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Surgical Peritonitis Or Not: An Analysis

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ABSTRACT

Introduction: To analyze the impact of peritoneum in the surgical area, it is necessary to go back to the anatomy, physiology, histology and even embryology of peritoneum. Since this structure becomes the "pivot"! strategic to perform or not the surgical act. Objective: To describe the experience of patients who presented surgical peritonitis in the Surgery departments. Method: A retrospective, longitudinal, observational and descriptive study of the Surgery Service was conducted in two public health hospitals. Results: A total of 211 records of patients with surgical peritonitis were reviewed, of which 123 were men (58.29%), 88 women (41.71%), with an average age of 57 years, ranging from 19 to 81 years. Intestinal perforation secondary to multiple pathologies is the leading cause of surgical peritonitis, accounting for 37%. The surgeries were initially urgent with an is of 198 patients, which is 93.83%, and the rest was scheduled or priority surgery. Adjusted morbidity 26.54%. Discussion: Abdominal peritonitis is classified into primary and secondary; some authors have mentioned tertiary peritonitis, where patients with complicated intra-abdominal infections have been diagnosed with the most severe and severe form. Regarding the quality of secondary peritonitis, where the therapeutic protagonist is surgery and with exhaustive washing of the abdominal cavity, acute abdomen. Conclusions: acute peritonitis in most patients is the tacit expression of a consequence of a surgical pathology, where the clinical scenario is florid or evident, leading to overtreatment in the so-called primary peritonitis. However, there are cases that, even though they are primary peritonitis, benefit exponentially from the surgical event, when draining and performing an exhaustive surgical wash.

Keywords: Peritoneum, Peritonitis, Surgery, Surgical washing, Intestinal perforation, Chemical peritonitis, Carcytomatosis.

INTRODUCTION

To analyze the impact of peritoneum in the surgical area, it is necessary to go back to its anatomy, physiology, histology and even embryology. Since this structure becomes the "pivot"! strategic to perform or not the surgical act.

The peritoneum embryologically derives from the mesoderm and is a serious membrane that covers the abdominal cavity composed of mesothelial cells supported by a thin layer of fibrous tissue, extremely thin tissue, formed by two layers that serve to support the organs of the abdomen and acts as a conduit for the passage of nerves, blood vessels and lymphatic vessels. The potential space between the two layers contains between 50 and 100 ml of serous fluid that

prevents friction and allows the organs to slide freely. **[1]** It is divided into parietal, which I know adheres to the abdominal and pelvic walls, and visceral surrounds the organs of the cavity to which it divides into two parts: retroperitoneal and peritoneal. **[2]** In male patients, the peritoneal cavity is closed, while in females it communicates with the extraperitoneal space through the fallopian tubes and reproductive organs. **[3]**

A wide variety of pathological processes can affect both the peritoneal membrane and its numerous spaces. These abnormalities can spread at or away from their site of origin through several routes, including spread throughout the peritoneal cavity, direct extension, extension along the mesentery and ligaments, lymphatic or peri lymphatic spread, perivascular and perineural spread, and hematogenous spread. **[4]** Peritonitis is defined as an inflammatory process caused by an irritant or a microorganism such as bacteria, fungi, viruses, granulomas, drugs, or foreign bodies. Intra-abdominal infection is defined as the local manifestations that occur because of peritonitis. **[5]** Intra-abdominal sepsis encompasses systemic manifestations of severe peritoneal inflammation. **[6]** However, it is not always an infectious process or failing that, either the microorganism is not isolated, **[7]** or it is because of mass, due to the increase in extra-visceral or compartmental pressure or due to chemical irritation in the so-called chemical peritonitis (hydrochloric acid, bile, blood, etc.). **[8]** It is imperative not to neglect the identification of purulent material in the pelvic hollow and/or in the entire abdominal cavity, in purulent peritonitis, with no apparent intra-abdominal cause/motive, only due to fascial continuity. **[9]**

OBJECTIVE

To describe the experience of patients who presented surgical peritonitis in the emergency surgery services of two hospitals of the public health system.

METHOD

This is a study with a retrospective, longitudinal, observational and descriptive design of the Surgery Service, an investigation of two public health hospitals/or state hospitals of second level health care, in Mexico City and the State of Mexico:

- General Hospital “Dr. Rubén Leñero” from the Ministry of Health. Mexico City. Country: Mexico. 2nd Level.
- “Las Americas” General Hospital. Institute of Health of the State of Mexico. Municipality of Ecatepec de Morelos, State of Mexico. Country: Mexico. 2nd Level.

In a study period that spanned from January 2020 to January 2025, in patients with peritonitis who supported an emergency surgical indication.

The following were determined: age, sex, diagnostic etiology, initiation of medical treatment followed by surgery, number of surgical reinterventions, management in intensive care, assisted mechanical intubation after surgery, anesthesia applied, initial and accumulated surgical bleeding, surgical time, types of peritonitis, surgical technique or therapy, with specification of morbidity and mortality. And finally, the authors share their experience in the management of abdominal pathologies, with the systematization of refined surgical techniques that converge in the evolutionary expertise applied to affected patients.

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RESULTS

A total of 211 records of patients with surgical peritonitis were reviewed, of which 123 were men (58.29 %) and 88 women (41.71 %), with an average age of 57 years, in a range of 19 and 81 years. The etiology of the previous diagnosis, the number of surgeries per patient, in emergency surgery is specified. The most frequent diagnoses are determined in **Table 1**.

Table 1: Patients Who Presented with Peritonitis that Supported an Emergency Surgical Indication. Expressed in Number/Percentage.

Diagnostic Etiology / Peritonitis	Number/%
Biliary Pathology	29//13.74
Acute Appendictis	34/16.11
Primary Peritonitis	06/0.84
Perforated Gastric And Duodenal Ulcer	18/08.53
Thin Bowel Perforation	78/36.96
Biliperitoneum	16/07.58
Bowel Perforation (Rectum And Large Intestine)	13/06.16
Peritonitis In Renal Insufficiency Due To Peritoneal Dialysis	08/03.79
Peritonitis Due To /Carcinomatosis	07/03.31
Anaerobic Peritonitis (Pneumoperitoneum)	02/00.94
Total Number Of Patients	211/100

The diagnosis of intestinal perforation secondary to multiple pathologies is the leading cause of surgical peritonitis, which reaches 37% of cases, mostly caused by internal or strangulated hernias, surgical dissections due to intestinal occlusion, blunt or direct abdominal trauma by either a firearm projectile or a knife, in descending order. **[10]** The second most common diagnosis is acute appendicitis, mostly in the late complicated stages or stage IV, reporting up to 16%. **[11]** In third place is biliary pathology of 29% that is varied, such as gallbladder perforation, Bili peritoneum or cholangitis, among others. **[12]** A striking etiological diagnosis is anaerobic peritonitis, where this is questioned, since the microorganism or its microscopic isolation is not corroborated. **[7]** On the other hand, primary peritonitis is a watershed of an exclusion diagnosis that in most cases is made at the time of surgery. Medical treatment with empirical antibiotic therapy with a double scheme was initiated for all patients and culminated with definitive or sequential or staged surgical treatment as warranted by the patient.

Most of the surgical interventions were initially emergency with a total of 198 patients, which are 93.83%, and the rest was scheduled or priority surgery. A staged reoperation was documented in 6 cases and the standardized technique always included washing the cavity of up to five liters or more with preheated sterile solution, and multiple drains of the entire cavity (subphrenic spaces, both parietocolic slides and pelvic cavity) and/or local antibiotics in 9%, being 19 of the 211 cases where no drains were left (this is determined by the degree of contamination or Fick level). **[6]** With the exception of individuals with chronic renal failure, where only the peritoneal dialysis catheter was removed and a sample was taken for culture, as well as from the tip of the dialysis catheter.

In terms of surgical time, the average is 160 minutes, which ranges from 11 to 216 minutes. Hemorrhage was quantified at 50 milliliters on average with ranges from 35 to 1,100 milliliters.

All those who underwent surgery were initially managed with a double antibiotic regimen with empirical coverage, and later they underwent surgical treatment, eliminating the primary cause as far as possible and without sequelae as far as each patient's pathology allowed. The average number of surgical reinterventions was tabulated at 2.5 with ranges from 2 to 5 but only occurred in 6 individuals representing 2.8%. Intensive Care Unit support was documented in 44 cases, representing 21% of the study population, with an average stay of 5 days and ranges of 3 to 9 days. General anesthesia was performed in 176 (83.41%) patients, mixed anesthesia (24 (11.37) and the rest in the epidural block group, which were only 11 (5.21%) cases.

Morbidity is specifically determined with the understanding that the same patient may have more than one morbid entity. Table **2** specifies by section with number and percentage.

Table 2: Morbidity in Patients with Acute Peritonitis.

Morbidity	**Number/%**
Healthcare-Associated Pneumonia	34/16.11
Fistula Intestinal	5/02.36
Urinary Tract Infection	29 /05.68
Seroma	18/08.53
Surgical Wound Infection	43 /20.37
Abdominal Hernia	33/15.63
Upper Gastrointestinal Bleeding	11/05.21
Troboflebitis	5/02.36
Abdominal Unraveling	3/01.42
Hypovolemic Shock	6/02.84
Total	187/88.62

Adjusted morbidity with acute peritonitis was documented in 56 patients, representing 26.54% per entity and rising to 88.62%. The first morbid cause is surgical wound infection reaching 20.27%, pneumonia associated with health care or hospitality, occupies second place with 16.11% and in third place abdominal hernia is 15.66%. The severity of post-surgery morbidities that can be immediately fatal such as evisceration, hypovolemic shock and pneumonia should be considered, scenarios that together do not exceed 20.27%. Most of the morbidities had a response to the medical/surgical treatment and therapeutic treatment used, however, mortality was present in 4 cases (1.89%), three of them due to pneumonia associated with health care, 1.42% and one case of high-output intestinal fistula with open or catastrophic abdomen. **[13]** The average hospital stay ranged from 5 days to 76 days with an average of 14 days. Home discharge was achieved, and three patients were sent to a third level of medical care. Follow-up was carried out in the Surgery outpatient clinic for an average period of 3 months depending on the case.

DISCUSSION

Abdominal peritonitis is classified into primary and secondary; some authors have mentioned tertiary peritonitis, where patients with complicated intra-abdominal infections have been diagnosed with the most severe and severe form. The greatest difficulty lies in giving a common, precise and consensual definition to know when to make its diagnosis and how to avoid and/or treat it. **[5]** Therefore, tertiary peritonitis is defined as the specific pathological process in patients with a persistent abdominal infection that require surgical re-interventions in which

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diffuse exudative collections are observed rather than abscesses and that at the systemic level manifests itself as a persistent septic process with multiorgan dysfunction and high mortality despite aggressive antimicrobial and surgical treatment. **[14]** The two main types are primary peritonitis (or spontaneous bacterial peritonitis) and secondary (or surgical) peritonitis, with distinctly different features. **[15]**

Fungal peritonitis is a rare but serious complication of peritoneal dialysis associated with high morbidity, mortality and technical failures; that is why due to its high mortality, chronicity and difficulty in its cure, it has been categorized by some as tertiary peritonitis. **[16]** Extrapulmonary tuberculosis can affect various organ systems, including the gastrointestinal tract, or it can manifest as intestinal, peritoneal, hepatopancreatobiliary tuberculosis, or tuberculous lymphadenitis, with evidence of chronic peritonitis that other authors would classify it as tertiary, highlighting the innocuous presentation of peritoneal tuberculosis and the difficulties in obtaining a diagnosis explaining the delay. **[17]**

Uterine leiomyomas represent the most prevalent benign neoplasms within the female genital tract, particularly disseminated peritoneal leiomyoma, characterized by multiple round nodules of smooth muscle tissue on the peritoneal surface and in the sub peritoneal space. With a difficult diagnosis only sometimes detected by Nuclear Magnetic Resonance. **[18]** These nodules can affect any organ of the abdominal cavity, including the retroperitoneum, and range in size from a few millimeters to several centimeters, simulating peritonitis where pathophysiology remains incompletely understood, although several theories have been proposed. One hypothesis suggests that smooth muscle tissue nodules may arise from multipotent mesenchymal cell metaplasia in the sub mesothelial layer with a chronic and benign inflammatory process of the peritoneum. **[19, 20]** Peritoneal carcinomatosis is a malignant neoplastic process where it processes one inflammatory event or multiple inflammatory and/or ascitic events (very similar to patients with liver cirrhosis, chronic renal failure, and portal hypertension) **[21]** Peritoneal carcinomatosis is an advanced manifestation of cancer characterized by the spread of malignant cells within the peritoneal cavity; crucial peritoneal immunity by collecting antigens, toxins and pathogens of the peritoneal cavity, viral vectors 5 and tumor antigen specific T cells 6 act primarily on the omen tum when administered intraperitoneally, unlike other routes. This phenomenon activates the endogenous immune response of the omen tum to induce antitumor responses in areas of peritoneal carcinomatosis, in a chronic or even acute inflammatory process. **[22, 23]** In ovarian cancer, 80% of patients are usually diagnosed in advanced stages (stages III and IV), with extensive disease in the peritoneum. Since the 1980s, the gold standard of treatment has been cytoreductive surgery followed by systemic chemotherapy. However, despite aggressive management, almost 70% of patients recur within 2 to 3 years. **[24]** Endometriosis has variable clinical presentations; however, 90% of people with endometriosis report pelvic pain, including dysmenorrhea, no menstrual pelvic pain, and dyspareunia, and 26% report infertility. **[25]**

Primary peritonitis is a great simulator of an acute surgical abdomen, such as familial Mediterranean fever that manifests itself in 90% of patients with recurrent episodes of peritoneal inflammation; Recurrent peritonitis can lead to primary intraperitoneal adhesions even without surgery. **[26]** Peritoneal dialysis is a widely used renal replacement therapy for patients with end-stage renal disease. However, prolonged exposure to dialysis fluid can damage the peritoneal membrane. Peritoneal inflammation in S. epidermidis-induced

peritonitis and decreased adherence scores in a postoperative intra-abdominal adherence model. These findings identify interferon gene stimulators as a fundamental mediator of peritoneal injury and support its potential as a protective actor. **[27]** Regarding the quality of secondary peritonitis, there is evidence of an acute surgical abdomen, where the therapeutic protagonist is surgery, with an exhaustive lavage of the abdominal cavity and complete drainage of the abdomen. In some cases, radiography showed pneumoperitoneum, and exploratory laparotomy revealed a perforation at the tip of Meckel's diverticulum with fecal peritonitis **[28]** or in complicated diverticular disease where it is characteristic and frequent. **[29] See Figure 2.**

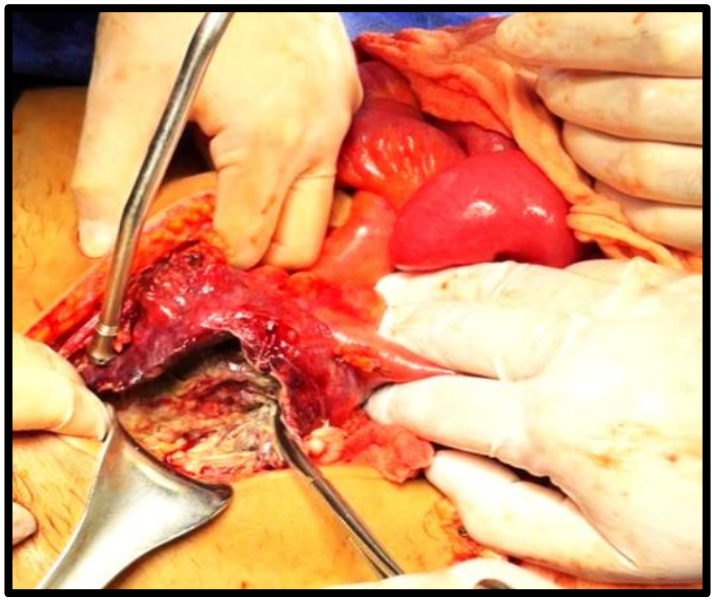

Figure 1: Perforation Due to Sigmoid Colon Cancer

Figure 2: Appendicular Mucocele

Examples and other types of peritonitis are evidenced in dermoid ovarian cysts or mature cystic teratomas, which are common benign ovarian masses. Surgical intervention for symptomatic cysts includes minimally invasive or open cystectomies. The consequences of intra-abdominal effusion during cystectomy can be significant and include acute chemical peritonitis or chronic

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granulomatous inflammatory reactions. **[30]** Another rare type of chemical peritonitis is due to mucin in appendicular mucocele pathology, where the sole contact with the peritoneum exponentially disseminates the disease throughout the peritoneum of the abdominal cavity and from being a circumscribed pathology, it becomes a high-impact pathology. **[31, 32]**

Another type of chemical peritonitis is when the products of the upper gastrointestinal tract are affected. This is an example caused by gastric perforation releasing hydrochloric acid into the cavity causing widespread damage and therefore surgery is the solution. **[33]** Another mixed pathology is duodenal ulcer and biliary pathology, where Bili peritoneum becomes peritoneum Armageddon, causing a process of systemic inflammatory response, chemical at first and later infectious. **[34, 35] See Figure 3.**

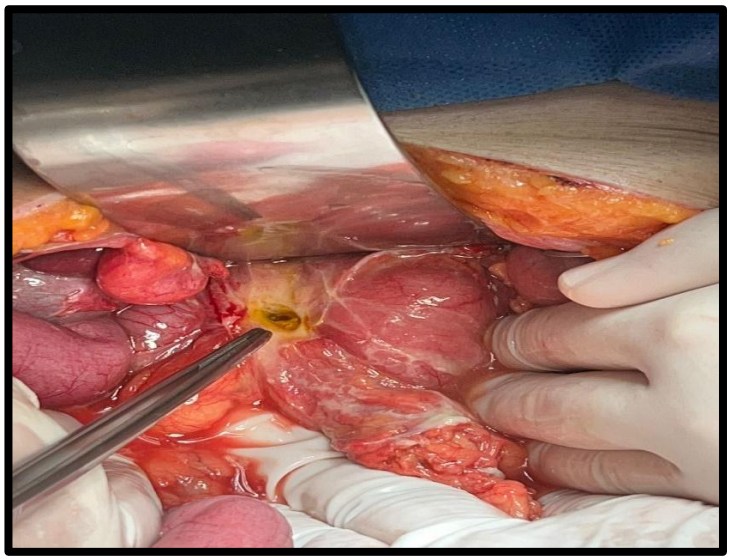

Figure 3: Prepyloric Gastric Perforation

On the other hand, it should be noted that antimicrobial resistance in primary or secondary peritonitis has been studied with logistic regression, polynomial, stacked sets, spatiotemporal Gaussian regression and mixed-effects meta-regression models to the modeling framework to adjust the resistance load and estimate the number of deaths and adjusted life years. It poses a serious threat to public health, especially for older people. If methicillin-resistant Staphylococcus aureus, and the pathogen with the highest annualized rate of change in attributed deaths over 31 years was Acinetobacter baumannii resistant to third-generation cephalosporins (17.5%). **[36]**

Regarding its presentation, the clinical and epidemiological data of all adult patients with peritonitis associated with peritoneal dialysis, abdominal pain, fever and diarrhea are the pivots in acute peritonitis. **[37]** Perforated peptic ulcer is a critical condition that may present atypical symptoms, leading to misdiagnosis and treatment delays; it classically presents with peritonitis, exceptional cases may induce localized inflammatory responses, mimicking other abdominal pathologies. **[38]** Spontaneous perforation without prior biliary symptoms is extremely rare and often presents as acute peritonitis, especially in elderly or immuno-compromised patients. Incoercible abdominal pain, jaundice, dyspnea, tachypnea, fever, pallor of integuments, dry mucous membranes, asthenia and dynamic and with frank evidence of

acute abdomen should not be dismissed. **[39, 40]** The diagnosis of acute peritonitis is made clinically, however there are variants or scenarios that complicate it, for example, Meckel's diverticulum, a congenital anomaly of the gastrointestinal tract is usually asymptomatic, but it can present complications such as inflammation, perforation or obstruction and that is when the symptoms resemble those of other conditions, such as urinary tract infections. **[41]** Pyo myoma is a rare condition caused by an infection within a uterine leiomyoma. When ruptured, it can cause peritonitis with ongoing abdominal pain, which can be life-threatening in the same way as liver and kidney abscesses. **[42]** Laboratory studies with leukocytosis and neutrophilia and with the support of computed tomography are elements that determine the diagnosis, treatment and prognosis of patients with acute peritonitis. The analysis revealed that certain CT scan findings, particularly complex collections larger than 5 cm near the site of the anastomosis and signs of generalized peritonitis were significantly associated with the presence of the pathology **[43]** Early diagnosis with confirmatory tools with laboratories, ultrasound, and timely surgical treatment are crucial to avoid serious complications such as biliary peritonitis and multi-organ failure and/or abdominal or systemic sepsis. **[44]** One of the most recent options with high diagnostic value in neoplastic pathology is PET/CT with [18 F]-FAPI-04 that demonstrated superior detection capacity for postoperative metastatic lesions in cancer patients, compared to PET/CT with [18 F]-FDG, with a complete diagnostic advantage, particularly in abdominal lymph node metastases, brain and peritoneum. **[45]**

In most patients with acute or chronic peritonitis, management is surgical, as the last or only option, such is the case of endometriosis where surgical removal of the lesions should be considered, usually with laparoscopy, if first-line hormonal therapies are ineffective or contraindicated. **[25]** Or, failing that, in neoplastic pathologies, peritonectomy for carcinomatosis due to recurrent ovarian cancer, which undergoes cytoreductive surgery combined with hyperthermic intraperitoneal chemotherapy with curative intent. **[46]** The gut functions as a closed system, and violation of this system can have consequences ranging from mild intraluminal gas leakage to severe purulent peritonitis. Perforation represents a disruption of the intestinal wall, management requires a comprehensive approach, where initial resuscitation, administration of broad-spectrum antibiotics and urgent surgical consultation remain the pillars of treatment. While some carefully selected cases can be managed non-surgically, people with hemodynamic instability, those with peritonitis, or those with persistent tachycardia or sepsis require immediate surgical exploration. **[47]**

CONCLUSIONS

Acute peritonitis in most patients is the tacit expression of a consequence of a surgical pathology, where the clinical scenario is florid or evident, sometimes leading to overtreatment in the so-called primary peritonitis. However, there are cases that, even though they are primary peritonitis, benefit exponentially from the surgical event, when draining and performing an exhaustive surgical wash. Under no circumstances should the surgical therapy called open abdomen be carried out in secondary peritonitis, nor should the wound be left open, since the consequences in the short to medium term are definitely a catastrophe. Protocolary sampling of the drained abdominal fluid in the surgical event is essential: cytological, cytochemical, culture, blood chemistry and/or special stains such as Ziehl-Neelsen. Empirical antibiotic therapy is essential, however, if there is no control of the pathological genesis, it is unproductive and delays the possibility of cure, increasing morbidity or mortality.

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Conflict of Interest.

The authors stated that they had no potential conflicts of interest regarding the research, authorship, and/or publication of this article.

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