD = in-hospital stay days; T2D = type 2 diabetes.
Table based on our results.

Table 2: Recommendations for the use of preoperative antibiotic prophylaxis.

Type of surgery	Recommended prophylaxis	Recommended prophylaxis in case of allergy to β-lactams	Level of evidence
Laparoscopy:			
Elective (low risk)	None	None	A
Elective (high risk)	Cephalothin Ceftriaxone Amoxicillin-clavulanate	Clindamycin or vancomycin + aminoglycoside or fluoroquinolone Metronidazole + aminoglycoside or fluoroquinolone	A
Biliary:			
Open procedure	Cephalothin Ceftriaxone Amoxicillin-clavulanate	Clindamycin or vancomycin + aminoglycoside or fluoroquinolone	A
Gastroduodenal	Cephalothin	Clindamycin or vancomycin + aminoglycoside or fluoroquinolone	A
Intestinal:			
With obstruction	Cephalothin	Clindamycin or vancomycin + aminoglycoside or fluoroquinolone	C
No obstruction	Cephalothin + metronidazole	Metronidazole + aminoglycoside or fluoroquinolone	C
Appendiceal*	Cephalothin + metronidazole	Clindamycin or vancomycin + aminoglycoside or fluoroquinolone Metronidazole + aminoglycoside or fluoroquinolone	A
Colorectal	Cephalothin + metronidazole Amoxicillin/clavulanate Ceftriaxone + metronidazole Ertapenem	Clindamycin + aminoglycoside or fluoroquinolone Metronidazole + aminoglycoside or fluoroquinolone	A

* Uncomplicated appendicitis.
Table adapted from: Mexican Institute of Social Security.[8]

and the particularities of the medical specialties should be considered in order to determine the rotation and modifications in the antibiotics to be used.[5,15]

In our study, 97% of the patients were administered PAP, showing a high percentage of compliance in this aspect; however, the wrong dose was administered in 35% of the cases without complying with the recommendations in terms of application time in 22% of the patients, evidencing the lack of homogeneity in the criteria applied by different surgeons.

When analyzing the results of the three variables that were considered to determine whether the prescription was correct (antibiotic, dose, and time), an optimal indication was only achieved in 56% of the cases and despite this, only two patients in the sample developed SSI.

Regarding the five patients who underwent CLE, but who did not receive PAP due to preference or omission of the treating physician, none presented clinical manifestations compatible with an infectious process, their length of stay in hospital was

like that of the rest of the population (2.20 vs. 2.05) and in no case was hospital readmission necessary.

Overall, both the low incidence of SSIs, despite the incorrect administration of PAP, and the absence of SSIs, and the lack of administration of PAP generate controversy as to whether its use is necessary on a routine basis. It should be considered that the arbitrary use and abuse of antibiotics in both ambulatory and hospitalized patients is accompanied by an increase in the appearance of new infections, adverse reactions and antimicrobial resistance, so that the prevention, approach and management of SSIs should be an active, continuous and primordial attitude for all personnel involved in health care and especially for the surgeon, who should also monitor their possible appearance during the postoperative period to enable him to make an early diagnosis with the aim of providing timely treatment.[13]

CONCLUSIONS

In our study, the optimal prescription of PAP was complied with in approximately half of the cases and despite this, only a minimal percentage of patients developed SSI, which is why we support the arguments of some CPGs not to prescribe it systematically, selecting patients according to their characteristics and risks. However, we consider that studies with a rigorous scientific methodology are required to issue final recommendations. In the meantime, we conclude that it is imperative to formalize continuous updating programs to standardize the criteria under which PAP is administered as well as to implement checklists to guide surgeons in their decision making.

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ORIGINAL ARTICLE

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Surgical treatment of postinfarction ventricular septal rupture

Tratamiento quirúrgico de la ruptura septal ventricular postinfarto

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Keywords:
Acute myocardial infarction, postinfarction ventricular septal rupture, surgical procedure.

Palabras clave:
Infarto agudo al miocardio, ruptura septal ventricular postinfarto, procedimiento quirúrgico.

ABSTRACT

Introduction: Postinfarction ventricular septal rupture is a mechanical complication of acute myocardial infarction, with high mortality. The evolution of techniques in the operating room has led to its early repair with better results. **Objective:** To describe the surgical experience in postinfarction ventricular septal rupture in patients at the *Hospital de Cardiología, Centro Médico Nacional Siglo XXI*. **Methods:** Descriptive, retrolective, observational, case series study. Data collected from records that met the inclusion criteria. **Results:** From January 1st, 1999 to April 30th, 2015, 49 patients who underwent restoration by surgery were registered. Only 27 met the inclusion criteria: 15 men and 12 women, with a mean age of 62 years. The overall mortality was 63%. Of the survivors, 50% presented residual ventricular septal defect: one patient was taken to reoperation for total correction and the rest of the patients continue to be followed up. **Conclusions:** The best surgical results were obtained in those patients who underwent reconstruction of the post-infarction ventricular septal rupture two weeks after the diagnosis of acute myocardial infarction, being in New York Heart Association functional class I and II. In terms of survival, the participants who underwent single-patch repair had a lower incidence of residual damage.

RESUMEN

Introducción: *La ruptura postinfarto del septum ventricular es una complicación mecánica del infarto agudo al miocardio, con alta mortalidad; pero la evolución de las técnicas en el quirófano ha llevado a su reparación temprana con mejores resultados.* ***Objetivo:*** *Describir la experiencia quirúrgica en la rotura septal ventricular postinfarto en pacientes del Hospital de Cardiología, Centro Médico Nacional Siglo XXI.* ***Métodos:*** *Estudio descriptivo, retrolectivo, observacional, serie de casos. Datos recabados de expedientes que cumplieron los criterios de inclusión.* ***Resultados:*** *Del 1o de enero de 1999 al 30 de abril de 2015 se registraron 49 enfermos que fueron sometidos a restauración mediante cirugía, sólo 27 cumplieron con los criterios de inclusión: 15 hombres y 12 mujeres, edad promedio 62 años, mortalidad general 63%. De los sobrevivientes, 50% presentaron defecto residual septal del ventrículo: un paciente fue llevado a nueva operación para corrección total y el resto de los enfermos continúa en seguimiento.* ***Conclusiones:*** *Los mejores resultados quirúrgicos se obtuvieron en aquellos sujetados a reconstrucción de la rotura del septum ventricular postinfarto luego de dos semanas del diagnóstico del infarto agudo al miocardio, encontrándose en clase funcional I y II de la New York Heart Association. En cuanto a la sobrevida, los participantes que se sometieron a reparación con parche simple presentaron menor incidencia de desperfectos residuales.*

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Abbreviations:

PVSR = Postinfarction ventricular septal rupture.
AMI = Acute myocardial infarction.
CVRF = Cardiovascular risk factors.
EUROSCORE = European System for Cardiac Operative Risk Evaluation.
CPB = Cardiopulmonary bypass.
AoC = Aortic clamping.
IACB = Intra-aortic counter-pulsation balloon.
CICU = Coronary Intensive Care Unit.
NYHA = New York Heart Association.
ECG = Electrocardiogram.
ACIS = Acute coronary ischemic syndrome.

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INTRODUCTION

Mechanical complications of acute myocardial infarction (AMI) are one of the most undesirable and dramatic setbacks that can occur.[1] Despite their low incidence (< 1%),[2] the seriousness of these complications requires rapid and accurate diagnosis and timely treatment. They are presented as three well-defined entities: ventricular septal rupture, ventricular free wall rupture and papillary muscle rupture with mitral insufficiency.[1]

Post-infarction ventricular septal rupture (PSVR) occurs most frequently during the first week after an AMI, typically three to five days later.[2] The use of thrombolytic agents reduced its incidence from 1-2% in the pre-thrombolytic era to only 0.2% currently. However, despite prompt and effective care in the coronary reperfusion era (mechanical and chemical thrombolysis), a mortality of 73.8-87% has been reported, with an approximate figure of 45% for surgically treated patients and 90% among those undergoing medical treatment alone.[3-5]

Due to the poor results of the medical procedure, usually is necessary.[5] However, urgent surgery is also associated with tissue fragility and a residual short-circuit. The evolution of techniques in the operating room[2] has led to early repair and has decreased mortality from 90% to approximately 50%.[3]

Patients who are completely stable, without the support of ventricular assist devices, represent 5% or less of the cases of PSVR, and in these patients, surgery can be delayed with good results.[6] In contrast, postponing the procedure in those with cardiogenic shock represents an unsuccessful management. Patients in an intermediate position between cardiogenic shock and hemodynamic stability should be operated on promptly (12-24 hours) after an adequate preoperative evaluation. For many acutely decompensated patients, recent improvements in surgical techniques have allowed to perform early surgery and reduce the risk of hemodynamic deterioration, at the cost of increased technical difficulty.[2,7,8]

Due to the complexity of this pathology, different approaches have been developed to improve surgical outcomes and survival. Among the known surgical techniques, we can mention an "infartectomy" (infarct zone resection) with closure, infarct exclusion, use of biological glue, double patch closure, septal exclusion, closure by a sandwich technique and single patch closure. On the other hand, the development of percutaneous techniques such as the use of an Amplatzer device has allowed, in selected cases, percutaneous closure of septal defects.[2,8]

The aim of this research was to describe the general characteristics of patients diagnosed with RSVP and the results obtained after surgical restoration, evaluating mortality, postoperative complications, and survival.

Table 1: Demographic characteristics of the population with postinfarction ventricular septal rupture, cardiovascular risk factors and associated morbidities.

	Patients, n (%)
Age, mean (range)	62 (48-83)
Sex	
Male	15 (55.56)
Female	12 (44.44)
Arterial hypertension	19 (70.37)
Diabetes mellitus 2	18 (66.67)
Smoking	12 (44.44)
Dyslipidemia	10 (37.04)
Obesity (BMI > 30)	6 (22.22)
Previous ischemic heart disease	0
Previous kidney disease	1 (3.70)

BMI = body mass index.

METHODS

A descriptive, observational, retrolective, consecutive case series study was carried out, which included all hospitalized patients registered from January 1999 to April 2015, who underwent surgery for RSVP repair and who had complete records at the *Hospital de Cardiología del Centro Médico Nacional Siglo XXI* of the *Instituto Mexicano del Seguro Social* (Mexican Social Security Institute).

Descriptive statistics, measures of central tendency and χ^2 were used for the analytical management of the data to examine the factors related to mortality.

Table 2: Clinical characteristics of patients before surgery.

	Patients, n (%)
Type of infarction	
STEMI	26 (96.30)
Non-STEMI	1 (3.70)
Location of the infarct	
Anterior	18 (66.67)
Inferior	9 (33.33)
Treatment upon hospital admission	
Conservative	23 (85.19)
Thrombolysis	3 (11.11)
PCI	1 (3.70)
Coronary lesions	
Main vessel disease	13 (48.15)
AD	7 (53.85)
DC	4 (30.77)
CX	2 (15.38)
Two-vessel disease	5 (18.52)
Tri-vascular disease	4 (14.81)
MVAD	5 (18.52)
No. of short circuits	
Simple	27 (100)
Apical	7 (25.93)
Anterior	12 (44.44)
Posterior	6 (22.22)
Middle segment	2 (7.41)
Complexes	0
LVEF (%)	
< 30	5 (18.52)
31-50	16 (59.26)
> 50	6 (22.22)
Complications associated with PVSR	15 (55.56)
Cardiogenic shock	
Arrhythmias	3 (11.11)
Ventricular tachycardia	1 (33.33)
AVB	2 (66.67)

STEMI = ST-segment elevation, PCI = percutaneous coronary intervention, AD = anterior descending, DC = descending coronary; CX = circumflex, MVAD = multivessel atheromatous disease, LVEF = left ventricular ejection fraction, PVSR = postinfarction ventricular septal rupture, AVB = atrioventricular block.

RESULTS

From January 1, 1999, to April 30, 2015, a total of 49 patients with a diagnosis of RSVP who underwent surgical reconstruction in the Cardiovascular Surgery service were registered, but only 27 met the inclusion criteria.

Population demographics, cardiovascular risk factors (CVRF) and associated morbidities are summarized in *Table 1*. The clinical characteristics of the participants are presented in *Table 2*.

The average EUROSCORE (European System for Cardiac Operative Risk Evaluation) indicator was 53.93%, with a range of 16.13-91.41%. All patients were hospitalized in the Coronary Intensive Care Unit (CICU) as part of the management of an AMI; the management provided during their stay in this service and the clinical status of these patients are shown in *Table 3*.

Regarding the operating room technique used, in 21 patients (77.78%) the repair was performed by single patch closure, while in six cases (22.22%) a double patch was used. The rest of the concomitant procedures performed, and the materials used are shown in *Table 4*.

The mean cardiopulmonary bypass (CPB) time was 135 minutes (range 62-313) with a mean aortic clamp (AoC) time of 90 minutes (range 49-153).

The postoperative setbacks reported were: bleeding greater than usual in five patients (18.52%), cardiogenic shock in 16 of the group (59.26%), acute renal failure in 10 of them (37.04%), perioperative infarction in one case (3.70%), metabolic acidosis refractory to treatment in another five (18.52%), arrhythmias in two patients (7.40%) (one patient with ventricular tachycardia and one with atrioventricular block), two events of arterial insufficiency in lower limbs (7.40%, both related to the use of intra-aortic counter-pulsation balloon [IACB]), biventricular dysfunction in two cases (7.40%), infectious complications in nine patients (33.33%) of which six cases (66.66%) presented pneumonia associated with mechanical ventilation, one patient (11.11%) had an urinary tract infection and two more (22.22%) suffered from mediastinitis; and finally seven

Table 3: Perioperative management of patients diagnosed with postinfarction ventricular septal rupture.

	Patients, n (%)
Inotrope use	16 (59.26)
IACB	14 (51.85)
Interventionism	
Amplatzer	1 (3.70)
PCI	3 (11.11)
Successful	2 (66.67)
Failed	1 (33.33)
NYHA functional class	
I	1 (3.70)
II	10 (37.04)
III	4 (14.82)
IV	12 (44.44)
Time to diagnosis from an AMI to surgical PVSR (days)	
< 7	12 (44.44)
7-15	11 (40.74)
> 15	4 (14.82)

IACB = intra-aortic counter-pulsation balloon, PCI = percutaneous coronary intervention, NYHA = *New York Heart Association*, AMI = acute myocardial infarction, PVSR = postinfarction ventricular septal rupture.

patients (25.92%) presented a residual interventricular septal defect.

The overall mortality observed in the sample patients was 62.96% (17); and the survival rate was 37.04% (10).

The analysis of these deaths in relation to the preoperative clinical condition and treatment given in the CICU is shown in *Table 5*. With respect to the surgical procedure, the analysis was carried out taking into consideration the type of technique used to repair the defect and the concomitant procedures performed during surgery *(Table 6)*.

Of the 10 survivors, eight are still on follow-up, and of the latter, four persist with residual interventricular septal deterioration without hemodynamic repercussions that merit interventional or surgical closure, remaining clinically in NYHA functional class II.

Of those patients who survived without residual defect and who continue with follow-up, 75% underwent closure with single patch and concomitant revascularization, and only one patient underwent reconstruction with double patch. As for the patients with residual damage, 50% were reconstructed with double patch, and one of them underwent reoperation in pursuit of closure of the residual defect; the size of the disarrangement reported in the records is 11, 9 and 3 millimeters, respectively which, as mentioned above, had not required treatment according to the outpatient follow-up.

DISCUSSION

PSVR is a rare but lethal complication of AMI.[1,4,7,9,10] It usually produces a large left-to-right shunt that deteriorates the clinical status of patients.[1,3,7,11] Regarding the demographic characteristics of the population, in the present investigation[1,11] no correlation was found with what is reported in the literature with respect to sex; since a male:female ratio of 1:1 was practically observed.

The cardiovascular risk factors most frequently associated in this study were diabetes mellitus, hypertension, and dyslipidemia.[1,11] None of the cases had a history of previous ischemic heart disease found, which, as Caballero Borrego et al. comment, is a protective factor for the development of PVR in those affected by AMI, due to the development of collateral circulation.

ST-segment elevation acute coronary ischemic syndrome (STEMI) was predominantly found, and by electrocardiography (ECG) the most frequent location of the infarction was in the anterior aspect. Angiographic evaluation reveals that, in general, PSVR is associated with occlusion of a main coronary artery and these patients have less development of collateral vessels. Regarding the angiographic findings of the population, a main vessel was particularly affected (almost 50% of the cases), and of these, the most affected artery was the anterior descending artery. This also correlates with that reported in the literature.[11,12]

With the initiation of urgent reperfusion therapy for AMI (including thrombolysis and percutaneous coronary intervention), the incidence of PSVR has decreased, as the flow

of the infarct-related artery was restored, aiming to save the myocardium, and reducing the incidence of transmural infarction.[4,10,11] In this report, most of the patients (85%) did not undergo coronary reperfusion treatment.

The anatomical location of the defect was antero-apical in approximately 60% of the cases, and 20-40% in the posterior septum. In this study, all patients presented simple ventricular septal defects, described by echocardiography, which was corroborated by the surgical findings reported, and the most common location was in the anterior segment, which corresponded to the coronary lesion most frequently associated with AMI.[11,12]

Noteworthy, the left ventricular function was preserved in almost 80% of the cases, with an LVEF > 30% and, as was found in the complications of PSVR, more than 50% of the cases presented an overt cardiogenic shock; therefore, these factors were not intercorrelated. Ventricular function depends on the severity of the infarction, with subsequent myocardial stunning and the hemodynamic modifications generated by the left-to-right shunt, which cause right ventricular failure with risk of biventricular damage.[1,2,7,11]

Table 4: Surgical management employed.

Surgical treatment	Patients, n (%)
Single patch repair	21 (77.78)
Double patch repair	6 (22.22)
Closure + exclusion infarction	2 (7.41)
Closure + myocardial revascularization	13 (48.15)
Closing + VAD	1 (3.70)
Closure + mitral plasty	1 (3.70)
Type of material used	
Bovine pericardium	12 (44.44)
Autologous pericardium	1 (3.70)
Polyester	5 (18.52)
Teflon	3 (11.11)
Dacron	3 (11.11)
PTFE	3 (11.11)

VAD = ventricular assist device, PTFE = polytetrafluoroethylene.

The complications most frequently observed because of PSVR were cardiogenic shock (60%), and 11% arrhythmias of the ventricular tachycardia-type and a complete atrioventricular block.

Because of the complications and hemodynamic instability of those included in the study, most of them required management with inotropic drugs, as well as circulatory support with IACB in the preoperative period. And as a corroboration of the severity of the disease, the reason for this study, the average EUROSCORE II calculated for the patients was greater than 50%.[2,4,7,8]

Regarding the surgical management performed in this hospital, in approximately 85% of the cases, it was carried out within the first 15 days after diagnosis of an AMI, and the surgical technique most frequently used to repair the septal defect was the placement of a simple bovine pericardial patch. The mean CPB and AoC times were 135 and 90 minutes, respectively.

The most common complications in the immediate postoperative period were persistent cardiogenic shock (59%), acute renal failure (37%), and finally infections in 33% of cases (pneumonia, mediastinitis and urinary tract infection).

In this study, mortality correlated with the mortality rate reported worldwide, which was 63%.[3-5,7,8,10-13] The factors analyzed and associated with statistical significance were NYHA functional class IV and the time period in which they had undergone reconstruction of ventricular septal damage after AMI, since in those patients in whom the procedure was delayed for more than 15 days, the survival rate was 100%, and, as is found in the literature, among the determinants of this outcome of surgery are the time between an AMI and repair of the defect, cardiogenic shock, left ventricular dysfunction, renal failure and previous coronary artery disease.[5,7,11,13-15]

It is currently suggested that, if possible, surgical management should be delayed until the patient has an AMI of at least three weeks old in order to better delimit the area of necrosis, although it is clear that in most patients treatment cannot be postponed due to the hemodynamic instability that conditions the

Table 5: Mortality associated with preoperative treatment and clinical status of patients diagnosed with postinfarction ventricular septal rupture.

	Mortality (patients)	Survival (patients)	p*
Inotrope use	12	4	NS
Use of IACB	11	3	NS
Interventionism			
PCI	2	1	NS
Amplatzer	1	0	
Functional class			0.01
I/II	4	7	
III/IV	13	3	
Time between AMI diagnosis and surgery (days)			
< 7	11	1	0.012
7-15	6	5	
> 15	0	4	

* p-value obtained by χ^2 test. IACB = intra-aortic counter-pulsation balloon, PCI = percutaneous coronary intervention, AMI = acute myocardial infarction, NS = not significant.

Table 6: Mortality analysis of surgical treatment.

	Mortality (patients)	Survival (patients)	p*
Technique for defect repair			
Single patch	14	7	NS
Double patch	3	3	
Concomitant procedures			
RVM	8	5	NS
Exclusion of infarction	1	1	
Mitral plasty	0	1	
VAD	1	0	

* p = χ^2 test. RVM = myocardial revascularization, VAD = ventricular assist device, NS = not significant.

left-to-right shunt; in addition, in those patients who only receive medical care, mortality is practically 100%.[4,7,8,11,13]

Although avoiding residual shunts and minimizing damage to non-infarcted areas are the most important goals in the management of PSVR, residual shunts continue to be a major problem in patients. The most important factor affecting leakage after reconstruction of posterior septal ruptures is the technical difficulty in identifying the defect in the septum, particularly when suturing necrotic muscle tissue. Residual defects can occur due to poor coverage of the damage or tearing of the friable myocardium at the suture line.[15]

In the follow-up of those patients who survived, it was observed that approximately half presented residual ventricular septal deterioration. It should be noted that, in these patients, 50% underwent repair of the damage with a single patch, while the rest were reconstructed with a double patch. However, there was no statistically significant difference to determine whether any technique influenced the presence of residual lesion.

Of those patients who survived, and in whom no residual ventricular septal defect was documented, 75% underwent repair with simple patch and concomitant revascularization. Likewise, no statistically significant difference was found in these results, but it could be established that, clinically, this may be due to the greater experience of the surgeons of this hospital with this technique, rather than to the advantages it may offer compared to others.

Due to limitations in the design of this analysis, it is not possible to establish further relationships between the variables; however, the authors consider it to be very useful to learn about the surgical experience in the management of this complication of AMI.

CONCLUSIONS

PSVR is a lethal complication of AMI, the management of which is challenging and requires a comprehensive approach by a multidisciplinary team. Operating room intervention is a viable option for these patients. The best results were observed in those patients who underwent surgery two weeks after the diagnosis of AMI, and in those patients who were in NYHA CF I and II before undergoing a surgical procedure.

Due to the limitations of this research, it is also considered necessary to carry out more studies on this subject in this environment, to

broaden the experience in the treatment of this pathology.

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REVIEW ARTICLE

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Vesicular dyskinesia remains an unsolved medical issue. A review of the literature

La discinesia vesicular continúa siendo una incógnita a resolver en problemas médicos, revisión de la literatura

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ABSTRACT

Introduction: The purpose of this report is to describe that gallbladder dyskinesia represents the most diffuse gastrointestinal motility disorder of unknown origin. The diagnosis of gallbladder dyskinesia remains a challenge, especially for those physicians who are not well related or familiar with this entity of epigastric or right upper quadrant pain, without any organic alteration that may explain the patient's symptoms. Gallbladder dyskinesia should be suspected in patients with biliary pain, in whom liver enzymes, pancreatic enzymes, hepatobiliary abdominal ultrasound and upper gastrointestinal endoscopy are normal, without alterations that may explain the clinical picture. **Material and methods:** Of 132 patients operated on for cholecystectomy, only 60 patients with gallbladder dyskinesia were registered in this study, of which only 55 patients underwent nuclear medicine imaging for hepatobiliary scintigraphy with Boyden test. All were symptomatic, and their discomfort was not mitigated by antacids, prokinetics, or proton pump inhibitors. **Results:** Of the 60 patients who underwent cholecystectomy by laparoscopic surgery, all have reported good to excellent functional and symptomatic results, with minimal morbidity, no deaths, and no recurrence of symptomatology at six months of follow-up. **Conclusions:** Since the first description by Krukenberg in 1903, the approach to gallbladder dyskinesia has not gained worldwide popularity among surgeons. We believe that when there is a comprehensive clinical history, a complete physical examination showing no visceromegaly and in the absence of gallstones or other structural pathology on abdominal ultrasound, gallbladder dyskinesia should be considered until proven otherwise.

RESUMEN

Introducción: *El propósito de este informe es describir que la discinesia de la vesícula biliar representa el trastorno más difuso de la motilidad gastrointestinal sin conocer el origen, el diagnóstico de la discinesia vesicular continúa siendo un desafío, especialmente para los médicos que no están bien relacionados o familiarizados con esta entidad de dolor en epigastrio o cuadrante superior derecho, sin ninguna alteración orgánica que pueda explicar los síntomas del paciente. La discinesia de la vesícula biliar debe sospecharse en pacientes con dolor biliar, en quienes las enzimas hepáticas, pancreáticas, la ecografía abdominal hepatobiliar y la endoscopia digestiva alta son normales, sin alteraciones que expliquen el cuadro clínico.* ***Material y métodos:*** *De 132 pacientes operados de colecistectomía, sólo 60 pacientes con discinesia vesicular se registraron en este estudio, de los cuales, sólo 55 pacientes se sometieron a medicina nuclear para gammagrafía hepatobiliar con prueba de Boyden. Todos estaban sintomáticos, y no se mitigaban sus molestias con antiácidos, procinéticos o inhibidores de la bomba de protones.* ***Resultados:*** *De los 60 pacientes que se sometieron a colecistectomía por cirugía laparoscópica, todos ellos han reportado de buenos a excelentes resultados tanto funcionales como sintomáticos, con una morbilidad mínima, sin muertes y sin recurrencia de la sintomatología a seis meses de seguimiento.* ***Conclusiones:*** *Desde la primera descripción por Krukenberg en 1903, el enfoque de la discinesia vesicular no ha ganado popularidad mundial entre los cirujanos. Creemos que cuando hay una historia clínica precisa, un examen físico completo que concluya que no hay visceromegalias y en ausencia de cálculos biliares u otra patología estructural en el ultrasonido abdominal, se debe considerar una discinesia vesicular hasta que no se demuestre lo contrario.*

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HISTORICAL BACKGROUND

After a systematic review of PubMed/Medline and Scopus databases from 1980 to 2016 to identify relevant literature, a search was done using terms related to the same disease such as: gallbladder dyskinesia, biliary dyskinesia, functional gallbladder, biliary spasm or acalculous cholecystitis and HIDA or scintigraphy (cholecystography), ejection fraction and cholecystectomy.[1,2]

In this search, 29 studies were retrieved that included 2,891 patients contrasting cholecystectomy with medical treatment, where it was observed that patients with a normal gallbladder ejection fraction (GEF) or above 35% did not benefit from cholecystectomy; while those with low GEF < 35% were more likely (relative risk [RR] = 2.37) to have symptomatic improvement after surgery.

These authors concluded that it is possible that a low GEF may provide some guidance to identify individuals with gallbladder dyskinesia who may benefit from cholecystectomy. However, available data were inconsistent and are based on low-quality studies that are often subject to patient bias and the impact of confounding factors. For these reasons, these authors speculated that the role of scintigraphy and cholecystectomy in the definition and treatment of this disorder remains unclear pending a definitive study.[1-5]

Krukenberg, in 1903, was the first physician to mention the term gallbladder dyskinesia. Later, pathologists Aschoff and Bacmieister described it in 1909 as a gallbladder stasis occurring without inflammation or biliary lithiasis.[1-5]

The recognition of biliary pain in the absence of gallstones was first described in the 1920s. In 1924, Blalock[6] described 139 patients with acalculous cholecystitis out of 735 patients with lithiasis biliary disease. As early as 1926, Whipple,[7] in agreement with Blalock's article, questioned to perform a cholecystectomy without having a definite pathology to justify it. In that same year, according to the surgical criteria for cholecystectomy, Whipple recommended leaving *in situ* a normal appearing acalculous gallbladder, based in what he observed in the 47 patients undergoing cholecystectomy without evidence of gallstones, of which 76.6% were asymptomatic at follow-up compared to almost 90% of the cases with gallbladder stones.[6] Cholecystography was first described in 1924 by Graham and Cole,[8] who used tetra bromo-phenolphthalein, a substance excreted in the biliary tree to allow radiological imaging of the gallbladder and biliary tree. In the following decades, several patients underwent cholecystectomy in the absence of gallstones. Similarly, in 1956, other physicians such as Gleen and Mannix[9] studied the results in patients who underwent cholecystectomy for gallbladders without stones and showing no inflammation, reporting that only 65% of patients had an improvement in their symptoms, 11% reported some improvement, while 25% reported no improvement at all.

With the increasing use of cholecystokinin during cholecystography, in 1975 Freeman et al[10] and others reported on the use of cholecystokinin injection to identify patients with acalculous gallbladder disease and who may benefit from cholecystectomy. In Freeman's study of 22 patients with decreased ejection fraction or reproduction of symptoms with cholecystokinin injection, 95% reported relief or improvement of symptoms after cholecystectomy.

Over the decades since the Freeman's study,[10] the diagnosis has improved, and subsequent studies have found similarities with high success rates compared to those of the early 20th century literature.

PATHOGENESIS

The exact pathogenesis of gallbladder dysfunction is unknown, but it is presumed that the pain associated with gallbladder dysfunction could be related to a very complex functional signaling that causes functional obstruction of bile flow from the gallbladder due perhaps to non-occlusive narrowing of the cystic duct. Another hypothesis is an abnormality found in the smooth muscle layer of the gallbladder causing

impaired gallbladder emptying, which was proposed by Merg,[11,12] who showed a higher incidence of chronic cholecystitis in patients with gallbladder dysfunction compared to normal subjects. Gallbladder dysfunction has been associated with altered motility in other gastrointestinal organs, for example, impaired gallbladder emptying has been observed more frequently in adults suffering from slow transit constipation,[13] or diarrhea in intestinal hypersensitivity, gastroparesis,[13] and achalasia.[13] This extends the reason if functional motility disorders are often concomitant in separate areas of the gastrointestinal tract, such as gastroesophageal reflux (hiatal hernia), gastroparesis (ulcerative peptic disease), constipation (irritable bowel syndrome), diarrhea (gastroenteritis), postprandial abdominal distention (irritable bowel syndrome) or pancreatic or hepatic insufficiency.

Cholecystokinin (CCK) is a neurotransmitter peptide that was originally discovered in the intestine (Ivy and Oldberg in 1928) but is widely distributed in the central nervous system (Van der Haegen, 1975).[14-16]

Cholecystokinin (CCK) is a neurotransmitter peptide that is secreted mainly in two forms, CCK33 and CCK8. They are condensed in the I cells of the duodenal mucosa and jejunum. They are also synthesized in the central nervous system, mainly in the forms of CCK8 and CCK4.

The two receptors that mediate the effects of CCK are CCKA and CCKB.

The CCKA receptor is found mainly in the gastrointestinal tract, while the CCKB receptor is found mainly in the brain.[11,14-16]

CCK exerts multiple gastrointestinal effects and is released during meals, causing delayed gastric emptying, gallbladder contraction, regulation of intestinal motility, and secretion of pancreatic enzymes in communication with the brain through the vagus nerve, while in the brain it causes an anorexigenic effect, postprandial somnolence and is speculated to have a role in emotions.[11,13-16]

Gallbladder function involves very complex signaling cycles. One hypothesis regarding the cause of pain in gallbladder dyskinesia is the increased pressure of the gallbladder which, by not contracting properly, accumulates bile in the gallbladder.

In 1997 it was demonstrated the formation of crystals in the bile[17] forming gallstones in patients undergoing cholecystectomy due to gallbladder dyskinesia; therefore, inflammation of the gallbladder wall has been proposed as a cause of pain, since even 94% of patients undergoing surgery show chronic and acute changes of cholecystitis in the histological study.[17-20]

Another hypothesis proposed for gallbladder dyskinesia is the existence of generalized hypersensitivity in the neural pathways connecting the brain and thalamus with the intestine.

Visceral hypersensitivity has been demonstrated in patients with other functional biliary disorders such as the Oddi sphincter dysfunction.[20]

It has also been shown that patients with irritable bowel syndrome show altered gallbladder contraction in response to cholecystokinin. Therefore, gallbladder dyskinesia may be the result of defects in cholecystokinin nerve signaling causing changes in bile composition and chronic cholecystitis.[16,17,20]

Gallbladder dyskinesia represents the most diffuse gastrointestinal motility disorder.

Esophageal gastric reflux disease and colonic inactivity affect many patients with gallbladder dyskinesia and are therefore commonly confused and diagnosed as irritable bowel syndrome, suggesting a relationship between the two disorders.[19,21] Cholecystokinin receptors are expressed throughout the gastrointestinal tract and, among other things, affect colonic motility and sensory function.

Based on these properties, cholecystokinin antagonists have been developed to treat functional disorders such as the irritable bowel syndrome.[17,19,21,22]

There are multiple active forms of cholecystokinin, and it is recognized as the most widely distributed neuropeptide in the brain with high concentrations of it and its receptors in the cerebral cortex, olfactory bulb, hypothalamus, amygdalae, hippocampus,

striatum, periaqueductal gray matter, and spinal cord.

This neuroanatomical distribution has generated speculation about its role in anxiety disorders, leading to multiple studies that have used cholecystokinin antagonists for these psychiatry conditions.[15,16]

Gallbladder dysmotility is believed to play a central role in the pathogenesis.

Gallbladder dysmotility may be the result of an initial metabolic disorder (i.e., bile supersaturated with cholesterol), which increases biliary viscosity, or a primary motility disorder in the absence, at least initially, of any abnormality in bile composition.[17,21] Functional gallbladder disorder has been associated with abnormal gastric emptying and abnormal colonic transit, suggesting a possible generalized gastrointestinal motility disorder.[11,12,17,19,21]

DIAGNOSIS

In 1923 Westphal described gallbladder dyskinesia as a "dysfunction of the autonomic nervous system of the gallbladder".[1,3] Gallbladder dyskinesia has been postulated for several decades as an entity that constitutes a motility disorder of the gallbladder, which manifests clinically with biliary pain in the right upper quadrant or epigastrium that in many patients may radiate to the right infra-scapular region. The pain is often associated with diaphoresis, nausea, and vomiting, may also be accompanied by abdominal distention, constipation, or diarrheal evacuations and/or gastroesophageal reflux.[21,23]

The pain stabilizes in less than an hour, ranging from moderate to excruciating intensity and once stabilized, the pain usually lasts at least 30 minutes and then slowly subsides over several hours.[21,23,24]

In a large percentage of patients whose abdominal ultrasound is negative for cholelithiasis, a number of erroneous diagnoses such as irritable bowel, peptic acid disease, hepatic or pancreatic pathology are wrongly made, resulting in the request of inappropriate tests, unnecessary costs and inadequate prescriptions. This results in higher costs of care and what is more serious, the persistence of symptoms that do not improve with the intake of antacids, proton pump inhibitors or prokinetics, or the reappearance of these symptoms after discontinuation of the drugs.[21,23,24]

The prevalence of gallbladder dyskinesia is estimated at 8% in men and 22% in women.[21,25] Definitely, the diagnosis of gallbladder dyskinesia is a challenge, particularly for physicians who are not well related or familiar with this entity characterized by pain in the right upper quadrant, accompanied by diaphoresis, nausea, and gastro-biliary or alimentary vomiting and practically always with a hepatobiliary abdominal ultrasound without evidence of lithiasis, sludge or inflammation of the gallbladder, normal liver function tests, pancreatic and a normal esophageal and gastroduodenal endoscopy.[21,23,24]

The Rome IV criteria include[26] "low gallbladder ejection fraction" following dietary stimulation as a "supportive" criterion for making this diagnosis.[5,14,27,28]

Gallbladder dyskinesia constitutes approximately 80% of patients with "unspecified gallbladder disease" in the United States, where hospital admissions for this disease have tripled in recent years, with a 700% increase in the pediatric population, constituting 5 to 20% of cholecystectomies in adult patients and 10 to 50% in the pediatric population in that country.[21,25]

The Rome III criteria for the diagnosis of functional gallbladder disorders defined it as biliary-type pain with normal liver and pancreatic enzymes, along with exclusion by abdominal US of other structural diseases, including gallstones and normal upper endoscopy.

The Rome III criteria define vesicular dyskinesia as the existence of various symptoms with variations during periods such as:

1. An episode of pain lasting at least 30 minutes.
2. Recurrent symptoms at different intervals (not daily).
3. Gradually increasing pain.

4. Moderate to severe pain that sometimes disrupts daily activities and may require evaluation in the emergency department.
5. The pain is not relieved by bowel movements.
6. The pain does not decrease with changes in position.
7. Pain is not relieved using antacids, proton pump inhibitors or prokinetics.
8. Exclusion of other structural diseases that may explain the symptoms.

In the Rome IV version of the criteria for the diagnosis of functional disorders, "low ejection fraction" of the gallbladder has been included as a supportive criterion for diagnosis of gallbladder dyskinesia.[5,14,28]

The Rome IV criteria for functional gallbladder disorder require[26] biliary pain, which is defined as pain in the epigastrium and/or right upper quadrant that meets all the following criteria:

1. Progressive pain to a constant level and lasts at least 30 minutes.
2. Pain occurring at different intervals (usually not daily).
3. Pain severe enough to disrupt daily activities or to go to the emergency department (< 20%) with bowel movements or relieved by postural change or acid suppression.

Criteria that support but are not required for biliary pain include pain associated with nausea and vomiting, radiation of pain in the right infra-scapular region, and pain that awakens the patient. Absence of gallstones, inflammation, or other structural pathology.

Criteria supporting functional gallbladder disorder, but not mandatory, include a low gallbladder ejection fraction (GEF) on hepatobiliary scintigraphy less than 35% performed in the nuclear medicine department that depends on an intravenous infusion of CCK, or an oral fatty meal and a time of 5, 30 or 40 minutes. In our hospital we use oral stimulation with 40 minutes as total post stimulation time to read the ejection fraction of the gallbladder.

A cut-off of 35% was recommended to define the lower normal limit of FSG[5,14,28] to diagnose gallbladder dyskinesia and predict a good response to cholecystectomy.[5,14,28]

Clinical presentation

Postprandial pain or abdominal distention accompanied by nausea related to intolerance to fatty foods, which is not relieved by antacids, proton pump inhibitors or prokinetics.

Following symptoms occurring one or more times in a 12-month period are nausea 52%, vomiting 43%, abdominal distention 21%, early satiety 21%, constipation 21%, and diarrhea 13%, with no evidence of pathology or structural abnormality to explain the origin of the symptoms.[21,23,24,29]

The first entity one should think of is a patient with epigastric pain or in the right upper quadrant of the abdomen, abdominal distention and gastro-biliary vomiting 15-20 minutes after food intake, particularly when associated with normal liver and pancreatic function tests (aminotransferases, gamma-glutamyl transpeptidase, alkaline phosphatase, total and conjugated bilirubin, amylase, lipase, hematic cytology, and normal erythrocyte sedimentation rate [ESR] and C-reactive protein [CRP] values) with normal esophago-gastroduodenal endoscopy and with an abdominal USG without evidence of gallbladder lithiasis or inflammation, should be considered a gallbladder dyskinesia until proven otherwise. The protocol to be followed to diagnose gallbladder dyskinesia includes performing a study of the gallbladder in the nuclear medicine department *(Figure 1)* with HIDA, also known as hepatobiliary scintigraphy cholecystography with 99_m of technetium (Tc) labeled with hepatic iminodiacetic acid (HIDA), administered as an intravenous bolus of the radio-labeled marker, which is absorbed by the liver and concentrated in the gallbladder as bile. The gallbladder is usually seen by minute 20 and after 60 minutes the patient is given an injection of a drug called cholecystokinin (CCK) or is allowed to eat a fatty meal to be performed at that time, since both CCK administered IV and oral fatty meal (Boyden's test) are signals for the gallbladder to contract, and if the gallbladder ejection fraction

(GEF) is less than 35% after 40 minutes of measurement, the test is considered universally positive for gallbladder dyskinesia (Krishnamurthy described it in 1981).[5,14,28]

The utility of nuclear medicine examination of gallbladder dyskinesia with HIDA focuses on its ability to indirectly assess gallbladder contractility in response to stimulation (nowadays a fatty food intake), where the results are expressed in terms of the percentage of radioactive tracer voided in the gallbladder ejection fraction (GEF) *(Figures 2 and 3)*. Dating back to 1970s,[28] 17 earlier studies using oral cholecystography and stimulation with IV CCK reported that a group of patients with biliary pain and no evidence of gallstones had a poorly contractile gallbladder. After 40 years cholecystography techniques in nuclear medicine *(Figure 1)* have improved considerably, and cholecystectomy has been used for quite some time to treat patients with low GEF less than 35%, obtaining excellent results despite the somewhat vague nature of this ill-defined disorder and the limitations of the proposed diagnostic tests. However, the incidence of cholecystectomy as a treatment

Figure 1: *SIEMENS SYMBIA INTEVO nuclear medicine equipment plus CT scan.*

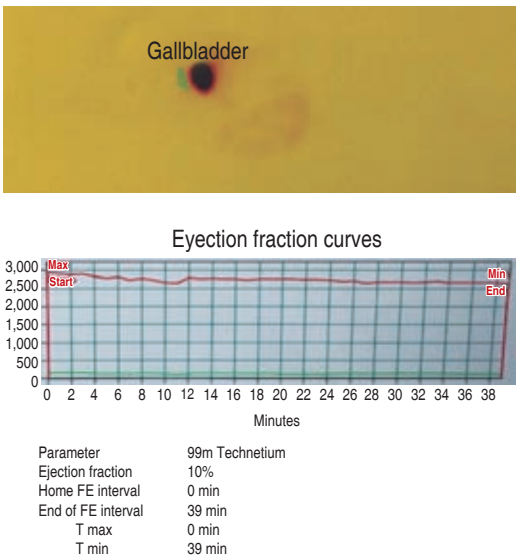

Figure 2: *Hepatobiliary iminodiacetic acid (HIDA) showing gallbladder EF (ejection fraction) 10% positive for gallbladder dyskinesia.*

for gallbladder dyskinesia (i.e., individuals without gallstones or other organic gallbladder pathology) has increased rapidly in the United States compared with other parts of the world, particularly since the advent of the laparoscopic approach.[5,14,19,20,28]

Therefore, despite years of research and debate, controversies still exist regarding the diagnosis and prognosis of gallbladder dyskinesia as well as the usefulness of cholecystectomy for gallbladder dyskinesia. Our objective, therefore, was to analyze through a systematic review the performance of gallbladder ejection fraction less than 35% in predicting response to cholecystectomy in patients with gallbladder dyskinesia.

It should be considered and recorded in the clinical history that several medical conditions can decrease the GEF such as diabetes mellitus, pregnancy, celiac disease, and irritable bowel syndrome as well as the administration of drugs such as anticholinergics, opioids, NSAIDs, calcium channel blockers, oral contraceptives, histamine receptor antagonists[2] and benzodiazepines, which should be discontinued at least 24 hours before the study.[5,14,18,28]

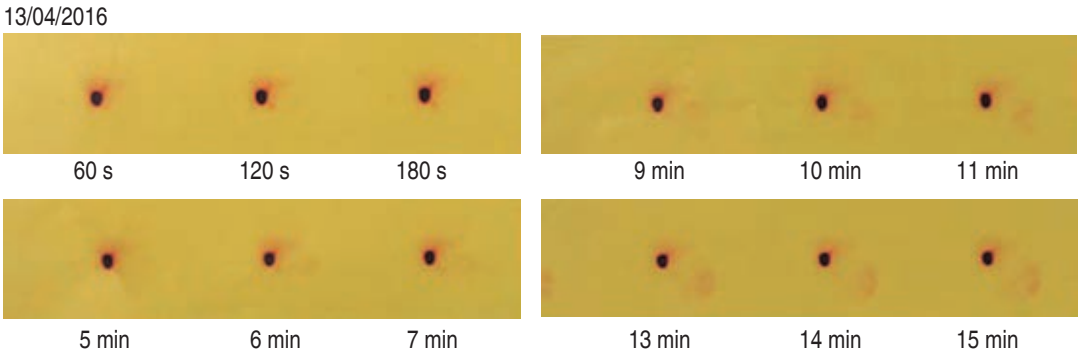

Figure 3:

Hepatobiliary iminodiacetic acid (HIDA) showing an EF of 10% of gallbladder compatible with gallbladder dyskinesia.

MATERIAL AND METHODS

From June 2015 to June 2019, we operated by laparoscopic surgery on 132 patients. They were 38 males (28.7%) and 94 females (71.2%), with a mean age of 28 years (range, 14-58 years). Only patients with gallbladder dyskinesia were included in this study. Patients with gallbladder stones were excluded from the study.

All patients underwent cholecystectomy by laparoscopic surgery.

Of 60 patients diagnosed with vesicular dyskinesia, 42 were female (70%) and 18 were male (30%) *(Table 1)*.

All patients underwent abdominal ultrasonography, where no stones, sludge, or gallbladder inflammation were observed, followed by 55 patients with hepatobiliary scintigraphy with hepatic iminodiacetic acid (HIDA) labeled with technetium (Tc) 99_{mm} and stimulated by a standard fatty oral feeding, showing a gallbladder ejection fraction (GEF) less than 35%. There were five patients who did not received HIDA, due to previous gallbladder abnormalities seen in an abdominal ultrasonography (US) scan, such as cap or phrygian cap. or due to the presence of a septum in neck or gallbladder fundus without lithiasis, sludge or inflammation.

The histopathological diagnoses of the 60 operated patients were compatible with acute chronic cholecystitis and coincided with adhesions of the greater omentum, duodenum, transverse colon to Hartman's pouch, or body, or gallbladder fundus or that the greater omentum completely covered the entire gallbladder as shown in *Figures 4 to 6*.

On histopathology review, 10 had sludge and cholesterolosis of the biliary mucosa *(Figures 7 and 8)*, two had polyps and three had gallbladder segmentation, one in the fundus and two in Hartmann's pouch that were not detected by abdominal US.

Of the total patients in this study, 100% presented with symptoms of upper abdominal pain, accompanied by diaphoresis, nausea, vomiting, abdominal distention, constipation, and postprandial gastroesophageal reflux in the absence of other attributable causes and associated with low gallbladder ejection fractions (GEF) less than 35%, with no evidence of hiatal hernia by endoscopy in patients who reported gastroesophageal reflux.

Abdominal pain, nausea, vomiting, constipation, and abdominal distention were the most common symptoms, and diaphoresis when the pain was so severe that they had to go to the emergency room, or the pain subsided within 30 minutes.

The average GEF was 26.0%.

All patients were followed for six months. There were no losses. All the questions asked were regarding their main symptoms before surgery. They were all retrieved taken from the clinical record and the satisfaction level after surgery. All patients revealed that their symptoms were completely relieved, including gastroesophageal reflux symptoms after cholecystectomy.

RESULTS

Of the 60 patients who underwent cholecystectomy by laparoscopic surgery

Table 1: Cases of vesicular dyskinesia, pathology and accompanying symptoms.

Sex	Age	Pathology	FE vesicular (%)	Associated symptoms
1. F	32	Mud	20	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
2. F	32	Mud	35	Postprandial epigastric pain, nausea, vomiting, abdominal distention
3. M	39	Mud	28	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
4. F	34	Cholecystitis	2	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
5. F	52	Cholecystitis	15	Postprandial epigastric pain, nausea, vomiting, abdominal distention
6. F	57	Cholecystitis	20	Postprandial epigastric pain, nausea, vomiting, abdominal distention
7. F	27	Cholecystitis	10	Epigastric pain, nausea, vomiting, abdominal distention, constipation, gastroesophageal reflux
8. M	32	Cholecystitis	3	Postprandial epigastric pain, nausea, vomiting, abdominal distention
9. F	20	Cholecystitis	7	Epigastric pain, nausea, vomiting, abdominal distention, constipation, gastroesophageal reflux
10. F	25	Cholecystitis	35	Postprandial epigastric pain, nausea, vomiting, abdominal distention
11. F	19	Cholecystitis	8	Epigastric pain, nausea, vomiting, abdominal distention, constipation, gastroesophageal reflux
12. F	28	Cholecystitis	35	Postprandial epigastric pain, nausea, vomiting, abdominal distention
13. F	53	Cholecystitis	35	Postprandial epigastric pain, nausea, vomiting, abdominal distention
14. F	22	Cholecystitis	20	Postprandial epigastric pain, nausea, vomiting, abdominal distension, gastroesophageal reflux
15. F	18	Cholecystitis	1.8	Postprandial epigastric pain, nausea, vomiting, abdominal distension, gastroesophageal reflux
16. F	57	Mud and polyp	30	Postprandial RUQ pain, nausea, vomiting, abdominal distention, constipation
17. F	26	Cholecystitis	16	Postprandial epigastric pain, nausea, vomiting, abdominal distension, gastroesophageal reflux
18. F	40	Cholecystitis	24	Postprandial epigastric pain, nausea, vomiting, abdominal distention
19. F	19	Cholecystitis	15	Epigastric pain, nausea, vomiting, abdominal distention, gastroesophageal reflux, constipation
20. F	25	Cholecystitis	24	Postprandial epigastric pain, nausea, vomiting, abdominal distention
21. M	17	Cholecystitis	35	Postprandial epigastric pain, nausea, vomiting, abdominal distention
22. M	42	Cholecystitis	35	Postprandial epigastric pain, nausea, vomiting, abdominal distention
23. F	54	Phrygian cap	0	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
24. F	30	Cholecystitis	24	Postprandial epigastric pain, nausea, vomiting, abdominal distention
25. M	49	Mud	2	Postprandial epigastric pain, nausea, vomiting, abdominal distention
26. F	18	Phrygian cap	3	Postprandial epigastric pain, nausea, vomiting, abdominal distension, gastroesophageal reflux
27. F	36	Cholecystitis	25	Postprandial epigastric pain, nausea, vomiting, abdominal distension, gastroesophageal reflux
28. M	37	Cholecystitis	28	Postprandial epigastric pain, nausea, vomiting, abdominal distention
29. F	55	Phrygian cap	3	Postprandial epigastric pain, nausea, vomiting, abdominal distension, gastroesophageal reflux
30. F	51	Mud	0	Continuous pain in epigastrium and RUQ, right subscapular irradiation, constipation.
31. M	25	Cholecystitis	13	Postprandial epigastric pain, nausea, vomiting, abdominal distension, gastroesophageal reflux

Continue Table 1: Cases of vesicular dyskinesia, pathology and accompanying symptoms.

Sex	Age	Pathology	FE vesicular (%)	Associated symptoms
32. F	32	Phrygian cap	3	Epigastric pain, nausea, vomiting, abdominal distention, constipation, gastroesophageal reflux
33. F	37	Phrygian cap	3	Postprandial epigastric pain, nausea, vomiting, abdominal distention
34. F	24	Phrygian cap	3	Postprandial epigastric pain, nausea, vomiting, abdominal distention
35. F	27	Phrygian cap	3	Postprandial epigastric pain, nausea, vomiting, abdominal distension, gastroesophageal reflux
36. M	23	Phrygian cap	3	Epigastric pain, nausea, vomiting, abdominal distention, constipation, gastroesophageal reflux
37. M	29	Cholecystitis	24	Postprandial epigastric pain, nausea, vomiting, abdominal distention
38. F	58	Mud	0	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
39. M	33	Cholecystitis	32	Postprandial epigastric pain, nausea, vomiting, abdominal distention
40. F	24	Cholecystitis	35	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
41. M	23			Phrygial cap postprandial epigastric pain, nausea, vomiting, abdominal distention, gastroesophageal reflux
42. F	25			Phrygial cap, postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
43. M	40	Cholecystitis	32	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
44. F	34	Mud	1	Epigastric pain, nausea, vomiting, abdominal distention, gastroesophageal reflux, constipation
45. M	57	Mud	0	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
46. M	29	Polyp	25	Postprandial RUQ pain, nausea, abdominal distention, gastroesophageal reflux, constipation
47. F	20	Mud	28	Postprandial RUQ pain, nausea, vomiting, abdominal distention, constipation
48. M	47	Cholecystitis	32	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
49. F	20			Phrygial cap, postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
50. F	20	Cholecystitis	10	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
51. F	40	Cholecystitis	1	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
52. F	26	Cholecystitis	0	Postprandial epigastric pain, nausea, vomiting, abdominal distension, gastroesophageal reflux
53. F	23	Cholecystitis	35	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
54. F	32	Cholecystitis	27	Postprandial epigastric pain, nausea, diarrhea, abdominal distention, constipation
55. F	36	Cholecystitis	24	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
56. M	26	Cholecystitis	21	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation
57. M	29			Phrygial cap, postprandial epigastric pain, nausea, vomiting, abdominal distention, gastroesophageal reflux
58. F	20			Phrygial cap, postprandial epigastric pain, nausea, vomiting, abdominal distention, gastroesophageal reflux
59. F	14	Mud	9	Postprandial epigastric pain, nausea, vomiting, abdominal distension, gastroesophageal reflux
60. F	35	Cholecystitis	34	Postprandial epigastric pain, nausea, vomiting, abdominal distention, constipation

F = female; M = male; EF = ejection fraction; RUQ = right upper quadrant.

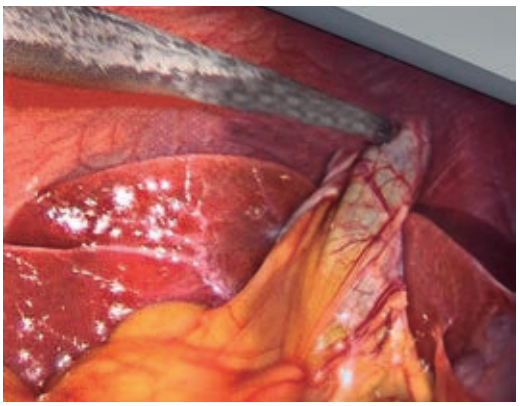

Figure 4: *Note the adhesions of the chronic process. Multiple adhesions, practically no structure of the gallbladder is identified and in most of these cases of severe inflammation the duodenum is attached to the gallbladder.*

Figure 5: *Note the inflammation in Hartman's pouch of a chronic process.*

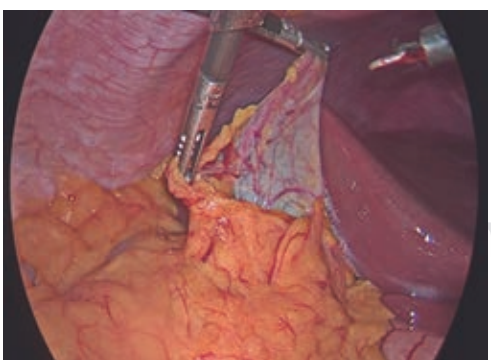

Figure 6: *Note the adhesion of the greater omentum to the entire gallbladder due to a chronic inflammatory process that was not seen on abdominal US scan.*

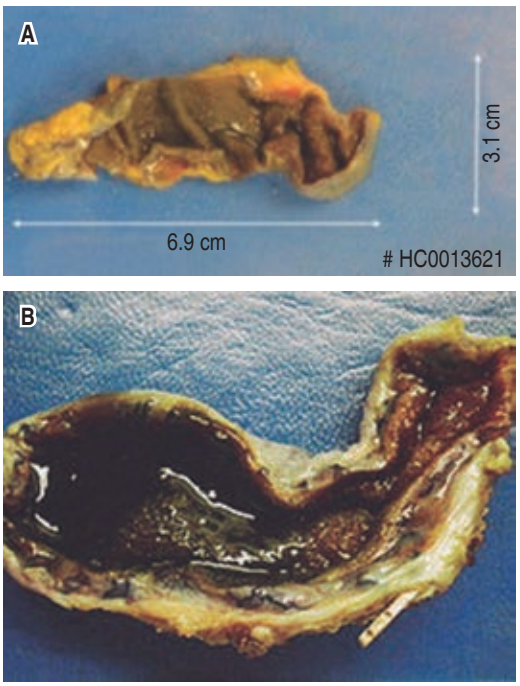

Figure 7: *Note the gallbladder inflammation, congestive mucosa and edematous mucosal cholesterolosis (**A**) without lithiasis and sludge (**B**).*

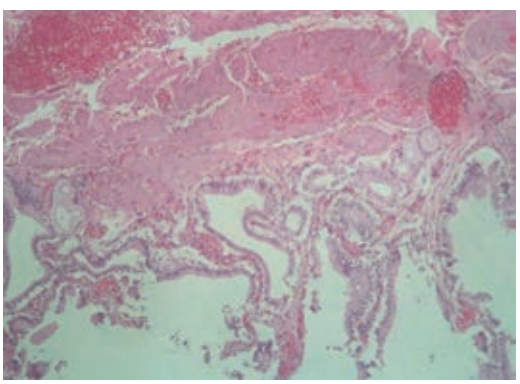

Figure 8: *Edematous and congestive vesicular wall, mixed type inflammatory infiltrate with polymorphonuclear predominance involving up to the muscularis.*

for gallbladder dyskinesia, all reported good to excellent functional and symptomatic results with minimal morbidity, no deaths, no complications, no infections, and no recurrence of symptomatology.

CONCLUSION

Gallbladder dyskinesia continues to be more common in women than in men, in younger people than in older adults, and is characterized clinically by symptoms of biliary-type pain in the absence of gallstones or other structural pathology.

Gallbladder dyskinesia remains as a challenge and a clinical mystery for gastroenterological surgeons.

Cholecystectomy has shown efficacy in curing symptoms in more than 90% of patients.[4]

To avoid late diagnosis, HIDA with feeding stimulation should be used as early as possible in the evaluation of a patient with biliary colic pain and a negative ultrasonography scan.

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Importance of antibiotic therapy for complicated intra-abdominal collections in patients with acute kidney injury. A case series report

Importancia de la antibioticoterapia ante colecciones intraabdominales complicadas en pacientes con lesión renal aguda: reporte de casos

Yeiscimin Sánchez-Escobedo,* Mónica Isabel León-Morales,‡ Roberto Ramírez-Vega§

Keywords:
Sepsis, intra-abdominal infection, antibiotic therapy, renal disease, acute kidney injury.

Palabras clave:
Sepsis, infección intraabdominal, antibioticoterapia, enfermedad renal, lesión renal aguda.

ABSTRACT

Introduction: Intra-abdominal infections (IAI), when associated with acute kidney injury, require modifications in the antimicrobial therapy to be employed, as much as initiating early and appropriately the antibiotic covering the spectrum of germs involved. The importance of source control has an impact on decreasing the mortality rate. **Description of clinical cases:** This is a case series report of five patients with complicated IAI with a mean age of 55.6 years; 60% were men and 66% presented comorbidities such as type 2 diabetes mellitus and systemic arterial hypertension. In most of these subjects, the clinical presentation was localized pain and fever (75%) and organ dysfunction severity scales (mean SOFA 15.8 points and AKIN 80% with LRA type III). The most used pre-hospital prophylactic antibiotic was ceftriaxone and, according to the antibiogram, it was decided to change to one of the carbapenem drug group. The mean duration of this antimicrobial therapy was 23.4 days; however, the mean length of in-hospital stay was 18.2 days, which suggests a prolonged period. **Conclusion:** Sepsis has a high incidence and mortality. Therefore, antibiotic therapy should be chosen according to the severity and clinical and laboratory status, and the availability of drugs, allowing the medical decision to be based on evidence.

RESUMEN

Introducción: *Las infecciones intraabdominales (IIA), cuando se asocian a lesión renal aguda, requieren modificaciones en la terapia antimicrobiana a emplear, tanto como iniciar de manera temprana y apropiada el antibiótico que cubra el espectro de gérmenes implicados. La importancia del control de la fuente repercute en el descenso de la tasa de mortalidad.* ***Descripción de casos clínicos:*** *Cinco pacientes con IIA complicada, cuyo valor medio de edad fue 55.6 años; 60% de esta población fueron hombres y 66% presentó comorbilidades como diabetes mellitus tipo 2, además de hipertensión arterial sistémica. En la mayoría de dichos sujetos, la presentación clínica fue dolor localizado y fiebre (75%) y las escalas de gravedad de disfunción orgánica (un promedio de SOFA de 15.8 puntos y AKIN 80% con LRA tipo III). El antibiótico profiláctico prehospitalario más empleado fue la ceftriaxona y, de acuerdo al antibiograma, se decidió cambiar por alguno del grupo de carbapenémicos. En días, la duración media de esa terapia antimicrobiana fue de 23.4, sin embargo, la media del lapso de estancia intrahospitalaria fue de 18.2, lo cual sugiere un periodo de tiempo prolongado.* ***Conclusión:*** *La sepsis tiene incidencia y mortalidad elevadas. Por ello, la antibioticoterapia debe ser elegida de acuerdo con la gravedad y estado clínico, de laboratorio y de la disponibilidad de los fármacos, permitiendo que la decisión médica sea basada en evidencia.*

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Abbreviations:

IIA = Intra-abdominal infection.
AKI = Acute kidney injury.
BLEE = β-lactamase of extended spectrum.
AKIN = Acute Kidney Injury Network.
SOFA = Sequential Organ Failure Assessments.
qSOFA = Quick SOFA.

INTRODUCTION

An intra-abdominal infection (IAI) is considered complicated when it occurs in a diffuse or localized way within the abdominal cavity and has systemic repercussions.[1,2] It occurs as a result of perforation or inflammation of the intestinal wall, and are therefore contaminations caused by many microorganisms that may be mixed (fungal or parasitic). However, there is a causal predominance of anaerobic bacteria.[3,4]

The presence of sepsis predisposes to the development of acute kidney injury (AKI), further increasing the mortality rate.[5] Therefore, the importance of choosing the appropriate antibiotic therapy in patients with AKI lies in the fact that antimicrobials should be adjusted to doses capable of reaching adequate serum levels, avoiding overdose and toxicity of these drugs, as well as the risk of resistance.[4,5] Several clinical trials have concluded that, according to the glomerular filtration rate, doses should be adjusted in order to be effective, so that the drugs reach the minimum inhibitory concentration and thus achieve their bacteriostatic or bactericidal effect, as the case may be, without causing damage to the kidneys.[6,7]

In complicated IAI there are strategies, such as source control by surgical treatment and choice of antimicrobials, which are accompanied by low failure rates and a decrease in the mortality rate. In Mexico, a multicenter study on sepsis reported a mortality rate of 30.4%, being the abdominal etiology the most frequent with 47%. Therefore, it is of vital importance to contextualize the case of a septic patient with AKI, since the assessment of severity and the adoption of urgent therapeutic measures lead to a decrease in the number of deaths, so that when the source is effectively controlled and appropriate antibiotics are used, the favorable response rate has been recorded in up 70 to 90% of patients.[8,9]

Table 1: Clinical characteristics of the sample studied. N = 5.

Patient	Age (years)	Sex	Comorbidities	Initial clinical manifestation	Source of infection	Initial diagnosis	Final diagnosis
1	64	Female	T2D/SAH	Pain in right hypochondrium, fever, nausea, vomiting	Gallbladder	Severe cholangitis + acute cholecystitis (Tokio grade III)	Piocolecisto
2	52	Male	Alcoholism	Mesogastric pain, nausea, and fever	Pancreas	Severe Acute Pancreatitis (Atlanta 2012)	Pancreatic pseudocyst (type V)
3	54	Male	T2D/alcoholism	Fever, jaundice, right hypochondrial pain	Liver	Chronic hepatic insufficiency (Child-Pugh B)	Pyogenic liver abscesses
4	67	Female	T2D/SAH/IC	Vomiting, pain in right iliac fossa	Kidney	Hydronephrosis vs. pyelonephritis + complicated UTI	Renal cyst (Bosniak I)
5	41	Male	SAH	Fever, jaundice, vomiting	Gallbladder	Severe cholangitis + choledocholithiasis	Vesicular perforation + peritonitis

T2D = type 2 diabetes, SAH = systemic arterial hypertension, HF = heart failure, UTI = urinary tract infection.

Table 2: Hemodynamic evaluation and characterization of acute kidney injury. N = 5.

	Organic dysfunction			Acute kidney injury	
Patient	Initial MAP (mmHg)	SOFA-score	qSOFA-score	SCi (mg/dl)	SCf (mg/dl)
1	63.33	14.0	3.0	8.4	1.30
2	60.00	12.0	2.0	3.1	1.00
3	56.67	16.0	2.0	1.9	1.30
4	50.00	20.0	3.0	12.9	3.20
5	51.67	17.0	3.0	3.7	1.60
Average	56.33	15.8 points	2.6 points	5.0	1.68

MAP = mean arterial blood pressure, SOFA = Sepsis related Organ Failure Assessment, qSOFA = Quick SOFA, SCi = initial serum creatinine, SCf = final serum creatinine.

PRESENTATION OF CLINICAL CASES

The group under investigation included five patients who presented with septic shock of abdominal origin evidenced by radiology studies associated with AKI at any stage according to the AKIN classification *(Table 1)*. The mean age at presentation was 55.6 years, being relatively more frequent in men (60%). The main comorbidities associated with complicated IAI were systemic arterial hypertension and type 2 diabetes (both in 33%), followed by alcoholism (22.5%) and, finally, heart failure (11.5%). The most common clinical presentation was the association of localized abdominal pain and fever. In the diagnostic approach to determine hemodynamic status and identify organ dysfunction, the SOFA/qSOFA scales were used, with averages of 15.8 and 2.6 points, respectively; mean blood pressure was 56.33 mmHg during all days of hospital stay. Laboratory parameters were elevated in all patients and the median reported were white blood cell counts of 26,040 cells/mm^3, procalcitonin levels of 87.6 pg/ml, erythrocyte sedimentation rate of 31.56 μg/ml.

The degree of renal damage was classified according to the creatinine values in the first laboratory test, those at the follow-up and at discharge. Eighty per cent 80%) of the patients were classified in stage III, according to AKIN *(Table 2)*. The imaging study to initiate the

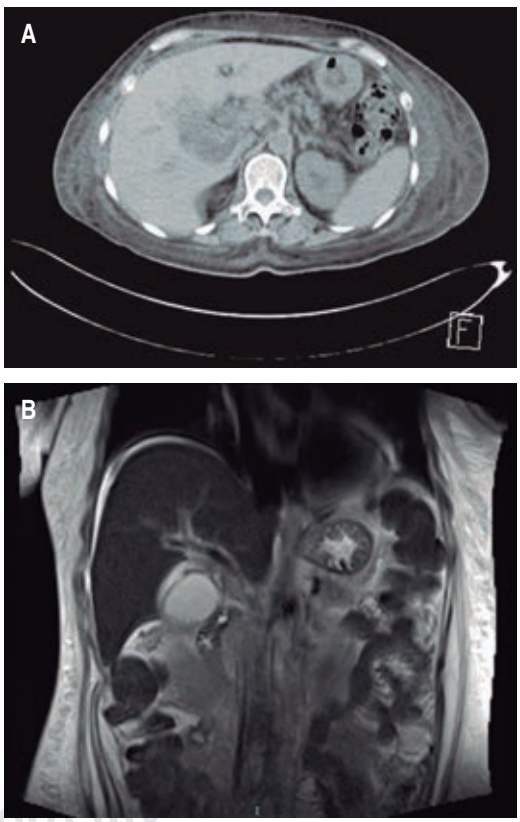

Figure 1: *Imaging studies of patient 1.* ***A)*** *Abdominal computed axial tomography scan with evidence of acute cholecystitis and peri-vesicular fluid without being able to rule out partial wall irruption and a volume of 184 cm^3.* ***B)*** *Cholangial magnetic resonance imaging showing evidence of acute chronic cholecystitis, biliary sludge with perforation and an adjacent abscess.*

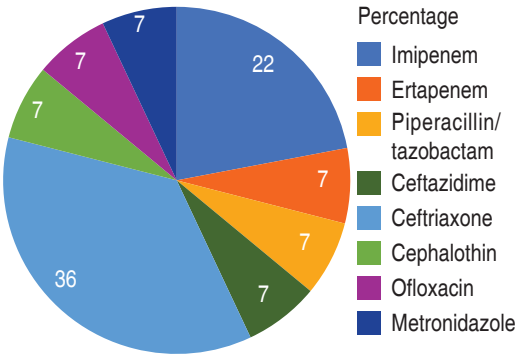

Figure 2: *Antibiotics used in surgical patients with acute kidney injury.*

approach is with an abdominal ultrasonography scan and to assess the patient's evolution, and abdominopelvic CT scan was requested *(Figure 1)*.

Medical treatment was focused on two points: support with vasopressor drugs and antibiotic therapy. The main empirical antibiotic used was ceftriaxone (35.7%) as monotherapy initiated as a pre-hospital scheme. In the hospitalization stage, a drug of greater dispersion was changed following the recommendations of international guidelines. In this series the antibiotic initiated was imipenem (21.4%) *(Figure 2)*. The mean duration of antimicrobial therapy was 23.4 days; however, the mean length of in-hospital stay was 18.2 days, which represents a long period of time. Finally, 60% required a surgical resolution in the form of percutaneous drainage and only 40% were candidates for laparoscopy.

The antibiogram report showed more than two multidrug-resistant strains, and the most frequently isolated germ was *Escherichia coli* BLEE (40%) followed by polymicrobial infection (40%) *(Table 3)*.

DISCUSSION

The severity of AKI increases in multiorgan dysfunction and correlates with the state of shock. Among the prognostic factors for poor outcome, the age of the patient with comorbidities is the greatest predictor, given that multicenter and experimental studies have demonstrated the strong association between different diseases whose pathophysiology includes hypoglycemic states, endothelial dysregulation, and immunosuppression, given that they increase the patient's vulnerability to an infectious process and eventually sepsis. On the other hand, among the protective elements is a rapid decrease in the first 24 hours of hospitalization.[10-14]

To assess severity, there are scales used in the initial approach that have been studied, validated with high sensitivity, and are easy and quick to obtain so that those affected can benefit early from the diagnosis and, of course, the most appropriate antibiotic treatment.[15] Among them are SOFA and qSOFA, which have proven to be useful in providing a prognosis and are frequently used in the evaluation of surgical patients.

In the case series presented here, most of the patients had severe septic shock criteria and therefore this explains the high proportion of those affected, who required hydric resuscitation, pharmacological support using vasopressors, and an early indication for broad-spectrum antibiotic therapy.[16] The most current recommendations for antibiotic use are based on mild, moderate, and severe severity. In patients coming from the community, with clinical signs of peritonitis, but who do not meet guidelines for severe sepsis and have not yet received antibiotic therapy, the association of a third-generation cephalosporin plus metronidazole should be offered; if they are allergic to β-lactams, a quinolone drug can be added.[17]

Table 3: Bacteriological spectrum reported by antibiogram. N = 5.

Patient	Crop report	Antibiogram
1	Polymicrobial	3 MDR
2	*E. coli* BLEE	2 MDR
3	*S. pyogenes*	4 MDR
4	*E. coli* BLEE	3 MDR
5	Polymicrobial	1 MDR

E. coli BLEE: *Escherichia coli* producing extended spectrum beta-lactamase, *S. pyogenes* = *Streptococcus pyogenes*, MDR = multidrug resistance.

In those who come from the community without a severe infection but who have already received antibiotics, the presence of BLEE enterobacteria should be suspected. If there is no risk of contamination by *Pseudomonas aeruginosa*, ertapenem may be administered as monotherapy. And finally, subjects with criteria of severe septic condition will be those who should receive a broad-spectrum antibiotic combination.[18]

Regarding the microbiological range reported for complicated IAI, the international literature reports a predominance of Gram-negative bacilli, for example *Escherichia coli* (25-30%), followed by *Klebsiella spp* and *Pseudomonas aeruginosa* (3-6%). In relation to Gram-positive cocci, the following stand out: *Streptococcus spp* (16%), *Staphylococcus spp* (5.2%) and to a lesser extent, *Enterococcus spp* (4.7%).[19,20] This is important since, in the present report, most IAIs were caused by multidrug-resistant organisms and polymicrobial, which results in a broad bacteriological diagnosis and difficult to eradicate with standard treatments and for usual periods of a few days. In such cases, the opposite must be done and always consider the pharmacokinetics and dynamics of those antibiotics prescribed, so as not to cause more harm than benefit to the patient.[21] After recovery from sepsis, patients are still susceptible to deterioration of health, of which 40% were hospitalized within 90 days.[19,22]

Early hospital care of infection focuses on rapid recognition, treatment using broad-spectrum antibiotics, elimination of sources of contamination, all as strategies that improve the quality of patient discharge and all the organ functions that were compromised by infection.

CONCLUSION

In the setting of a patient with IAI complicated by severe sepsis and AKI, it becomes imperative to assess severity and adopt measures that lead to both decrease mortality and costs associated with treatment and hospitalization.

The septic condition has a high incidence and mortality. Therefore, the antibiotic therapy should be chosen according to the severity and clinical status, laboratory results and drug availability, allowing the medical decision to be based on evidence.

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Ethical considerations: Procedures in humans must conform to the principles established in the Declaration of Helsinki of the World Medical Association (WMA) and with the provisions of the General Health Law Title Five and Regulations of the General Health Law on Research for Health, and to NOM-012-SSA3-2012, which establish the criteria for the execution of research projects for health in humans, as well as with the rules of the Research Ethics Committee of the institution where they are carried out.

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Gastric volvulus: a case report seen at the Hospital Central Universitario del Estado de Chihuahua

Vólvulo gástrico: reporte de caso en el Hospital Central Universitario del Estado de Chihuahua

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Palabras clave:
Vólvulo gástrico, hernia hiatal, isquemia gástrica, gastrectomía.

ABSTRACT

Gastric volvulus is an uncommon clinical entity, characterized by an abnormal rotation of the stomach over one of its axes (longitudinal or axial). It possesses high morbimortality and risk of complications (obstruction or perforation). It is necessary to have a high clinical suspicion to diagnose it early and treat it. A case report of a gastric volvulus in a 50-year-old woman admitted for abdominal symptoms of three days of evolution with pain, nausea and vomiting is presented. During an exploratory laparotomy a grade IV hiatal hernia with associated gastric volvulus was found and treated surgically. However, she had a torpid evolution and died due to complications.

RESUMEN

El vólvulo gástrico es una entidad clínica poco común, caracterizada por una rotación anormal del estómago en uno de sus ejes (longitudinal o axial), entidad con elevada morbimortalidad y riesgo de complicaciones (obstrucción o perforación). Es necesario tener alta sospecha clínica para diagnosticarlo tempranamente y tratarlo. Reporte de caso de vólvulo gástrico en mujer de 50 años que ingresa por cuadro abdominal de tres días de evolución con dolor, náusea y vómito. Durante laparotomía exploradora se encuentra hernia hiatal grado IV con vólvulo gástrico asociado, se trata quirúrgicamente; sin embargo, tiene una evolución tórpida y fallece por complicaciones.

INTRODUCTION

Gastric volvulus (GV) (from Latin *volvere*: to turn) is an uncommon condition defined as an abnormal rotation of the stomach over its axis at more than 180º,[1] was first described in 1866 by Berti.[2] Delay in diagnosis results in high morbidity and mortality rates due to its potential complications, thus often requiring urgent surgical treatment.[3] A literature review conducted in the PubMed database from 1999-2018 sought information on clinical presentation, GV type, its etiology, diagnostic tests, treatment, and outcomes where cases without such information were excluded, resulted in only 43 reported cases. Mesenteric axial GV (51.1%) was the most frequent, followed by the organ axial GV (46.5%). Surgical treatment was the therapeutic mainstay in 90.7% of patients. Three deaths were reported, and the rest of the patients had a successful recovery.[2] In other reports published up to 2009, 350 cases had been reported worldwide.[4] It is a pathology with a higher frequency in pediatric age (20%).[4] Peak incidence in adults is around the fifth decade of life.[4] Mortality with timely diagnosis and treatment of acute GV is 15-25% and in chronic GV is 0.13%.[2] However, with late treatment or complications a mortality rate of 30-50% is reported.[5] It can be classified according

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to its etiology and axis of rotation. In pediatric patients, primary causes predominate due to immaturity of the stomach and its ligaments or congenital diaphragmatic hernial defects,[6] while in adults the highest percentage are secondary[5] due to anatomical alterations of the stomach or surrounding organs, the most common cause being a paraesophageal hernia.[7]

PRESENTATION OF THE CASE

A 50-year-old woman with a history of type 2 diabetes, untreated hypertension, morbid obesity, and hysterectomy 20 years ago was admitted to the hospital. Her condition began three days prior to admission with progressive cramping pain in the epigastrium, abdominal distension, nausea, and vomiting on multiple occasions, dyspnea at rest, non-quantified febrile episodes, and no bowel movements for the last five days. Her vital signs were blood pressure 133/100 mmHg, heart rate 122 beats per minute, respiratory rate 36 breaths per minute, and temperature 37.7 ºC. On examination, the left lung fields were hypo ventilated, the rigid abdomen showed generalized distension, tympanic on percussion, and intense pain on palpation predominantly in the epigastrium, no peristalsis was heard, and the rebound sign was positive. Hydric resuscitation was started, and laboratory studies were requested. A computed axial tomography scan showed signs of a hiatal hernia grade IV and toxic megacolon *(Figure 1)*. Laboratory results were as follows: blood white cells of 16,300 cells/µl, neutrophil count of 14,000 cells/µl, hemoglobin 17.3 g/dl, platelet count of 409,000 u/µl, arterial blood gas with lactate 5.5 mmol/l and pH 7.48. Gastric decompression was performed via a nasogastric tube (NGT) placed without difficulty. Ranitidine 50 mg iv, dexamethasone 8 mg iv, metoclopramide 10 mg iv, ceftriaxone 1 g iv, butylhioscin 20 mg iv, and paracetamol 1 g iv were administered. An exploratory laparotomy was performed on 12/07/18 and a grade IV hiatal hernia was found with a secondary gastric volvulus type II showing gastric necrosis. Reduction of the hernial sac and of the GV, a Nissen type fundoplication and a partial gastrectomy with Billroth II technique in manual Brown's omega were performed. Closure as done with Prolene intestinal needle 3-0 in two planes with Connell and Mayo stitches, as well as a Lembert reinforcement and esophageal hiatus plasty with Prolene® intestinal needle 2-0 simple stitches. No complications occurred at that time; an antibiotic regimen of ciprofloxacin 400 mg iv, every 12 hours for 10 days and metronidazole 500 mg iv, every eight hours for 10 days was indicated, and she was admitted into the Intensive Care Unit. One week later, she presented a 50% dehiscence of the gastro-jejunal anastomosis, with leakage of gastric contents. Primary gastric closure was performed with a Graham patch, and a Bogota bag was placed. Her postoperative lab results showed a leukocytosis of 22,000 cells/µl, neutrophil count of 18,000 cells/µl, hemoglobin level of 8 mg/dl, a platelet count of 123,000 u/µl, pH of 7.31, lactate of 3.9 mmol/l, and data of renal failure associated with creatinine of 3.2 mg/dl, urea of 65 mg/dl, urea nitrogen 45 mg/dl, sodium 153 mEq/l, potassium 2.8 mEq/l, chlorine 110 mEq/l. Later, and due to the persistence of the leak, a surgical cleaning procedure and a partial gastrectomy and Roux-en-Y gastro-jejunal anastomosis in two planes with Connell and Mayo stitches and reinforcement of Lembert stitches with 3-0 Prolene® intestinal needle, and a subsequent jejunostomy using 2-0 silk with simple stitches to abdominal wall aponeurosis were performed. In the following weeks she underwent four surgical cleaning procedures, replacement of the Bogota bag and a Stamm type gastrostomy due to intestinal leakage. She persisted with abdominal sepsis, had a

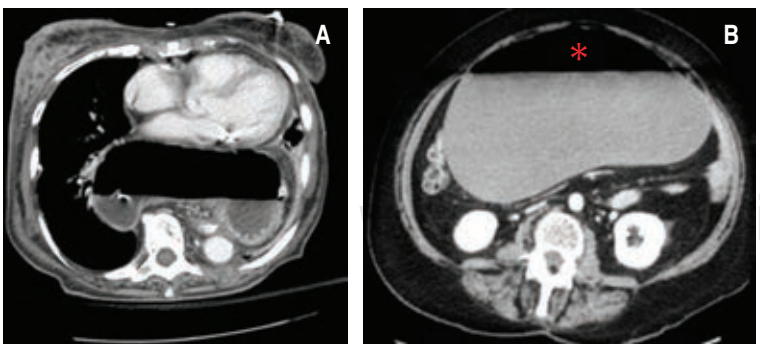

Figure 1: *Images of the computed axial tomography of a 50-year-old woman.* ***A)*** *Hiatal hernia with intrathoracic stomach.* ***B)*** *Dilatation with hydro aerial level present (*).*

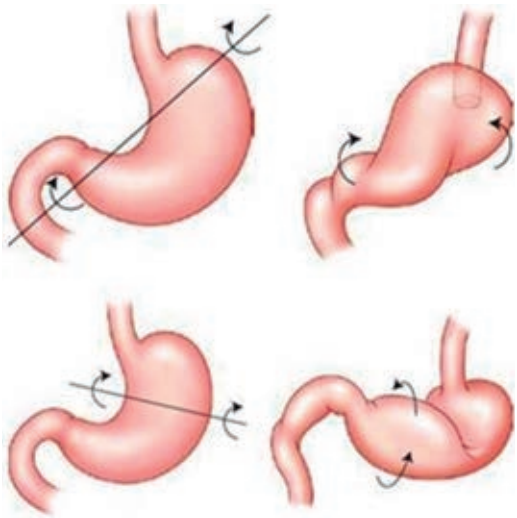

Figure 2: *Upper drawings: organ-axial gastric volvulus over the longitudinal axis. Lower drawings: mesenteric-axial gastric volvulus with rotation over the horizontal axis. Taken from: Caldaro T, et al.*[3]

perforation of the anastomosis and a gastric T-tube was placed. In the cavity was found abundant purulent and foul-smelling material, in addition to a frozen abdomen. During her stay she was managed with multiple antibiotic therapy with ciprofloxacin and metronidazole, changing to meropenem 500 mg iv, every eight hours, and subsequent adjustment to tigecycline 100 mg iv, continuing with 50 mg iv, every 12 hours and vancomycin 1 g iv, every 12 hours for 10 days, in addition to total parental nutrition, showing no improvement in her general status. Due to positive peritoneal fluid cultures for multi-resistant *Staphylococcus aureus* and *Acinetobacter baumannii*, her morbid obesity and poor nutritional status, she developed septic shock of abdominal focus, and died one month after admission.

DISCUSSION

GV is a rare condition with a high mortality rate (30-50%), so it is necessary to know the pathology and its presentation for timely diagnosis and intervention.[2,7] The classification we used was that of Singleton *(Figure 2)*:

Type I. Organ-axial: rotation of the stomach over its longitudinal axis, which extends from the gastroesophageal junction to the pylorus. The antrum rotates in the opposite direction to the gastric fundus. This is the most common presentation of gastric volvulus (60% of cases).

Type II. Mesenteric axial: rotation of the stomach over its horizontal axis passing through the greater and lesser curvatures. It presents as an idiopathic condition with chronic or intermittent symptoms (30% of cases).

Type III. Mixed: combination of organ-axial and mesenteric-axial rotation, it is an extremely rare entity (2% of cases).

Type IV. Unclassified (8%).

Primary gastric volvulus is due to defects in the gastric anchorage due to hyperlaxity or agenesis of the gastrocolic, gastrohepatic, gastro-phrenic and gastrosplenic ligaments or due to alterations in the esophageal hiatus, retroperitoneal fixation of the duodenum, and short gastric vessels.[8] The secondary form (65-70% of cases) of gastric volvulus is due to disorders of gastric anatomy (peptic ulcer or tumors) or its function (hypomotility, distension); or to anomalies of adjacent organs (hiatal hernia, congenital diaphragmatic hernia, phrenic nerve palsy, asplenia, or wandering spleen), trauma or previous abdominal surgery with section of gastric ligaments, as in liver transplantation and fundoplication.[7,9]

Its clinical presentation varies according to etiology, speed of progression, type of volvulus, degree of rotation and resulting obstruction, so the symptoms may mimic any abdominal condition. In the acute form, Borchardt's triad (severe epigastric distention with abdominal pain, intractable retching, and inability to pass a gastric tube) is diagnostic in 70% of adult patients.[3,10] The subacute form of gastric volvulus is characterized by vague abdominal discomfort, while in chronic GV the symptomatology is nonspecific with epigastric pain, early satiety, nausea or vomiting.[8] Other symptoms may be atypical chest pain, anemia, weight loss, dyspnea, reflux, postprandial abdominal distention. or dysphagia and may appear irregularly over weeks or years.[7] The high probability of exacerbation of chronic VG should be reminded. Secondary complications of acute GV are gastric ileus, pyloric ischemia, gastric necrosis with perforation, and even death.[3,11] Diagnosis is usually difficult due to a low clinical suspicion and can range from being an incidental radiological

finding to an urgent situation.[12] Abdominal plain X-rays usually show gastric dilatation with gas scarcity in the remaining part of the intestine.[2] If the GV is secondary to a diaphragmatic defect, a retrocardiac air bubble or air level may be found in the chest *(Figure 3)*; especially in the mesenteric-axial form the gastric shadow shows a double level of air and fluid in the standing position, while in the organ-axial form, the stomach is more horizontally positioned with a single fluid level.[13] An upper gastrointestinal barium series is considered more specific than the plain radiographs, as it reveals the obstruction of the stomach at the site of the volvulus and its distension at the level of the diaphragm *(Figure 4)*.[8] In our case, the presentation was not the classic one, and therefore an accurate preoperative diagnosis was not achieved. It was necessary to perform a CT scan, which is consistent with the study by Mazaheri et al, which supports its use since this imaging study has the highest sensitivity and specificity for the diagnosis of GV and an accuracy of 90%. In the CT scan imaging, the most important finding is the transition point of the pyloric peak,[14] which confirms the diagnosis with anatomical details and possible associated conditions (paraesophageal and diaphragmatic hernias, diaphragmatic eventration). In a late stage of a GV, the vascular involvement may result in findings of gastric ischemia, ulceration, or gastric mucosal fissures.[11,15] The hemodynamic status of our patient did not allow further studies to be performed so we proceeded to perform an urgent exploratory laparotomy. Treatment can be conservative or surgical depending on the clinical presentation and possible associated anomalies. While in the acute phase the GV should be treated with an emergency surgical intervention, there are no clear guidelines on the management of chronic GV.[11,14] Initial management should be with a gastric tube placement for decompression, followed by surgery to check gastric viability, resection if necrosis is present, and a definitive surgical treatment such as reduction of rotation, gastrostomy, gastropexy, and repair of predisposing defects.[17] In a retrospective study of patients with GV and conservative management for five years, it was found that symptomatic recurrence was 64%, but this is only an option for patients with chronic GV, especially those over 60 years of age and with high surgical risk[17] and involves reduction or percutaneous endoscopic gastrostomy plus prokinetic and antisecretory treatment. However, there is a high risk of gastric perforation.[16] In our case it was determined that the patient was not a candidate for this type of management.[1,18] Minimally invasive surgery, such as endoscopic de-rotation and single incision laparoscopic surgery, has gained ground over classic techniques due to the

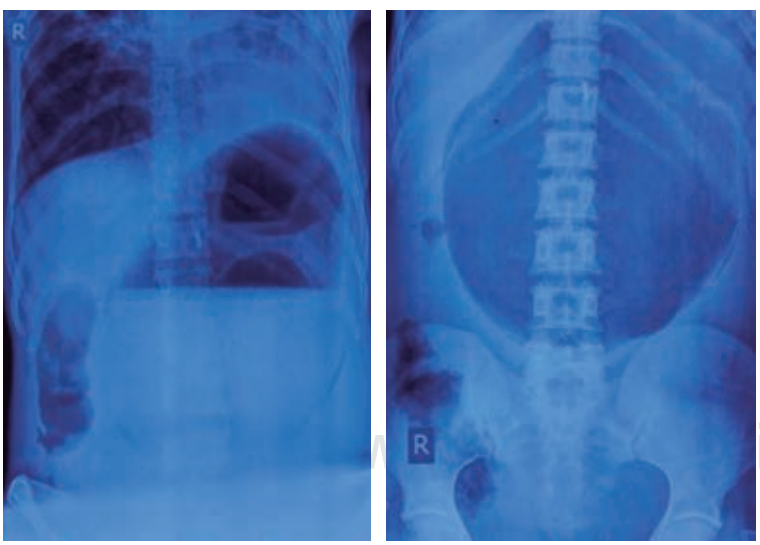

Figure 3: *Plain abdominal radiograph of a patient with gastric volvulus where the distended stomach occupies almost the entire abdomen, predominantly in the epigastrium and umbilical region, in addition to a large fluid level in the image on the left. Taken from: Kumar B, et al.*[16]

Figure 4: *Barium study: paraesophageal hernia with gastric body in the thoracic cavity.*

lower rate of complications, with less bleeding and shorter hospital stay, so it is necessary to establish a standard procedure under this technique. The option of a more drastic management with the performance of a total gastrectomy with end-to-end esophageal-jejunal anastomosis should be considered from the beginning, trying to avoid complications, the risk of infection and repetitive surgical trauma.[12]

CONCLUSIONS

Despite the comprehensive management of the case, the outcome was fatal due to the time of evolution and the patient's own comorbidities. This requires analyzing and emphasize the options and care to improve pre and postoperative conditions of cases with this entity. GV represents a challenge for which it is necessary to have a high diagnostic suspicion when approaching an acute abdomen and to rely on imaging studies with high sensitivity and specificity to reach an accurate diagnosis. Therefore, it is necessary to maintain constant updating and training to deal with this type of pathology.

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Ethical considerations and responsibility

Protection of humans and animals: The authors declare that no experiments on humans or animals have been performed for this research.

Data confidentiality: The authors declare that they have followed their center's protocols on the publication of patient data.

Right to privacy and informed consent: The authors declare that no individual patient data appear in this article.

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Multiple projectile gunshot lumbar trauma with multi-visceral lesion

Traumatismo lumbar por arma de fuego de proyectiles múltiples con lesión multivisceral

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Keywords:
Penetrating wounds, emergencies, surgeons.

Palabras clave:
Heridas penetrantes, emergencias, cirujanos.

ABSTRACT

We present a case of penetrating trauma in the lumbar region by multiple projectile firearm that involved damage to multiple organs. It is considered a surgical emergency, although with infrequent presentation. In such cases the surgeon must make decisions and act immediately to improve the patient's survival. Clinical and paraclinical data, its management and evolution are presented, in addition to comparing the with the related medical literature.

RESUMEN

Se presenta caso de trauma penetrante en región lumbar por arma de fuego de proyectiles múltiples que implicó daño en múltiples órganos, considerado una urgencia quirúrgica, aunque con presentación poco frecuente. En dichos casos el cirujano debe tomar decisiones y actuar de forma inmediata para mejorar la supervivencia del paciente. Se exponen datos clínicos, paraclínicos, su manejo y evolución, además de compararlo con escrutinio con la literatura médica relacionada.

INTRODUCTION

In Latin America with impoverished economies and social strata, interpersonal violence is the most frequent cause of death and disability in persons under 45 years of age.[1] Venezuela currently has no record of trauma prevalence, but according to the 2018 report of the violence observatory, a rate of 81.4 violent deaths per 100,000 inhabitants was recorded for a total of 23,047 deaths nationwide.[2]

Penetrating lumbar trauma from multiple projectile firearms is infrequent but is considered an emergency at the time of admission. The injuries can be complex and affect various organs and intra-abdominal viscera, so the surgeon must act immediately to reduce morbimortality even in institutions with a lack of resources. Studies have shown that overall survival correlates with the number of injured organs; the risk of death doubles with each additional injured organ and survival drops significantly when four or more organs are injured.[3] Since the last years of the 20th century, a damage control strategy has been applied in severe abdominal injuries; initial management is limited to adequate hemostasis, removal of contamination, and prevention of abdominal hypertension by temporary closure. Then, if the injured person during his stay in intensive care compensates for all his general imbalances, one or more operations are planned without further urgency for definitive repair of the injuries.[4] Of all penetrating traumas in the lumbar region, only 25% have visceral injury; however, it is possible that there are hidden injuries, so the biggest problem is to diagnose injuries that may initially go unnoticed. The main injuries due to penetrating wounds in the lumbar region are those of the kidney, colon, and liver, and it is necessary to be alert to the clinical manifestations of each one of them. It is established that patients with peritonitis, shock

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or blood loss through the gastrointestinal tract will require laparotomy, but retroperitoneal injuries, especially of the colon, may go unnoticed until they have late manifestations.[5] At present, in patients with penetrating wounds in the dorsal region, the first evaluation tool is the clinical examination. If the patient is unstable, with peritonitis or blood loss from the rectum, an exploratory laparotomy is indicated. However, if the patient does not meet the criteria for immediate surgical exploration and the clinical evaluation is not reliable, he/she shall be studied with computed tomography, and depending on the result, he/she will be transferred to trauma observation or intensive care units, where he/she will continue to be evaluated, with continuous monitoring of the hemodynamic status of the patient with paraclinical and imaging control in the following hours.[6]

CASE PRESENTATION

A 19-year-old female patient with a history of allergy to metamizole sodium and segmental cesarean section in 2015 without complications, was admitted to the emergency department of the University Hospital "Dr. Luis Razetti" after multiple gunshot wounds in the bilateral lumbar region, predominantly on the right.

Physical examination: Her heart rate was 110 beats per minute, blood pressure of 90/50 mmHg, respiratory rate of 21 per minute a temperature of 36.6 ºC. Her skin was brown with generalized mucosal pallor and a capillary filling less than 3 seconds. The cardiopulmonary examination showed a symmetrical thorax, hypo-expandable predominantly in the right hemithorax. Multiple gunshot holes in the lower region of the left posterior hemithorax and lower third of the right posterolateral hemithorax were seen with diminished respiratory sounds in the lower third of the right hemithorax without aggregated abnormal sounds. The heartbeat sounds were heard rhythmic and regular without any murmurs or gallop rhythm. Her abdomen was distended, with decreased hydro-aerial sounds, painful on palpation with signs of generalized peritoneal irritation. In the lumbar region multiple firearm projectile orifices in bilateral lumbar region predominantly on the right *(Figure 1)* were observed. The rectal examination showed a tonic external anal sphincter, blistered stool, and a bulging cul-de-sac. The extremities were symmetrical, eutrophic and without edema. Neurologically the patient was conscious and oriented in time, space, person.

Figure 1: *Patient on admission. Projectile orifices caused by multiple discharges.*

Figure 2: *Left renal lesion.*

She was taken to the operating room and an exploratory laparotomy was performed and the following findings were observed: 1) There were 1,500 cm^3 of hemoperitoneum and another 1,000 cm^3 that occurred intraoperatively. 2)

An expandable retroperitoneal hematoma in the right zone II right in expansion and a non-expansive hematoma in the left retroperitoneal zone II. 3) Multiple lesions < 0.5 cm at the right renal level with involvement of the hilum. 4) Multiple non-bleeding lesions < 0.5 cm at the left renal level without hilum involvement *(Figure 2)*. 5) Two 0.5 cm lesions were seen on the vesicular fundus. 6) Multiple lesions in < 50% of the ascending colon up to the hepatic angle of transverse colon. 7) Multiple lesions < 50% of thin loop of 175 cm of longitude up to 250 cm of the fixed loop (40 cm from ileocecal valve). 8) A < 50% lesion of the descending colon. 9) Multiple punctate hepatic < 1 cm deep non-bleeding lesions in segments V, VI, VII and VIII. 10) A punctate serous lesion in the posterior face in the body of the stomach. 11) A 2 cm lesion of right hemidiaphragm towards its posterior insertion. 12) A non-bleeding 1 cm deep and 1 cm long lesion in the lower pole of the spleen. 13) A < 0.5 cm non-bleeding lesion in the right ovary. and 14) The rest of the abdominal organs were seen unharmed.

During the surgery, the following procedures were performed: hemoperitoneum evacuation, a thorough systematic revision of the abdominal cavity, the Cattell Branch Cattell-Braasch maneuver, right nephrectomy, the Mattox maneuver the Kocher maneuver, cystic-fundal cholecystectomy, a ileo-transverse end-to-end anastomosis, closure of the anastomotic gap, a descending colon raffia, gastric raffia, diaphragmatic raffia, placement of a passive tubular 24 Fr drain in the Morrison's space, the placement of a 24 Fr passive tubular drain in the left retroperitoneal zone II, placement of internal tension stitches, and a minimal right thoracotomy plus placement of a thoracic drain (150 cm^3 of hematic content plus air were found). During surgery, she received one unit of packed red blood cells and one unit of whole blood and was subsequently transferred to the intensive care unit in stable condition. She had a satisfactory clinical evolution and after 48 hours she was transferred to the regular hospitalization area. She had a passive drainage through the Nelaton tube placed in the Morrison's space of biliary aspect whose cytochemical analysis showed a blackish cloudy alkaline content with a density of 1.015. Her red blood cell count was 5,000, a white blood cell count 1,500 with 64 neutrophils, serum glucose of 64, proteins 22, a negative Rivalta test, LDH of 284, total bilirubin of 7.5, direct bilirubin of 2.5 and indirect bilirubin of 5.1. All these values were compatible with a biliary fistula.

She was evaluated jointly with the nephrology, nutrition, and neurosurgery services. She received three units of red packed cells during her hospitalization. She was monitored with water balance control, paraclinical and hemodynamic control, drain output, and pleural tube management, plus daily wound healing. On the fifth day of hospitalization, the drain placed in the cul-de-sac was removed due to lack of output. On the ninth day, there was a spontaneous exit of the drain placed in the Morrison space while still maintaining biliary output. an ultrasound-guided drain re-canulation was

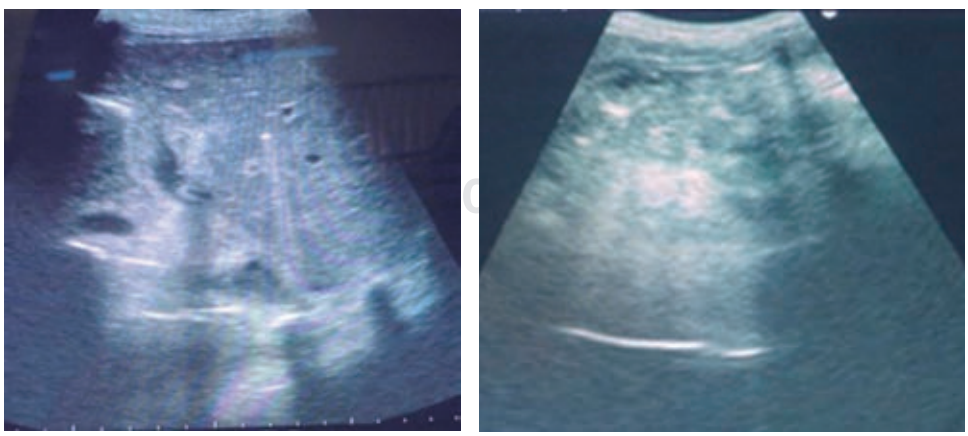

Figure 3:

Eco-guided re-canulation of the Morrison's drain.

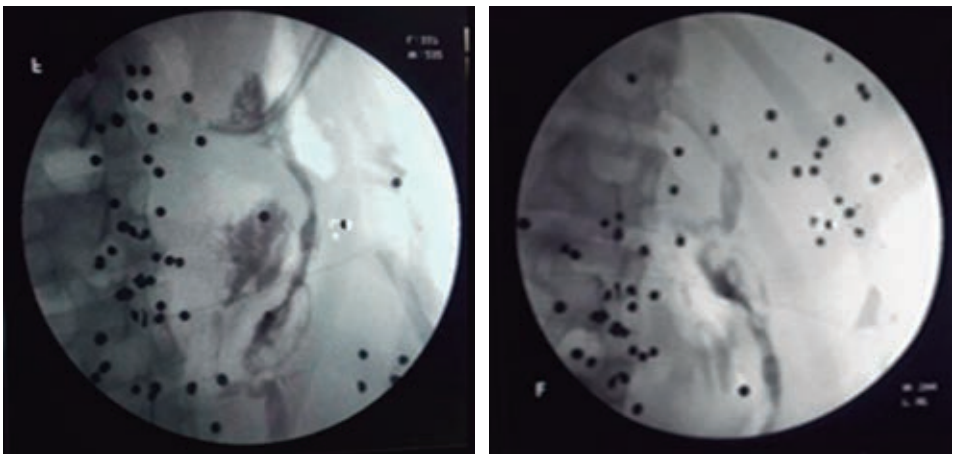

Figure 4:

Fistulography after discharge.

performed *(Figure 3)*. On the tenth day the thoracic drainage tube was removed due to good pulmonary expansibility. She was then discharged from the hospital.

As part of her postoperative control a fistulography study was performed *(Figure 4)*. The drainage was removed two months after discharge, and she had a low drainage output for five weeks until its cessation.

DISCUSSION

In gunshot wounds, Moore and Marx mention that 80% of them are penetrating and that in 95% of them there is visceral damage,[7] such as was seen in the case just described, which after a gunshot trauma the patient had diaphragmatic, pleural, hepatic, biliary, renal, gastric, splenic, intestinal and ovarian injuries. She was admitted to the emergency department with clinical signs of peritoneal irritation and signs of hemodynamic instability, and immediate surgical intervention was decided, as recommended by a study of 2,212 patients with penetrating wounds of the abdomen treated in three Charity hospitals.[8] Hemodynamic instability and signs of peritoneal irritation are absolute indications for emergency laparotomy. Patients with penetrating abdominal trauma often have multiple injuries which, in addition to injuries to solid organs and vascular structures, involve hollow viscera, biliopancreatic tree and urological structures.[9] The error lies in delaying surgical intervention when it is mandatory.[10] As a postoperative complication, a biliary fistula was evidenced and diagnosed, and was treated expectantly with drainage and performing a control fistulography. Once the drain was removed, spontaneous closure occurred after 37 days, in agreement with the study by Hollands and Little in which they describe that expectant management in patients with biliary fistula continues to be an efficient tool in patients with severe hepatic trauma, with a median number of spontaneously closed biliary leaks after 33-44 days.[11]

CONCLUSION

Every firearm trauma represents an emergency; the exhaustive physical examination, hemodynamic control, paraclinical and imaging studies such as computed tomography scan may guide and define the treatment, either conservative with a non-operative management or with an early surgical intervention that may result in definitive surgery or in a staged damage control surgery that may reduce the patient's morbidity and mortality. The surgical procedure should never be delayed.

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Familial adenomatous polyposis: current status and case report

Poliposis adenomatosa familiar. Estado actual y reporte de caso

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Keywords:
Familial adenomatous polyposis, colectomy, proctocolectomy, colorectal cancer, role of adenomatous polyposis coli, colonoscopy.

Palabras clave:
Poliposis adenomatosa familiar, colectomía, proctocolectomía, cáncer colorrectal, rol de la poliposis adenomatosa coli, colonoscopia.

ABSTRACT

Introduction: Familial adenomatous polyposis is a rare disorder and accounts for less than 1% of the causes of colorectal cancer. It is characterized by thousands of colorectal adenomas with high risk of developing cancer. **Case report:** A 48-year-old female patient with hematochezia and weight loss. Colonoscopy showed more than 100 polyps and a tumor in the sigmoid colon. She has a history of three direct relatives with colon cancer. **Conclusion:** It is necessary to perform an early assessment and family evaluation to prevent the appearance of cancer. Surgery is the basis of treatment.

RESUMEN

Introducción: *La poliposis adenomatosa familiar es un trastorno poco frecuente y significa menos de 1% de las causas de cáncer colorrectal. Se caracteriza por presentar miles de adenomas colorrectales con alto riesgo de desarrollar cáncer.* ***Caso clínico:*** *Paciente femenino de 48 años con hematoquecia y pérdida de peso. La colonoscopia muestra más de 100 pólipos y un tumor en colon sigmoides. Cuenta con antecedente de tres familiares directos con cáncer de colon.* ***Conclusión:*** *Es necesario realizar una valoración precoz y evaluación de familia directa para prevenir la aparición de cáncer. La cirugía es la base del tratamiento.*

INTRODUCTION

Colorectal cancer is the third leading cause of cancer and the fourth most common cause of cancer-related deaths in the world. Most occur sporadically in approximately 70 to 80% of cases, and 10 to 20% are familial.[1]

Familial adenomatous polyposis (FAP) is an autosomal dominant inherited disorder that occurs in approximately 1:10,000 live births and affects both genders equally and all races. It may be asymptomatic or present with bleeding, diarrhea, abdominal pain, or mucous discharge. It also presents with anemia, intestinal occlusion, or weight loss when large polyps are present or increase in number preceding the development of cancer. The main characteristic is the presence of hundreds to thousands of colorectal adenomas with areas of normal mucosa between each lesion. Mild polyposis is when 100 and 1,000 adenomas are identified. When fewer than 100 adenomas are found, it is diagnosed as attenuated polyposis. Nearly 100% of patients will develop cancer if they do not receive treatment.[2]

FAP is a multisystem disease that can present with numerous extracolonic manifestations. These include gastroduodenal adenomas and cancer, desmoid tumors, osteomas, epidermoid cysts, papillary thyroid cancer, small bowel polyps and cancer, congenital hyperplasia of the retinal pigment epithelium, and dental anomalies.

Gardner syndrome is a polyposis accompanied by desmoid tumors, osteomas, epidermoid cysts, or supernumerary teeth. Turcot syndrome is a FAP associated with

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malignant tumors of the central nervous system. Both syndromes are caused by mutations in the APC adenomatous polyposis coli (APG) gene.

GENETIC BASIS

FAP is caused by an inherited mutation in the APC gene located on chromosome 5q21,[2,3] Affected patients are born with only one functional copy of this "guardian" gene. Loss of the second allele leads to the rapid development of hundreds to thousands of colorectal adenomas. More than 850 different mutations have been described, in which there is abnormal development of the APC protein. About 25% of patients with FAP have a *de novo* mutation, with no family history.[4]

DIAGNOSIS

Familial adenomatous polyposis can be diagnosed genetically or clinically. Genetic testing reveals a mutation of the APC gene in approximately 80% of cases. Indications for referral to genetic counseling include family history of FAP, personal history of 10 or more adenomas, personal history of adenomas, and extracolonic manifestations of the disease. In at-risk patients with family members with known mutation, targeted testing for that mutation is performed. In approximately 20% of patients the mutation cannot be identified, but the clinical phenotype is present.[5]

RISK OF CANCER DEVELOPMENT

FAP presents a risk of developing colorectal cancer close to 100%. It represents only 0.5 to 1% of the causes of colorectal cancer and mean age of presentation is 39 years. The goal of treatment in these cases is to increase survival by decreasing the risk of death from colorectal cancer by performing colectomy or proctocolectomy before cancer occurs. The risk of cancer in attenuated FAP is approximately 70% and develops at an older age compared to classic disease.[5,6]

EXTRACOLONIC MANIFESTATIONS OF FAMILIAL ADENOMATOUS POLYPOSIS

Approximately 90% of patients with FAP develop duodenal adenomas, but only 5-10% develop periampullary cancer. Up to 50% of patients also have polyps in the gastric fundus, which have minimal risk of malignancy.[5]

Desmoid disease affects approximately 5% of patients with polyposis. About half of the tumors originate in the mesentery and 40% develop in the abdominal wall. The remainder occur in the back, neck, or extremities. Desmoid tumors manifest as flat, fibrous lesions, or discrete masses. They are more frequently associated with female gender and family history of desmoid tumors. Most of these lesions develop five years after abdominal surgery possibly as part of the inflammatory response.[5]

The risk of developing thyroid cancer is only 2%; however, it corresponds to twice that of the general population. The incidence is 17 times higher in women than in men and develops on average at 27 years of age. The main histology is papillary carcinoma.[5]

Less frequent associated malignant lesions include pancreatic adenocarcinoma, hepatoblastoma, and medulloblastoma. There are also associated benign lesions that, although they do not require treatment, are useful for diagnosis. Congenital hypertrophy of the retinal pigment epithelium corresponds to dark gray or brown oval lesions seen in 60-85% of patients. Osteomas are dental abnormalities seen in 20% of cases. Some skin lesions such as dermoid cysts, lipomas or fibromas may be seen. Their presence on the face, neck, skull, or extremities usually suggests the diagnosis of FAP.[5,7]

SCREENING STUDIES FOR FAMILIAL ADENOMATOUS POLYPOSIS

Screening studies should be performed for both colonic disease and extracolonic manifestations to limit the risk of developing cancer by timely intervention and surgical referral. Screening should be done in everyone by genetic

diagnosis or in first-degree relatives diagnosed with FAP. Even with only the clinical diagnosis, a complete study of family members should be done. Studies should begin at 12 years of age by flexible recto-sigmoidoscopy. If polyps are observed, a complete colonoscopy should be requested. If there are no polyps on initial examination, sigmoidoscopy should be repeated every one to two years or sooner if symptoms are present.[5]

The first upper endoscopy should be performed between 20 and 25 years of age and surveillance intervals are performed according to the findings. In the case of thyroid disease, physical examination and ultrasound should be performed every year in search of suspicious lesions. For desmoid tumors and other extracolonic lesions there is no specific screening system; however, special studies should be performed if there is high penetrance of a particular lesion in other family members.[7,8]

TREATMENT

The goals of treatment in familial adenomatous polyposis are to eliminate or limit the risk of cancer, to increase life span, and improve the patient's quality of life. Since the possibility of developing cancer is high, timely surgical treatment is the mainstay of treatment. The decision on the timing of surgery depends on the presence of symptoms, the age of the patient at the time of diagnosis and other special circumstances. When symptomatology is present, the patient should be offered surgery to treat the symptoms themselves and prophylactically for the potential risk of developing cancer. In asymptomatic children and adolescents, surgery is reasonably delayed until late adolescence or around the age of 20 years, when some physical and emotional maturity has been reached. Because the risk of cancer increases with age, surgical treatment is offered to patients from the third decade of life onwards at the time of diagnosis.[7]

For patients in whom there is no evidence of rectal cancer, colectomy with ileorectal anastomosis or proctocolectomy may be offered. The latter removes all the mucosa at risk and the possibility of developing cancer in the future.[9] An ileo-anal pouch anastomosis or ileal reservoir (pouch) has higher bowel movements, higher risk of incontinence and the quality of life is affected compared to ileorectal anastomosis; however, the risk of developing cancer in the remaining rectal mucosa is 4-10%. The risk of developing cancer increases up to 12% 20 years after surgery; 42% of postoperative ileorectal anastomosis patients will require proctectomy in the future due to the presence of cancer or uncontrolled polyposis.[9]

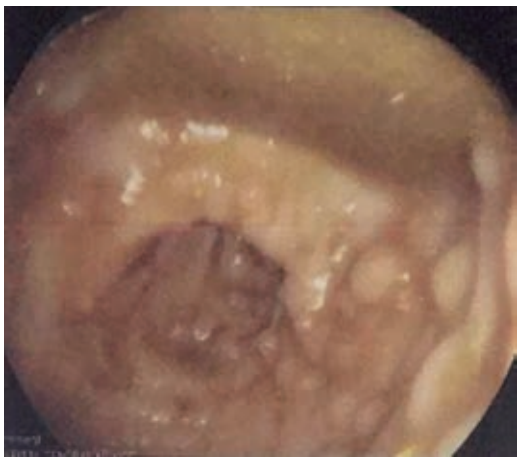

Figure 1: *Multiple sessile polyps in rectal mucosa.*

When there is a colon cancer and distant metastasis the decision on the type of surgery is based on the possibility, even if low, that there is a metachronous cancer in the rectum if the rectum is respected. Patients with locally advanced tumors (or at risk of metastasis) with minimal polyps will benefit from open or laparoscopic colectomy on a case-by-case basis, with ileorectal anastomosis or proctocolectomy with end ileostomy. In patients with stage IV cancer with low life expectancy, proctectomy is recommended if there is no colon cancer or the presence of polyps is minimal. It should be considered that proctectomy is associated with an increased risk of urinary and sexual dysfunction, decreased fertility in women and a lower quality of life in general.[10]

A small percentage of patients develop cancer in the anal transition zone or in the

ileal reservoir anastomosis zone. Mucosectomy has been proposed as an alternative, but if mucosectomy is not performed properly it may fail in its purpose. Up to 21% of patients undergoing mucosectomy have cancer seeding near the ileal pouches.[8]

Duodenal adenoma can rarely (up to 11%) progress to cancer and lesions can be treated by upper endoscopy.[7]

Desmoid tumors present from asymptomatic to severe pain, intestinal occlusion, or fistula. Treatment depends on the symptoms, location, size, and extent of the disease.

Thyroid nodules larger than 1 cm should be analyzed by fine needle puncture. Thyroid cancer is treated by total thyroidectomy and iodine ablation.

EVALUATION OF FAMILY MEMBERS AT RISK

All first-degree relatives have a 50% chance of developing FAP, so they should be initially evaluated by a genetic specialist. Potentially affected relatives should be screened at the time of diagnosis and in the case of children at 12 years of age. When an APC mutation is known in the family, DNA testing is recommended. At-risk family members who do not have a genetic diagnosis should begin surveillance at 12 years of age with flexible sigmoidoscopy or colonoscopy if screening is initiated in adulthood. Relatives who do not have polyps at 40 years of age will be managed according to the guidelines for the general population.[7]

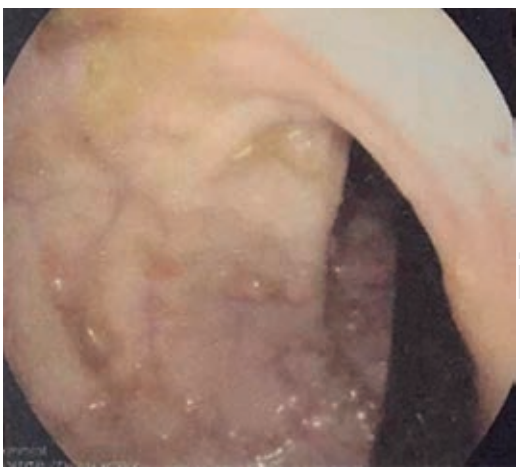

Figure 2: *Polyps in sigmoid colon mucosa.*

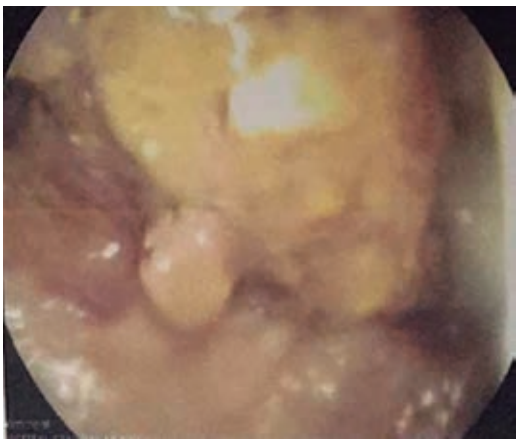

Figure 3: *Stenosing tumor at the level of the sigmoid colon seen by colonoscopy.*

CLINICAL CASE

The patient is a 48-year-old female patient who started with hematochezia approximately six months ago, loss of more than 10 kilograms of body weight and non-specific abdominal pain. She also presents a history of three first-degree relatives diagnosed with colon cancer and one second-degree relative diagnosed with polyposis. Colonoscopy was performed, finding more than 100 sessile polyps and a stenosing tumor 25 cm from the anal margin *(Figures 1 and 2)*. The patient underwent open proctocolectomy with terminal ileostomy, identifying a 3 × 2 cm tumor at the level of the sigmoid colon *(Figures 3 and 4)*. The histopathological study reported invasive moderately differentiated adenocarcinoma of the colon. It was classified as a T4a N1b M0, stage IIIB, for which he received adjuvant treatment with chemotherapy.

DISCUSSION

Familial adenomatous polyposis is a rare condition that requires a timely and accurate diagnosis to prevent the formation of colorectal

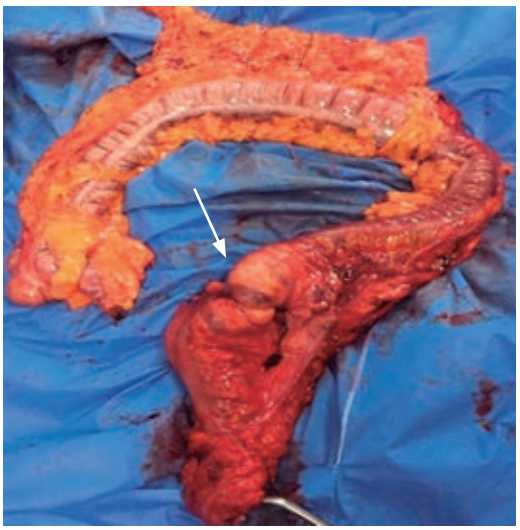

Figure 4: *Proctocolectomy product. The tumor can be seen at the sigmoid colon level (arrow).*

cancer in both the patient and first-degree relatives. Surgery remains the only preventive treatment at present; proctocolectomy, with or without restitution of intestinal transit, is the best procedure, as it removes the mucosa at risk of cancer formation.

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Ethical considerations and responsibility: The procedures in humans must comply with the principles established in the Declaration of Helsinki of the World Medical Association (WMA) and with the provisions of the General Health Law Title Five and the Regulations of the General Health Law on Research for Health, and NOM-012-SSA3-2012, which establishes the criteria for the execution of research projects for health in human beings, as well as with the rules of the Research Ethics Committee of the institution where they are carried out.

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Castleman's disease of mediastinal location: report and review of the literature

Enfermedad de Castleman de localización mediastínica: reporte y revisión de la literatura

Aldo Manuel Álvarez-Morán,* Liliana Estefany Hernández-Navarrete‡

Keywords:
Castleman's disease, mediastinal tumors, B-cell, lymphoid nodular hyperplasia.

Palabras clave:
Enfermedad de Castleman, tumores mediastinales, células B, hiperplasia nodular linfoide.

ABSTRACT

The mediastinum is involved in numerous pathologies, including the growth of anatomical structures, ranging from adenomegaly to tumors, with diverse histopathological behavior. The mediastinum is a compartment that harbors anatomical structures of different embryonic origin and gives rise to benign tumors that, due to their growth, can compress vascular structures, behaving as a malignant entity and whose surgical resolution is the only curative alternative. Castleman's disease is a rare disease characterized by lymphoproliferative growth of B cells, which can be found at mediastinal level and whose surgical treatment is an option when resection is possible. We present a case of Castleman's disease located in the mediastinum, with complete removal of the tumor.

RESUMEN

El mediastino puede ser parte de numerosas patologías, entre las que se encuentran el crecimiento de estructuras anatómicas, que van desde adenomegalias hasta tumores con diverso comportamiento histopatológico. El mediastino es un compartimento que alberga estructuras anatómicas de diferente origen embrionario y da lugar a tumores benignos que, por su crecimiento, pueden comprimir estructuras vasculares, comportándose como entidad maligna y cuya resolución quirúrgica es la única alternativa curativa. La enfermedad de Castleman es una enfermedad rara caracterizada por crecimiento linfoproliferativo de las células B, las cuales pueden encontrarse a nivel de mediastino y cuyo tratamiento quirúrgico resulta ser una opción cuando es posible su resección. Se presenta el caso de enfermedad de Castleman localizada en mediastino, realizándose extirpación completa del tumor.

INTRODUCTION

Mediastinal tumor pathologies include a significant number of histologic subtypes, which can be located in one or another mediastinal compartment depending on the type of tissue of origin. Most of anterior mediastinal tumors include thymomas (20%), germ cell tumors (15%) and lymphomas (50-70%). Tumors of the middle mediastinum are mostly cysts and the most common are intestinal duplication cysts. Most posterior mediastinal tumors are of neural origin, and approximately 80% are benign.[1]

Castleman's disease (CD), first described by Castleman, Iverson and Menendez in 1956, is a rare and heterogeneous disease. It is characterized by proliferative growth of B cells that tends to manifest with the growth of benign tumors of lymphoid tissue. The prevalence of the disease is unknown but has been estimated at less than 1/100,000 population. The localized form is the most frequent (more than 400 cases reported). The multicentric form can also occur in association with HIV (human immunodeficiency virus) infection and manifest at any age. The frequency of symptoms has been evaluated in a French cohort of 117 cases.

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Localized forms are asymptomatic in 51% of patients and are often discovered by chance. They may cause pain in the thorax or abdomen when the lesion is large (mean diameter of 6 cm with extremes ranging from 1 to 12 cm).[2] The sites affected, in order of decreasing frequency, are abdomen, superficial lymph nodes, and mediastinum. Signs are nonspecific in 31% of patients and include asthenia (20%), fever (20%) and weight loss (11%). Multicentric forms are always symptomatic. Weight loss occurs in 69% of patients and fever in 67%. Peripheral lymphadenopathy is observed in 81% of cases, and hepatomegaly and/or splenomegaly in 74%.[3]

Localized disease is most frequently seen in the abdominal or pelvic regions, while disseminated forms are seen in superficial nodules or in a mediastinal localization.[4] Castleman's disease, also known as angiofollicular lymphoid nodular hyperplasia or lymphoid nodular hyperplasia, is an interesting entity because of its peculiar form of clinical presentation and the low frequency of occurrence and presentation in the general population.[3] The site where the disease presents can be at any site where lymph nodes are present, or it can also be found in an extra nodal site.

This disease has no gender predilection and usually occurs between the second and third decades of life, with a rare occurrence in children under 13 years of age. Three histological types have been described: hyaline vascular (90%), plasma cell, and a mixed form (10%). In its pathogenesis it has been associated with infectious processes, abnormal cytokine expression or autoimmunity that may cause lymphoid proliferation.[4,5]

Herpesvirus 8 (HV-8) has been associated with Kaposi's sarcoma, non-Hodgkin's lymphoma, and with the plasma variety of multicentric Castleman's disease.[6-11] In this disease, there appears to be overproduction of interleukin-6 (IL-6), which has been associated with plasma cell expression.[11-13] The hyaline vascular type has not been linked to cytokine-mediated disorders, it is of regional localization (80-90% of cases), and usually asymptomatic. Some cases of CD are symptomatic when their size is very large and produce compression of surrounding anatomical structures. The plasma cell variety and the mixed form account for 10-20% of localized cases.[5,7,8] The plasma cell variety commonly manifests as disseminated disease associated with hepatosplenomegaly (70-80% of cases); it is associated with systemic manifestations, weight loss, polyneuropathy, renal or hepatic failure, and in other cases with polyarthritis or glomerulonephritis, hypergammaglobulinemia, leukopenia, thrombocytopenia, hypoalbuminemia, and proteinuria.[4-6] The diagnosis of the disease is based on clinical evaluation including a detailed patient history, laboratory studies and a variety of imaging studies such as computed tomography scan, magnetic resonance imaging, and positron emission tomography. The latter is useful as it gives information on the metabolic activity of the lymphoid nodules, with attenuation values that are lower to those observed in lymphomas.[11,12,14]

Surgical excision is the treatment of choice in most localized cases with involvement of neighboring structures. Currently, minimally invasive techniques are available for its removal such as video-assisted thoracic surgery (VATS) and robotic surgery (with the Da Vinci equipment), whose results are exceptionally good in the postoperative period with a complete recovery of cases when the surgical removal is complete removal and mediastinal emptying can be performed.[15] Adjuvant steroids and/or Rituxan before surgery are useful to reduce tumor size.[5-7] Several therapies have been used in multicentric disease such as immunoglobulins, acyclovir, ganciclovir, and combination chemotherapy such as CHOP. Other therapies include the use of angiogenic growth inhibitors. Anti-IL-6 therapies include Suramin and anti-IL-6 receptor antibodies.[5,12]

CASE REPORT

This is a 47-year-old man who had been managed for 15 years for gout, so he went to rheumatology consultation, where he refers respiratory symptoms of three months of evolution characterized by dry cough in accesses, in addition to facial edema and upper extremities. In his last consultation he requested a routine chest X-ray where a mediastinal

widening was observed, so a computed tomography scan was performed, which showed a mass in the middle mediastinum of approximately 7 × 5 centimeters in diameter, with extrinsic compression of the superior vena cava and azygos vein, elevation of the homolateral hemidiaphragm, in addition to severe hepatomegaly *(Figure 1)*.

Laboratory results showed a hemoglobin level of 15 g/dl, hematocrit 48.2%, a white blood cell count of 7,800 per microliter, a platelet count of 182,000, a prothrombin time of 10 seconds, an International Normalized Ratio (INR) of 0.77, partial thromboplastin time of 29.5 seconds, and serum glucose 82 mg/dl, urea 11.5 and uric acid levels of 8.3 mg/dl, a lymphocyte count of 3%, liver function tests in normal range and a HIV serological test negative.

A right posterolateral thoracotomy was performed because we did not have equipment to perform minimally invasive surgery, finding a tumor in the middle mediastinum of approximately 7 × 5 × 4 cm, with a hard consistency, encapsulated, and attached to the lateral wall to the superior vena cava, upper edge of the azygos vein and intrathoracic trachea, and to its lower portion to the azygos vein *(Figure 2)*. The tumor was completely excised *(Figure 3)*. In the immediate postoperative period, the patient showed no complications and was extubated. The control thoracic X-ray showed complete pulmonary expansion *(Figure 4)*.

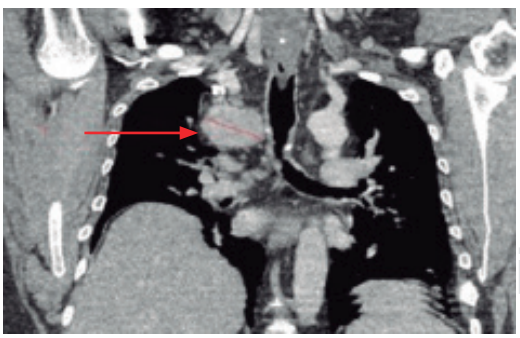

Figure 1: *Mass in the middle mediastinum (arrow) measuring 7 × 5 cm in diameter, with partial compression of the superior vena cava, elevation of the right hemidiaphragm, and severe hepatomegaly with steatosis.*

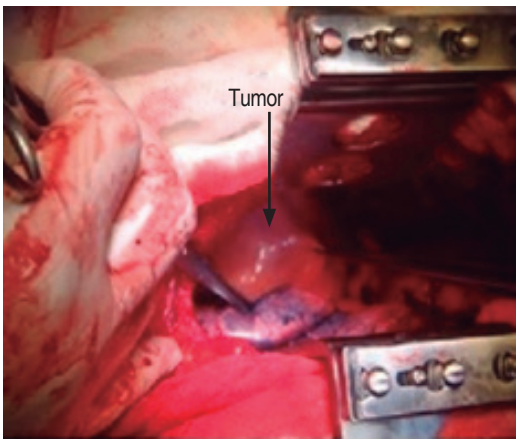

Figure 2: *Tumor in the middle mediastinum (arrow) attached in lateral wall to the superior vena cava and trachea, and its lower portion to the azygos vein.*

Macroscopically, histopathology evaluation showed an encapsulated tumor with scarce adherent fibroadipose tissue and fine vascular tracts. The histopathological diagnosis was Castleman's disease, of the hyaline vascular type, with reactive hyperplasia of dendritic cells. The antibody panel performed for CK AE1/AE3 was negative and positive for CD21.

The patient was discharged on the third postoperative day, with follow-up with the hematology and rheumatology services. He received a short course of steroids. At one year there was no tomographic evidence of any mass at the level of the middle mediastinum.

DISCUSSION

Castleman's disease is a rare condition characterized by the proliferative growth of B cells that tends to manifest with benign tumors of the lymphatic tissue, which due to their growth, may compress the neighboring structures. It is an interesting entity due to its peculiar form of clinical presentation and the low frequency of occurrence and incidence in the general population.[1,2] The disease can occur anywhere there are lymph nodes, or it may also be seen in an extra-nodal site.

Some authors describe forms located in the abdominal or pelvic cavities in 70% of cases, followed by thoracic location, while disseminated forms are observed with

superficial nodules or mediastinal location. It is worth mentioning that our case, since it was located at the mediastinum, it may be considered as a rare location and the symptoms it produced were superior vena cava compression, facial and upper extremity edema, and unspecific respiratory symptoms.

If Castleman's disease is localized, complete surgical excision should be performed and subsequent follow-up is necessary, as it occurred in our case. Clinically, the symptomatology was non-specific, which guided us towards surgical resection as treatment. As mentioned, we currently have minimally invasive techniques such as video-assisted and robotic thoracic surgery (with the Da Vinci equipment), whose results are comparable to conventional surgery, allowing to perform a complete removal of the tumor with mediastinal lymph node emptying, offering so better results in the postoperative recovery time of patients. Therefore, they have become the techniques of choice for the surgical removal of these tumors in those facilities where this resource is available.

Another important aspect to consider in multicentric CD is its association with HIV, so the corresponding tests should be performed, as well as immunostaining to exclude lymphoma. In our patients all these tests were negative. The histopathological study showed that it was of the hyaline vascular type and, as described in the literature, it is of regional localization in 80-90% of cases, and usually asymptomatic. Cases

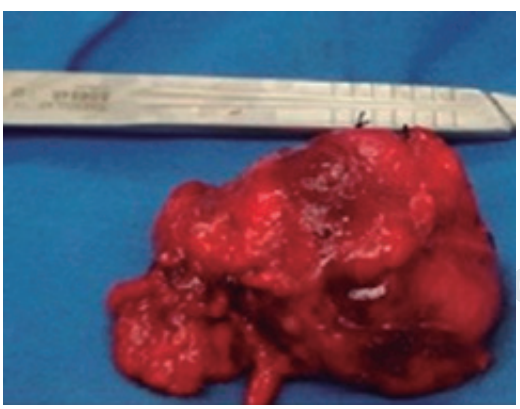

Figure 3: *The entire resected tumor measured approximately 7 × 5 × 4 cm, with a hard and well encapsulated consistency.*

Figure 4: *Postoperative radiograph showed complete lung expansion.*

of Castleman's disease are symptomatic when their size is very large and produce compression of surrounding anatomical structures.[5,7,8] The plasma cell variety commonly manifests as disseminated disease with hepatosplenomegaly, which does not correspond to this case.

As for non-surgical treatment, different types of chemotherapies have been proposed, such as the CHOP regimen (cyclophosphamide, doxorubicin, vincristine, and prednisone), which has been successful; IFN-alpha, alone or in combination with vinblastine or etoposide, has been shown to be beneficial in some cases. The anti-IL-6 monoclonal antibody can be used.[13,14]

CONCLUSION

In localized forms of CD, recovery without sequelae after complete surgical excision is achieved in 90% of cases, where minimally invasive techniques, such as VATS and robotic surgery (with the Da Vinci equipment) are the procedures of choice when available in the hospital center. CD is a rare disease, and its anatomical and clinical presentation may be limited to the mediastinum and, due to its growth, at some point may compress vascular structures and part of the aerodigestive tract, which should make us think of this entity as a clinical possibility. Surgical treatment is indicated with subsequent follow-up of the cases due to the probable recurrence of the disease. In addition, being the mediastinum an anatomical compartment of different structures

with different embryonic origin, it should make us suspect not only of the pathologies that usually present in this anatomical compartment.

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Garengeot's hernia complicated with inguinal abscess. Review of the literature

Hernia de Garengeot complicada con absceso inguinal, revisión de la literatura

Francisco Xavier Cabrera-Mendoza,[*] Aurelio Barrera-González,[*] Jesús Galindo-Jiménez,[*] Joel Castillo-Espinoza,[‡] Edgar Cantú-Rodríguez[‡]

Keywords:
Femoral hernia, acute appendicitis, complication, diagnostic imaging.

Palabras clave:
Hernia femoral, apendicitis aguda, complicación, imagen diagnóstica.

ABSTRACT

The sliding of the cecal appendix through the femoral canal is known as Garengeot's hernia. Its presentation complicated with abscess is extremely rare and a cause of diagnostic confusion. We describe a case presenting with groin abscess resulting from an acute appendiceal picture in a Garengeot's hernia along the diagnostic and therapeutic approach he underwent. The review of isolated cases agrees that appendectomy should be performed, as well as hernioplasty according to the surgeon's expertise and experience.

RESUMEN

Se conoce como hernia de Garengeot al deslizamiento del apéndice cecal a través del canal femoral, su presentación complicada con absceso es en extremo rara y causa de confusión diagnóstica. Se describe un caso que presenta absceso inguinal resultado de un cuadro apendicular agudo en una hernia de Garengeot (y el abordaje diagnóstico y terapéutico que llevó a cabo). La revisión de casos aislados coincide en que se realice apendicectomía, así como hernioplastía de acuerdo con el dominio y experiencia del cirujano.

INTRODUCTION

The sliding of the cecal appendix into an inguinal hernia sac is known as Amyand's hernia, first described by Claudius Amyand, who simultaneously performed the first appendectomy.[1] A Garengeot's hernia, so recognized by the eponymous French surgeon who described an acute appendicular picture in a femoral hernia in 1731, has been associated with congenital defects and is therefore much more frequent in women. The cecal appendix is a rare finding in femoral hernias and even rarer in the presence of acute appendicitis within the femoral canal, representing about 0.1% of femoral hernia[2] and 0.13 to 0.8% of all cases of acute appendicitis.[3] In the present case, a diagnostic and therapeutic approach to this rare presentation is proposed.

PRESENTATION OF THE CASE

An 84-year-old woman with a history of systemic arterial hypertension and chronic atrial fibrillation controlled with enalapril and verapamil. Within her surgical history, four years prior to the current condition, she underwent emergency surgery for a right direct strangulated inguinal hernia, with intestinal content, approached in the inguinal region, requiring intestinal resection and entero-entero-terminal anastomosis and Shouldice hernioplasty. Her postoperative period was satisfactory, and she was discharged without complications. Her current condition began with a mass in the inguinal region, which was growing slowly, initially presenting with dull mild pain. She did not give it importance. In the following two weeks she noticed an important

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growth in the zone with changes in color, erythema, and intense pain, so she went to another hospital where a strangulated inguinal hernia was suspected again. An ultrasound scan was performed in the inguinal region, which reported an apparent inguinal hernia and abundant gas, which was avascular according to the Doppler function. She was sent to our institution for management. On examination she was agitated, tachycardic (105 beats per minute) and moderately dehydrated. On abdominal examination a rigid, erythematous, and warm mass was found in the right inguinal region, which displaced the previous surgical scar. It was very painful on palpation. She had

Figure 1: *A bulging warm tender inguinal mass on arrival at the emergency department.*

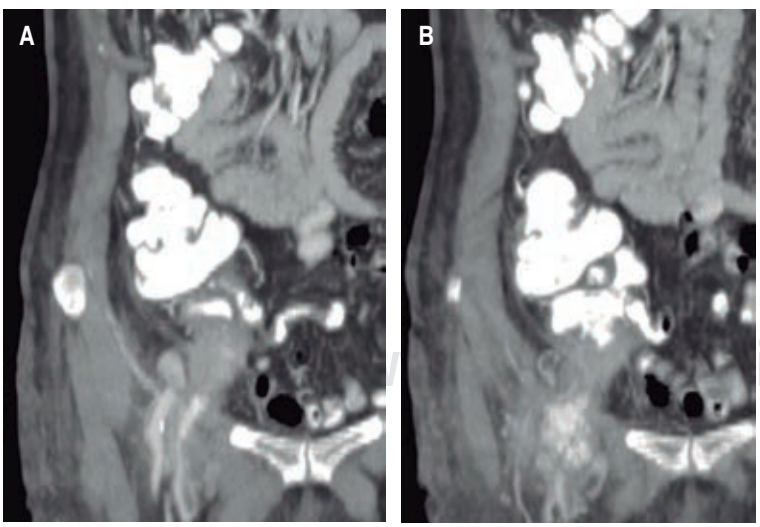

Figure 2: *Tomographic images of the cecal appendix through femoral canal* ***(A)*** *and covering with contrast femoral canal and residual collection* ***(B)****.*

leukocytosis of 19,250 cells/μl with neutrophilia of 88.90%, increased prothrombin time (PT) and partial thromboplastin time (PTT), and the rest of her lab tests were within normal rages. A recurrent inguinal hernia with intestinal content was suspected, although the appearance of the mass was reminiscent of an abscess *(Figure 1)*. It was decided to take her to the operating room where, under regional anesthesia, an incision was performed through the previous scar. A large abscess approximately of 400 cm^3 was found and was completely drained. The previous inguinal plasty was observed intact. No hernial sacs were observed. The origin of the abscess could not be clearly determined. It was decided to use the open wound technique with closure by second intention and keep on monitoring the patient. Cures were performed according to the output and a contrasted abdominal tomography scan was performed a few hours later to determine the probable sites of origin of the abscess. At this moment, a complicated diverticular disease was suspected. The report by the imaging service staff was of an edematous vermiform appendix, which apparently comes out through the femoral duct and a small peri-appendicular collection *(Figure 2)*. A new exploratory laparotomy was scheduled where multiple adhesions around the site of the anastomosis performed four years ago were found. These adhesions were released reaching the cecum and vermiform appendix *(Figure 3)*. An appendicectomy was performed with management of the Pouchet stump. When the surgical specimen was removed the appendix tip was found completely perforated. The closure of the hernial defect was attained with two simple polypropylene 00 stitches. It was decided not to place a prosthetic mesh due to the high risk of infection. The postoperative period was satisfactory, with a decrease in leukocytosis to 9.43 cells/μL and normalization of PT and PTT. The total hospital stay was six days. The inguinal wound granulated by second intention, continuing with cures and weekly supervision until total closure was achieved. The final histopathological was of an acute appendicitis with leukocyte infiltration in greater quantity in its distal half, lymphoid hypertrophy in its proximal half, a perforated tip and negative for malignancy *(Figure 4)*.

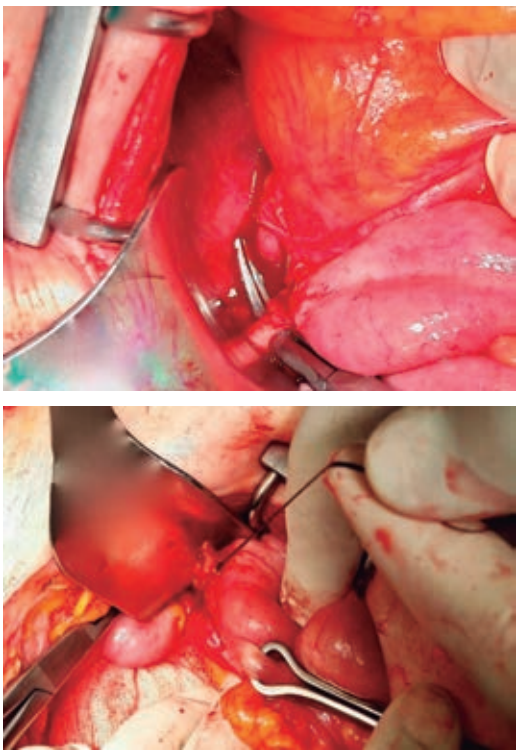

Figure 3: *Cecal appendix in the femoral hernia and stump management.*

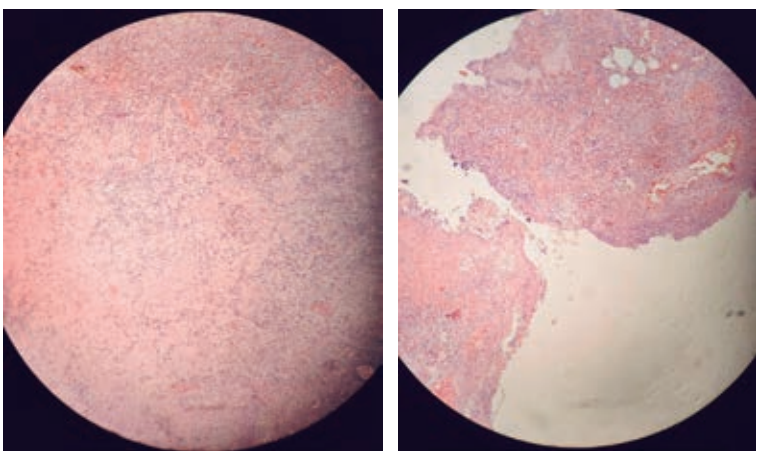

Figure 4: *Photomicrographs of the extracted specimen. They show the leukocytic infiltrate in this case of fibrinopurulent appendicitis.*

DISCUSSION

There are several theories about the peculiarity of these cases being the most accepted the abnormal attachment of the appendix to the cecum due to a bad rotation, which causes a pelvic location of the appendix, with a greater risk of entering the femoral canal.[3] Acute appendicitis in a femoral hernia may be a consequence of strangulation of the cecal appendix as it passes through the femoral canal, rather than to lymphoid hyperplasia or presence of an appendicolith, which is evidenced in the literature with a predominant presence in adults and rarely in the elderly population.[4,5] The largest reported series of cases of Garengeot's hernia was seven over 16 years at Whiston Hospital, UK, reported by Sharma H et al. They report four cases without acute appendicitis where hernioplasty with a prosthetic mesh was performed, and three cases in which appendectomy plus hernioplasty without prosthetic material was performed due to the presence of an inflamed cecal appendix intraoperatively. It is worth mentioning that abdominal pain was only present in one case. Just as in this case, one patient presented a two-week evolution with a growing and painful groin mass, with the same erroneous ultrasound report, as well as perforation towards the femoral canal that only generated an abscess of occult origin.[6] The presence of an abscess or extra-abdominal purulent collection in the inguinal region associated with a Garengeot's hernia has been reported in two more isolated cases in the world literature, suggesting the plugging effect of the appendix on the femoral canal and, additionally, the tightness of the inguinal plasty previously performed in our patient. The preoperative diagnosis is difficult when there are already complications such as an appendiceal perforation, and the possible formation of abscesses and necrotizing fasciitis, both clinical forms of rapid deterioration of patients that force us to act cautiously, with an initial drainage of the abscess and surgical planning through an abdominal contrasted tomography scan as suggested by expert groups in abdominal wall defects[7] to differentiate the origin of the purulent material, such as diverticular disease[8] and acute pancreatitis.[9] Since no hernial defect was found in the previous plasty or femoral region during the first surgical event, it was decided to wait for a tomographic study and solve the primary pathology in a second surgical exploration,

which in this case resulted in the finding of an appendicular perforation through the femoral canal. There is no consensus on the management of Garengeot's hernias; however, in the extensive review of the reports, all agree that appendectomy should be performed, whether incidental or in acute inflammatory conditions, as was in this case, as well as herniorrhaphy of the femoral defect, with the most appropriate technique according to the surgeon's expertise and experience.[10,11]

CONCLUSION

Inguinal masses with clinical features characteristic of an abscess should raise suspicion of intraabdominal pathology that can lead to rapid clinical deterioration, especially in elderly patients. Imaging studies play an important role in these cases which, in expert hands, can lead to an accurate diagnosis and adequate and directed surgical planning.[12] Its presentation on the right side should raise suspicion of an acute appendicular condition, either in an inguinal hernia (Amyand) or in the femoral region (Garengeot).

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Memoirs of a General Surgical Service and its surgeons. Part 3

Memorias de un Servicio de Cirugía General y de sus cirujanos. Parte 3

David Olvera-Pérez*

CHRONOLOGY OF THE GENERAL SURGERY SERVICE AND GENERAL SURGEONS OF THE GENERAL HOSPITAL OF THE NATIONAL MEDICAL CENTER OF THE MEXICAN SOCIAL SECURITY INSTITUTE 1963-1981

DR. JORGE BAUTISTA-O'FARRILL (1926-2014) *(Figure 1)*

The memories of Dr. Jorge Bautista go back to the time of the Mexican Revolution, when his father, Gonzalo Bautista-Castillo, was the courier of the Aquiles-Serdán brothers. The young Bautista became a doctor with the purpose of having an economic support that would allow him to enter politics, an innate desire that saw fulfilled. He became governor of the state of Puebla (1941-1945), and among his closest collaborators was Gustavo Díaz-Ordaz, who became president of Mexico, a transcendental fact that over time had relevance in the development of the General Hospital of the CMN of the IMSS as we will see below.

Dr. Jorge Bautista studied at the Faculty of Medicine of the UNAM, and after graduating he emigrated to France where he studied gastroenterology at the Tenon Hospital, University of Paris, and later completed his residency in general surgery at The Bronx Hospital, New York University, New York, USA, where he became chief resident. Upon his return to Mexico, he began his professional activities at the Central Hospital of the Ministry of Communications and Transportation. In 1963 he joined the Gastroenterology Service of the General Hospital of the National Medical Center of the IMSS as a surgeon.

One day he was called by Mr. Gustavo Diaz-Ordaz, president elect of Mexico, to ask his opinion on who should operate on his wife for a gallbladder lithiasis. He recommended Dr. Manuel Quijano, who performed the surgery assisted by Dr. Rafael Alvarez-Cordero.

In March 1969, the day after my arrival from Mexicali –where I did my postgraduate internship– I went to the General Hospital of the CMN of the IMSS to receive instructions for my rotation as a first-year resident. The secretary instructed me to wait for Dr. Jorge Bautista, who after a short wait arrived and immediately informed me about the general surgery residency, its structure and organization. His kind and courteous treatment caused me a good impression and surprise; he was very different from the medical masters I had dealt with in other occasions. In the end it is only the first impression that counts, isn't it?

The following year, when I rotated through the gastroenterology service as an R-2, out of the four surgical teams, I got to be in his group. I continued to be personally attracted to him because of his simplicity as well as his education and personal treatment. My admiration reached its climax when I had to perform my first cholecystectomy, and he participated

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as the first assistant, guiding me through the rough path of a difficult gallbladder. And it was very difficult because it was an atrophic sclerosing xanthogranulomatous cholecystitis embedded in the liver, which took us almost the whole morning to remove it. I never saw him impatient nor restless, and his intraoperative advice was soft-spoken and reassuring. He was undoubtedly a teacher who knew how to teach surgery and many other things. So, it was with almost all the surgeons he forged, and for that reason our admiration and recognition will be eternal.

His love for hunting brought about an important change in his professional life when he suffered an accident that caused him to lose an eye. After a long period of rehabilitation, he returned to the surgery he was so passionate about, as well as to teaching.

His academic achievements and outstanding public and private recognitions that clarify his image are the following. He was founder and president of the Mexican Council of General Surgery in the Mexican Association of General Surgery, was an honorary member, belonged to the Mexican Academy of Surgery (honorary member), and to the Mexican Association of Faculties and Schools of Medicine, in addition to 11 other associations, in most having achieved the distinction of honorary, president of the Mexican Association of Gastroenterology, director of the Faculty of Medicine of the Autonomous Popular University of the State of Puebla (UPAEP). In all these positions he distinguished himself for his honorability, commitment, and innovation. This information is useful to highlight that he was a very active man, updated in his surgical field and in others. He always had knowledge of the surgical novelties, even when he no longer needed them. He stopped reading the latest surgical articles in print and on the internet just days before his death.

Figure 1: *Dr. Jorge Bautista-O'Farrill.*

He published nearly 100 scientific papers and gave more than 300 lectures in Mexico and abroad. He directed 17 postgraduate theses and collaborated in 10 books on general surgery. He participated in 31 continuing medical education courses in general surgery and/or gastroenterology. He was an undergraduate professor at the Mexican School of Medicine of La Salle University, and assistant professor and later full professor of the general surgery course.

His trajectory as a surgeon and later as chief of surgery in relation to the teaching and friendship he developed with the surgical residents. Such trajectory is an example of the great affection he earned from all generations. Many tributes were paid to him during his lifetime by his residents throughout the country.

He had a singular personality characterized by his kindness, simplicity, and personal treatment. In his role as a teacher, he was able to take many surgeons by the hand through the roughest roads of surgery, through the most complicated pathology and he never allowed any resident to abandon the scalpel or the scissors. His perseverance, tolerance and teaching combined to give the resident surgeon the courage to overcome the obstacle, no matter how long and how difficult the patient's disease was. He was also a counselor in our lives, he knew us very well in the hospital

environment, inside and out; many residents received guidance and the truth of their emotions, finding a solution to their personal blindness.

When structural changes in the operation of hospitals were presented, adapting them to the levels of care, the General Hospital of the CMN of the IMSS could not be exempted, so he made the decision to separate from the IMSS. Undoubtedly, the resignation from institutional surgery and teaching was very painful, but not painful enough to produce a feeling of resentment.

His decision to return to the city where he was born was very gratifying, since the university authorities of the Autonomous Popular University of the State of Puebla (UPAEP) quickly welcomed him and took him to the direction of the School of Medicine, where he once again demonstrated his experience and organizational skills. In 1998 he received his diploma as director emeritus.

Only lung disease, a consequence of his many years as a smoker, retired him from professional activity. He received multiple treatments, demonstrating his mettle, and a lot of discipline by undergoing several treatments that allowed him to live more than 15 years, much longer than the world statistics say about this disease.

Dr. Jorge Bautista, together with other brilliant surgeons, forged more than 300 surgeons that are found throughout the country, so his tomb is the niche where his remains will perennially be, but his pedestal is the Mexican Republic where surgeons who were fortunate enough to inherit his surgical knowledge are working. As a sample, some of them are former presidents of our association, such as Carlos Godínez, Luis Ize-Lamache, Armando Castillo, Juan Mier, Rafael Aguirre, José Antonio Carrasco, Jesús Tapia, Alfonso Pérez-Morales and Jesús Vega-Malagón.

On July 9, 2014, approximately at 9:00 a.m., a star of the Mexican surgical universe was extinguished. My professor, my surgical father and friend ended his life cycle, and surely the minds of more than 300 general surgeons in Mexico will go back to the years of coexistence with Dr. Jorge Bautista-O'Farrill. For me it was a period of 46 years.

Figure 2: *Dr. Vicente Guarner-Dalias.*

DR. VICENTE GUARNER-DALIAS (1928-2011) *(Figure 2)*

Dr. Guarner was of Spanish origin, specifically from Barcelona. An outstanding Mexican physician for the XXI century, he came to Mexico to finish his primary and preprofessional studies, continuing at the School of Medicine of the UNAM. He carried out his professional studies in Mexico and completed them in hospitals in the USA -postgraduate in Basic Sciences and Surgical Anatomy at Harvard Medical School. Upon his return he worked at the General Hospital of Mexico in Pavilion 29, where he served as chief of Dr. Fernando Martinez-Cortes until he joined the General Hospital of the National Medical Center of IMSS, where he started as a surgeon assigned to the gastroenterology service of Dr. Luis Landa. After a brief period as chief in the surgery division, he migrated to Centro Medico La Raza to take over as chief of surgery.

I knew him as a teacher and very little as a surgeon. He was a gentleman in his treatment and an excellent teacher who always gave me his affection. For reasons unknown to me, I never went through his service, so I have no

basis to comment on his surgical skills. His participation in the general surgery service was brief and indirect, only when he was appointed Chief of the Surgery Division at the General Hospital of the CMN of the IMSS, replacing Dr. Rafael Alvarez-Cordero.

Among his academic achievements, he was admitted to the National Academy of Medicine in 1973. He founded the Society of History and Philosophy of Medicine, of which he was president in 1982-1984. He was also founder and advisor of the Mexican Academy of Bioethics.

He received the "Fernando Ocaranza Surgical Research" award from the National Academy of Medicine, the "Surgical Cinematography" award from the National Assembly of Surgeons and the "Medical Excellence" award from the Cedars Sinai Institution in Los Angeles, California, USA. He produced 140 scientific articles, co-authored nine books and was the author of the book *Esophagus*, published by the National Autonomous University of Mexico. He also gave 300 lectures in Mexico and abroad.

Culture, art, literature, and history were his ideals with which he always worked. The same happened with his professional practice, which only separated him when an esophageal cancer surprised him and led him to death.

DR. RAFAEL ÁLVAREZ-CORDERO (1938-PRESENT) *(Figure 3)*

Writing about an extraordinary man, who in addition to being a brilliant surgeon is also a writer and founder of surgical subspecialties that gave rise to medical colleges and associations, requires a lot of space and a good writer. I hope that in this report all the expectations about the best contemporary surgeon we have in active practice will be fulfilled.

When I met him, he was part of a team of three surgeons who solved surgical problems in the gastroenterology service of the General Hospital of the CMN of the IMSS. He was the second resident to arrive and finish his residency.

In experimental surgery I had the opportunity to help him in the first total liver transplants in dogs that he performed with great skill, which is why he is a pioneer of transplants in Mexico. He in turn collaborated with me for the realization of a work of common bile duct plasty that won a national award.

I worked with him in the creation of intensive care therapy since my interest in this incipient specialty awakened an emerging specialty to know it in depth. From that time on, I always admired him for his intelligence, restlessness, and perseverance.

Subsequently, these values increased when he was able to install one of the first intensive therapies in the country. He also participated in the first obesity surgery works carried out in the 70s.

His studies in intensive care, morbid obesity, his literary production as well as his academic degrees of master and doctor in medical sciences from the UNAM were achievements that very few surgeons have and allow us to confirm the words mentioned in the first lines.

An example of his intelligence was the fact that he had to present a lecture in Brazil and three months before leaving he studied Portuguese to give the lecture in that language. That was his intellectual capacity,

Figure 3: *Dr. Rafael Álvarez-Cordero.*

which he preserves to date. By the way, he is quadrilingual.

Now let's move on to his professional and academic development and productivity. He is originally from Mexico City, has a degree as a surgeon issued by the UNAM and his postgraduate studies in general surgery, digestive surgery and surgical research were performed in Mexico, the United States and France.

He obtained his doctorate in medical sciences from the UNAM in 1976, has continued his academic preparation with workshops and international courses in intensive therapy, clinical research methodology, didactic techniques, liposuction techniques and body control, comprehensive management of obesity, laparoscopic surgery, gastric band surgery and laparoscopic gastric bypass surgeries. It has four councils: general surgery, gastroenterology, critical medicine-intensive therapy, and geriatrics.

From his participation in teaching activities, he is described as professor of surgery at UNAM and undergraduate at the Michoacan University of San Nicolás de Hidalgo, School "Ignacio Chávez".

Among his professional activities, the following stand out: head of the Intensive Care Unit of the HG of the CMN of the IMSS, head of the General Surgery Division of the same hospital, head of the Surgery Division of the Specialty Hospital of Centro Médico La Raza, head of the Department of Hospitals of the IMSS and head of the Medical Services of the IMSS of the Delegation VI and director of International Affairs of the Ministry of Health.

His participation in academies, councils and associations is important and variable. Here are some of them: advisor to the IMSS Scientific Research Council, president of the Experimental Surgery Association, coordinator of surgery at the National Academy of Medicine, advisor to the IMSS Medical Sub-Directorate, honorary president of several Mexican and foreign medical associations, founder and honorary president of the Mexican Society of Obesity Surgery and co-founder of the International Federation for Obesity Surgery (IFSO). He has also chaired several national and international congresses of metabolic surgery.

His recognitions begin with diplomas of excellence in his studies at UNAM and honorable mention in his professional examination. He has won several awards in national and foreign competitions in surgical cinematography and experimental surgery. He is an honorary doctor of the Global Organization for Excellence in Health and obtained the international award "Lifetime Membership Award" granted by the International Federation for the Surgery of Obesity and Associated Disorders.

He is a member of 28 national and international medical societies. He has given more than 600 conferences in Colombia, Brazil, Argentina, Chile, Spain, France, Belgium, Italy, Austria, Czech Republic, and Greece. His literary production consists of 159 scientific articles published in national and international journals in Spanish, English, French, and Portuguese. He has collaborated in 11 national and international books on surgery, intensive care, and obesity, and has registered 17 books related to medicine and health education.

He is and has been a regular contributor to several newspapers in Mexico with his editorial column "Health and Politics" in *Unomasuno* and *El Universal* Mexican newspapers, and currently writes a weekly editorial in the Mexican newspaper *Excelsior* in the "Opinion" section and the column *Viejo mi querido viejo* in which he frequently advises to do physical exercise, since he has always been an athlete that undoubtedly gives him a youthful spirit.

From his Sunday editorial article in this newspaper, it is important to point out the civic courage with which he very frequently writes and describes the actions of the current government, which on many occasions produces serious consequences in the economy, health, and the population in general. Thanks to his letters we identify with and support his position because from our trench we do not have an audience to listen to us. My great admiration and respect for this work, Rafael.

In conclusion, I will point out that he was editor of the *Journal of the Faculty of Medicine of the UNAM*, continuing and strengthening the work developed in that position by Manuel Quijano-Narezo. Subsequently, the rector of UNAM invited him to serve in Paris as academic secretary of the Center for Mexican Studies

(CEMUNAM France). I am sure that his work as a promoter in that position will soon yield results.

DR. CARLOS GODÍNEZ OROPEZA *(Figure 4)*

He was the fourth resident of a generation that began in 1963 and grew rapidly, flooding the country with excellent surgeons who held management positions within the IMSS, or whose surgical practice gave them prestige within the institution or in their private activity. His excellent work as a resident and the immediate growth of the gastroenterology service due to the demand of patients gave him the fortune of being chosen to continue within the service as an attending physician.

He was a very skilled, friendly, cheerful, and of course jovial surgeon, who had gained a lot of experience from being under the guidance of great surgeons, and from being in a hospital with great surgical demand. His youth allowed him to have a close approach with the residents, and his teachings were well applauded. After a few years of working in the gastroenterology service, he occupied an important place in the morning service, performing this responsibility with efficiency. It was two years until the gastroenterology service was divided into general surgery and medical gastroenterology. The general surgery service lasted five years in the HG building of the CMN of the IMSS until the new dispositions of respecting the levels of attention gave place to transfer the general surgery service to the second level hospitals, so he decided to leave the institution.

Figure 4: *Dr. Carlos Godínez-Oropeza.*

With him I presented and wrote the first academic papers related to gastroenterological surgery. He was a productive surgeon who encouraged residents to participate in academic meetings, was a member of several medical associations, president of the AMCG, and was inducted into the Mexican Academy of Surgery.

While enjoying private surgery, he was struck by ALS, which quickly led to his death.

He was always a good partner and friend.

DR. LUIS IZE LAMACHE (1946-2014) *(Figure 5)*

I met him in 1967 during my social service. Agua Blanca was the town in the state of Hidalgo where I did my social service. I had to pass through Santa Ana Hueytlalpan, a small and scattered illiterate town, poor and abandoned by our politicians, near the city of Tulancingo, Hidalgo, Luis' place of origin. In that tiny town where in an old house there was an office with little old furniture like the house, and which had the name of "Health Center", he did his social service. There I saw him consulting with the help of an interpreter with a professional spirit that caused me admiration and respect, that was how I got to know his human, charitable and professional side. A year later we met at the General Hospital of the National Medical Center of the Mexican Social Security Institute when he started his surgical residency. Among other qualities of his personality, his intelligence stood out. In all the activities in which he participated or was present, his simple personality stood out. He finished his professional career with honors as well as his surgical residency. In the residency

Figure 5: *Dr. Luis Ize-Lamache.*

he stood out for his presentation of work, comments, and companionship, that is why he was elected chief resident. His mastery of languages, his ability to organize, program and his discipline were the virtues that led him to be selected for a scholarship for the first course of Dr. Dudrick and Dr. Rhoads, precursors of artificial nutrition worldwide. Upon his return to Mexico, he founded the first service in this field at the General Hospital of the CMN of the IMSS, which helped many patients with acute or chronic pancreatitis complicated with intestinal fistula, peritonitis, and shock from various causes. His experiences were quickly published and disseminated in congresses and medical meetings, so his image grew rapidly as a great surgeon who promoted important changes in the treatment of these patients.

He belonged to the Mexican Academy of Surgery, was president of the Mexican Association of General Surgery, founding member and first president of the Mexican Association of Clinical Nutrition and Medicinal Therapy, A.C. (1989); he was also in charge of the general surgery course and chief of the gastro-surgery service when the General Surgery Service of the General Hospital of the National Medical Center of the Mexican Social Security Institute disappeared.

He was an excellent sportsman, practiced various sports and enjoyed sailing, but his life came to an end when bladder cancer caught him in the middle of his professional maturity.

It is very sad that an intelligent, well-prepared, and productive person abandons us in the fullness of his professional activity, when he is transmitting to us his consolidated experiences.

The following biographical sketch of Dr. David Olvera Perez, who has written this memoir, is a reproduction of one written some time ago by a surgeon friend, which has been slightly modified to omit undeserved praise.

DR. DAVID OLVERA PÉREZ *(Figure 6)*

It is difficult to summarize in a few lines the trajectory of a professional and a remarkable human being, and although the description is not very fair, it is intended to summarize the most outstanding aspects.

In the 1940's, back in the beautiful Pachuca City (*la Bella Airosa*), a city majestically framed by its emblematic clock built to commemorate the first centenary of our independence and cradle of national soccer game, an illustrious future-to-be surgeon was born.

In 1961 he began his undergraduate studies at the School of Medicine of the newly founded Autonomous University of the State of Hidalgo. He studied the first years, standing out for his commitment to his studies, always obtaining one of the first two places of his generation. Three years later he entered the School of Medicine of the National Autonomous University of Mexico to continue his studies and finished his degree in 1966. On April 9, 1968, he took his professional examination.

Being a surgeon was his lifelong obsession. He was inclined to heart and thorax surgery, which at that time was beginning to stand out due to the first heart transplant performed in South Africa by Dr. Claudio Barnard. Certain circumstances made it easier for him to acquire experience since his student days when he met Dr. Rubén Argüero and Carlos

R. Pacheco, who gave him their support to perform experimental surgery on dogs in 1964, performing lung and trachea transplants. An important fact that should be in the annals of the history of Mexican medicine was the initiative of Dr. Carlos Pacheco to hold weekly bibliographic sessions of surgical literature related to transplants. It was in 1964, in the meeting room on the fourth floor of the Hospital of Pneumology and Thoracic Surgery of the CMN where the beginnings of one of the surgical specialties are kept in its walls, a place where doctors Carlos R. Pacheco, Rubén Argüero, Carlos Ibarra and the student David Olvera used to meet.

At the General Hospital of the National Medical Center of the Mexican Social Security Institute he completed his residency in general surgery in 1972, during which time he won awards at congresses and meetings of IMSS residents. His dedication and responsibility resulted in one more achievement, that is being awarded with a year of gastroenterological surgery; in this period he also observed good performance as chief resident of that generation, closing a cycle of general surgery directed by Manuel Quijano-Narezo.

With the thesis entitled *Definitive ileostomy with ileal pouch and continent valve*, on July 1º, 1977, he presented his postgraduate examination at the National Autonomous University of Mexico. These studies allowed him to be certified by the boards of general surgery and gastroenterology.

Figure 6: *Dr. David Olvera-Pérez.*

At the end of his residency, due to his personal and surgical qualities, he was chosen to be part of the corps of surgeons of the Gastro Surgery Service of the General Hospital of the National Medical Center, at that time directed by Dr. Luis Landa, and in which there were great surgeons who gave prestige at that time to this distinguished hospital center and therefore, to the general surgery of our country.

For 10 years, in addition to working intensely, he acquired medical knowledge and vast surgical experience that positioned him as an excellent surgeon, but this was not enough, and the search for new challenges and achievements led him to the Ministry of Health, where he served as director of the General Hospital Valle de Ceylan in Tlalnepantla in the State of Mexico, This fruitful work led him after three years to the position of Chief of Region III of the Health Institute of the State of Mexico. With his participation and coordination, it was possible to start up three of the five hospitals that were built after the earthquake of 1985.

In this same position, he was responsible for the proper functioning of 20 hospitals and 240 health centers to provide medical care to 2.5 million inhabitants, a function he performed until 1990.

When he rejoined the private professional activity in 1990, he began his preparation as a laparoscopic surgeon, and despite the adversities encountered for his training, he designed a technique in chicken with which he began his minimally invasive surgical skill, which earned him a prize and was the passport to take this technique to the competition in Video Med in the city of Badajoz, Spain. Later he won another award for the first laparoscopic splenectomy performed on children in Mexico. His enthusiasm for laparoscopic surgery has been one of his concerns for the last 20 years, during which he has directed courses, workshops, symposiums, participated in conferences, lectures, congresses, and meetings on the same subject.

Among his work, the direct puncture of the first trocar without using a Veress needle stands

out, a work that has served as a standard for practice in health services in Australia.

One of his great interests has been education. Since he was a student, he has participated as a substitute or assistant professor, and throughout his life he has participated in eight undergraduate and four graduate courses, in addition to 65 monographic and continuing medical education courses.

His preparation has never stopped, as evidenced by the 32 postgraduate courses he has studied, including management development, personal development, public health, and hospital administration and, in recent years, minimally invasive surgery.

He currently belongs to six surgical associations, the Mexican Association of General Surgery, the Mexican Association of Endoscopic Surgery, the American College of Surgeons, the Association of Laparoscopic Surgeons, the Latin American Association of Endoscopic Surgery, and the Latin American Federation of General Surgeons.

He has written six chapters for books, published 50 articles, and co-authored the book Surgery in the geriatric patient. He has more than 166 participations in national and international congresses. He has received awards and distinctions from medical associations and society in general.

In 2003 he was invited by the incoming president of the AMCG Dr. Roberto Bernal Gómez to create and direct the Social Service Committee, a transcendental stage in his life that allowed him to meet with the main values of medicine and develop a surgical activity that gave him the opportunity to give back to Mexican society something of the much it has offered him. His firm and determined character, but at the same time possessing a great sensitivity, and a spirit of service, helped him for eight years to direct, with and without the support of medical societies, the Extramural Surgery Program of General Surgery performing more than 60 campaigns throughout the Mexican Republic with amazing results of more than 8,500 surgeries in total. The main surgical procedures were abdominal wall hernias and laparoscopic cholecystectomy. Memoirs of this humanitarian service are in process and could only be made possible by the support of a brilliant staff of general surgeons, nurses, anesthesiologists, and laparoscopy technicians.

The great professional achievements have not been enough because the audacity to dive day and night in the sea as well as the constancy to practice horseback riding and continuous reflection complement his fruitful trajectory. What is certain is the immense passion he imprints on each of the enterprises he undertakes.

Few words can describe the surgeon, the administrator, the student, the teacher, the writer, but above all the human being who has been a great friend, a loving father, and an invaluable husband.

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Mexican Board of General Surgery, A.C. Origins and development. Present and future

Consejo Mexicano de Cirugía General, A.C. Orígenes y devenir. Presente y futuro

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Keywords: History Mexican Council of General Surgery, general surgery, certification.

Palabras clave: *Historia Consejo Mexicano de Cirugía General, cirugía general, certificación.*

ABSTRACT

On the forty-second anniversary of the creation of the Mexican Board of General Surgery, A.C. (*Consejo Mexicano de Cirugía General, A.C.* [CMCG]) the following historical synthesis is presented with the intention of recalling the origins of the institution, its evolution and current condition, and to highlight its transcendence for the national general surgery.

RESUMEN

Con motivo del cuadragésimo segundo aniversario de la creación del Consejo Mexicano de Cirugía General, A.C. (CMCG) se presenta la siguiente síntesis histórica con la intención de recordar los orígenes de la institución, su evolución y condición actual, y destacar su trascendencia para la cirugía general nacional.

INTRODUCTION

Although the origins of general surgery in our country date back to pre-Columbian times, it was in Mexico at the end of the 19th century and the first half of the 20th century when the first surgical specialties such as gynecology, urology, digestive system surgery, abdominal wall surgery, orthopedic surgery, ophthalmology, among others, were established, and it was not until 1969 when general surgery as such was recognized as a core specialty by the Division of Postgraduate Studies of the Faculty of Medicine of the National Autonomous University of Mexico (UNAM).[1] The training of surgeons prior to this date was tutorial and surgeons learned the surgical fundamentals with each of their rotations through the medical and surgical services of the different specialties.[2]

In our country, during most of the first half of the 20th century, "specialist" physicians were largely self-taught since neither internships nor medical residencies as we know them today existed. For young physicians interested in perfecting their learning and orienting it towards a particular "specialty" to achieve their goal, it was necessary to approach one of their outstanding teachers in the intended discipline. Teachers were generally chosen by the students for their charisma and professional prestige, and students were selected or admitted by the preceptor based on their background as undergraduates, and on the sympathy the teacher felt for them. We must remember that in the 1930s there were only nine medical schools in the whole country,

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which explained the closeness that often prevailed in teacher-student relationships in the national medical field, since they knew each other in depth since their undergraduate stage, so that both knew perfectly well what to expect from each other, that is, it was a selection loaded with subjectivity, but no less efficient than the current one.[3]

In 1970 the General Surgery Program was formally integrated to the postgraduate courses of the Faculty of Medicine of the UNAM. This program was revised and updated in 1976 and the courses had a duration of three years until 1994, when the program was substantially modified, increasing one year to the initial program, resulting in a current duration of four years for training courses in general surgery throughout the country;[4] even in some universities the current duration of the residency is up to five years.

Background and creation of the CMCG

In response to the concerns of creating the Mexican Board of General Surgery (CMCG), on September 22, 1976, the following doctors met in the meeting room of the Blood Bank of the Mexican Red Cross Hospital: Drs: César Athié Gutiérrez, Guillermo Alamilla Gutiérrez, Carlos Albarrán Treviño, José Luis Bravo Llamosa, Antonio Capetillo Robles Gil, Fernando Díaz Ballesteros, Óscar Díaz Giménez, Enrique Fernández Hidalgo, Enrique Flores Espinosa, Manuel Manzanilla, Carlos Moreno Fernández, Manuel Quijano Narezo, Fernando Romero Castillo, Mario Trápaga Altamirano, José Valencia del Riego, Alfredo Vicencio Tovar, and Alberto Villazón Sahagún with the purpose of ratifying the statutes that would govern the CMCG and/or initiating the procedures for its legal constitution before a notary public and requesting its registration before the Mexican Ministry of Health and the approval of the National Academy of Medicine. These were the founding members of the Mexican Board of General Surgery, A.C. All of them were full professors of the specialization courses in general surgery registered at the Division of Higher Studies of the Faculty of Medicine of UNAM.[5]

Definitive constitution of the CMCG

As part of the agreements of that meeting, it was proposed and accepted that invitations to be certified soon be sent to all surgeons in the country. This communication was sent through the health institutions as well as the institutions that used to train surgeons. The distinctive logo of the CMCG was also proposed and accepted and it was agreed to invite an equal number of surgeons representing the entire Mexican Republic, that is, 15 surgeons, to confer it the national character and it was agreed to initiate the corresponding notary procedures to legalize the constitution of the CMCG.

A little more than a year later, on November 19, 1977, in the same meeting room of the Blood Bank of the Mexican Red Cross Hospital, the 30 surgeons listed below met:

Dr. Guillermo Alamilla Gutiérrez	CDMX*
Dr. Carlos Albarrán Treviño	CDMX*
Dr. César Athié Gutiérrez	CDMX*
Dr. Leonel Barrera Cantú	Chihuahua
Dr. José Luis Bravo Llamosa	CDMX*
Dr. Antonio Capetillo Robles-Gil	CDMX*
Dr. Fernando Díaz Ballesteros	CDMX*
Dr. Óscar Díaz Giménez	CDMX*
Dr. Enrique Fernández Hidalgo	CDMX*
Dr. Enrique Flores Espinoza	CDMX*
Dr. Pedro Gama Carpio	Guanajuato
Dr. Gilberto López Betancourt	Nuevo Leon
Dr. Manuel Manzanilla Sevilla	CDMX*
Dr. Armando Martínez Santaella	Oaxaca
Dr. Ricardo Mondragón Ballesteros	Mexico State of
Dr. Raúl Montalvo Escamilla	Yucatan
Dr. Carlos Moreno Fernández	CDMX*
Dr. Jaime Paredes Ugarte	Puebla
Dr. Javier Preciado Zepeda	Jalisco
Dr. Manuel Quijano Narezo	CDMX*
Dr. Ricardo Quilantán Antiga	San Luis Potosi
Dr. Gregorio Ramírez Valdez	Coahuila
Dr. Fernando Reyes Méndez	Guerrero
Dr. Francisco Rivadeneyra Hinojosa	Michoacan
Dr. Rafael Sedas Rendón	Veracruz
Dr. José Valencia del Riego	CDMX*
Dr. Juan Vela Trujillo	Tamaulipas
Dr. Alfredo Vicencio Tovar	CDMX*

Dr. Alberto Villazón Sahagún	CDMX*
Dr. Héctor Zazueta Duarte	Sinaloa

* Former Federal District (D.F.)

On this occasion, with the purpose of declaring the definitive constitution of the Mexican Board of General Surgery, A.C., in this session, Dr. Manuel Quijano Narezo informed the details of the registration of the CMCG before the Mexican Ministry of Foreign Relations and the Ministry of Health. Afterwards, the governing body was elected unanimously naming first secretary Dr. Manuel Quijano Narezo, second secretary Dr. Enrique Flores Espinoza and treasurer Dr. Carlos Moreno Fernández.[6]

Becoming

During 1978, the first year in which the CMCG came into operation and based on a transitory article, 1,769 surgeons from all over the country were certified who, in response to the call issued by the CMCG, took advantage of the mentioned transitory article and were all certified-on November 11, 1978.[7]

The first certification exam was held on December 7 and 8, 1979 at the traditional General Hospital of Mexico and from that year onwards the exam has been held annually at different venues.

Currently, the evaluation process is carried out in three phases: curricular (carried out altruistically and efficiently by the counselors), followed by a written and oral evaluation. To allow recent graduates of university courses to take the written exam days before officially concluding their residency, in the month of February of each year, the month in which the residents graduate from their academic programs, the written phase is carried out simultaneously in four venues, in the cities of Monterrey, Nuevo Leon, Guadalajara, Jalisco, Puebla, and Mexico City (at the Tlatelolco Evaluation Center of the *Torre de Vinculación y Gestión Universitaria* of the UNAM) and those who pass the written phase take the oral phase of the exam in the month of April for the interior of the Republic in Monterrey, Guadalajara, and Puebla and in the month of May, the oral exam is held in Mexico City at the facilities of the *Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán*.

It is worth mentioning that in 1980 the Mexican Ministry of Health granted the recognition of certification in general surgery and in 1981 both the Mexican Academy of Surgery and the American College of Surgeons granted this recognition. Likewise, it is important to highlight that in 1994 the CMCG signed the constitutive act of the National Normative Committee of Medical Specialties Councils (CONACEM).

It is equally important to point out that on September 1, 2011, articles 81 and 272-Bis II of the General Health Law were modified, which establish the obligation for all general surgeons in the country to have the current certification by the CMCG in order to perform surgical procedures of the specialty.[8] Likewise, in 2012 the CMCG was the first council to sign an agreement with the Federal Institute of Access to Information (IFAI) within the framework of respect and observance of the Personal Data Protection Law.

It should be noted that, in agreement with CONACEM, chapters have been opened within the CMCG itself, establishing the certification processes for bariatric surgeons as of 2013 and for renal transplant surgeons as of 2014, with the process of creating the endoscopy certification chapter for the surgeon in the pipeline.

The certification and recertification evaluations as well as the recertification processes by curricular points currently carried out at the CMCG are:

General Surgery Chapter:

1. First time certification (written and oral exams).
2. Recertification by examination.
3. Recertification by curricular points.
4. Surgery for rural health services.
5. Surgeons with more than 15 years of experience.
6. Training. Emphasizing that this exam is directed to the third-year residents of the specialty so that they become familiar with the type of exams and registration processes through the CMCG web page,

with the purpose that their performance in the actual certification exam is optimal. This examination modality was implemented in the first decade of the present century.

Chapter of Bariatric Surgery:

1. First time certification (written and oral exams).
2. Recertification by examination.
3. Recertification by curriculum points.

Chapter of Renal Transplant Surgery:

1. First time certification (written and oral exams).
2. Recertification by examination.
3. Recertification by curriculum points.

As part of the principles that reflect the philosophy of the *Consejo Mexicano de Cirugía General, A.C.*, we will mention its mission, vision, and values:

CMCG mission: To be and remain the only academic certifying body in Mexico that leads the regulation, standards, and certification in general surgery, with national and international recognition for the quality of the certification processes developed as well as for the quality and performance of its staff and members of the CMCG.

CMCG vision: Is the establishment, transparent management, and continuous improvement of processes, parameters, and standards to carry out the certification and recertification of general surgeons practicing their specialty in the Mexican Republic, which guarantee the high and homogeneous quality of knowledge, skills, and academic training of excellence of all graduates in the various academic training programs in the country.

CMCG values: Responsibility, quality and continuous improvement, honesty, honorability, professional reliability and probity.[9]

With our certification processes we seek that the approved surgeons are worthy of the endorsement conferred by the Mexican Council of General Surgery, A.C. and the National Regulatory Committee of Medical Specialties Councils as well as the recognition of suitability granted by both the National Academy of Medicine and the Mexican Academy of Surgery. Since the certification is valid for five years, with the five-year recertification mandate we also seek the constant and optimal updating of the general surgeon to permanently maintain their level of medical preparation.

List of former presidents of the Mexican Board of General Surgery

1978-1980	Dr. Manuel Quijano Narezo
1980-1982	Dr. Alberto Villazón Sahagún
1982-1984	Dr. Alfredo Vicencio Tovar
1984-1986	Dr. Jorge Bautista O'Farril
1986-1988	Dr. Óscar Díaz Giménez
1988-1990	Dr. César Gutiérrez Samperio
1990-1992	Dr. Víctor Manuel Arrubarrena Aragón
1992-1994	Dr. Jorge Pérez-Castro Vázquez
1994-1996	Dr. José Fenig Rodríguez
1996-1998	Dr. Rubén Cortés González
1998-2000	Dr. Ángel Zárate Aguilar
2000-2002	Dr. Alfonso G. Pérez Morales
2002-2004	Dr. Gilberto López Betancourt
2004-2006	Dr. Lorenzo De la Garza Villaseñor
2006-2008	Dr. Patricio Rogelio Sánchez Fernández
2008-2011	Dr. Luis Humberto Ortega León
2011-2014	Dra. Adriana Hernández López
2014-2016	Dr. Ricardo Blas Azotla
2016-2018	Dr. Héctor F. Noyola Villalobos
2018-2020	Dr. Jordán Zamora Godínez

Current Board of Directors (2018-2020)

President:	Dr. Jordán Zamora Godínez
Vice-president:	Dr. Juan Pablo Pantoja Millán
Secretary:	Dr. Enrique Jiménez Chavarría
Treasurer:	Dr. Vicente González Ruiz

Suitability

Although the CMCG oversees the evaluation of the surgeons in the country, the CMCG in turn is evaluated by the CONACEM and the National Academy of Medicine and the Mexican Academy of Surgery to be able to confer the recognition of suitability endorsed by them.

The certificates that are physically delivered to the surgeons who pass the exams or the recertification processes, are made exclusively by CONACEM, have several security measures and, very important, they have with the recognition of suitability granted by both CONACEM and the National Academy of Medicine and the Mexican Academy of Surgery. This condition of suitability and its corresponding seal must be renewed every five years and its attainment depends on the evaluation that CONACEM and the academies make of the CMCG. The latest recognition of suitability was granted to the CMCG on February 16, 2018, and is valid until 2023.

In its 42 years of existence of the CMCG, both the exam format and the registration and evaluation processes have evolved according to the modernity of each historical moment, starting from printed sheets, through slides, the use of optical sheets for scoring and analysis of the results, etc., to the moment in which there is a very efficient electronic platform that allows both the registration and the application of exams and their evaluation.

All the information is integrated in a reliable database linked to the CMCG web page (www.cmcgac.org.mx) through which the applicants carry out the registration process and in which, among other things, the calls for the different types of exams offered by the CMCG and the directory of doctors with current certification are published, which can be consulted by any person, at anytime and anywhere in the world.

In this same period, the CMCG has certified, at least once, 10,232 general surgeons, of which 4,242 are currently certified.

CMCG headquarters

The first address of the CMCG was located at Av. Veracruz No. 93-202, Colonia Condesa, Delegación Cuauhtémoc, Mexico City, first rented and since 1990 owned.

Current and own address since August 2011: World Trade Center of Mexico City, Montecito Street No. 38, 18th Floor, Office 21, Colonia Nápoles, Alcaldía Benito Juárez, Mexico City, C.P. 03810. Telephone numbers 55-5286-3012 and 55-5211-0074.

CONCLUSION

In summary, the training of medical specialists in the country is made up of a large number of institutions, initially public and, since the last third of the last century, also private institutions, with varying degrees of development and, therefore, with different educational offerings, so that the specialists who graduate have great heterogeneity and differences in their training.[10] Despite this, this system is so far the best option for the training of human resources for health.

However, it is precisely because of this heterogeneity in the training of general surgeons in Mexico that it is essential to have an academic, professional and completely neutral body in charge of establishing the minimum academic and deontological criteria that a general surgeon must have, regardless of the university that endorses him or her or the hospital or hospitals where he or she has been trained, and to evaluate, by means of its examinations, all surgeons in the country with the purpose of accrediting that the current certified surgeon has the adequate preparation for his patients to receive quality care in any part of the national territory in both public and private health institutions, and that organism is precisely the Mexican Council of General Surgery, A.C.

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