



Abdominal Sepsis Associated with Multiple Organ Failure in Patient from the IMSS, UMAE 14

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Abstract

Introduction: Abdominal sepsis is a systemic response to an infectious process, initially localized to one or more abdominal viscera. This response can be associated with multiple organ failure, whose underlying mechanisms are not completely understood, thus, it is important to identify associated factors that can predispose its development.

Objective: Determine the association of abdominal sepsis in patients with multiple organ failure.

Material and Methods: An observational, retrospective and analytic study was performed, in which, it was examined 42 clinical records of patients with diagnosis of abdominal sepsis, treated in the UMAE surgery unit of IMSS from Veracruz. The following variables were analyzed: presence of multiple organ failure, sepsis origin, extent of peritonitis, characteristics of the peritoneal fluid, hemoglobin, hematocrit, leukocytes, platelets, TP, TPP.

Results: The study included 42 clinical records and diagnosis of multiple organ failure was found in 13 (31%) of them. Patients' ages range 62.1 ± 19.9 years. Serous peritoneal fluid 24%, purulent 71.4% and fecaloid 7.1%. Regarding sepsis origin, the colonic origin was identified in 64.3% and non-colonic in 35.7% of cases. The variables that obtained the greatest sensitivity were: TP (100%), hemoglobin (84.5) and peritoneal extension (76.9%).

Conclusion: Patients with abdominal sepsis were associated with multiple organ failure with a colonic origin and fecaloid liquid in 23% of the cases.

Keywords: Abdominal Sepsis; Multiple Organ Failure; Mannheim Criteria; Peritonitis

Introduction

Abdominal sepsis is a systemic inflammatory response, derived from an infectious process, initially localized to one or more abdominal viscera. Depending of its severity, it can cause hypo-perfusion, tissue injury and, finally, multiple organ failure [1-4].

It is the second leading cause of sepsis, after the sepsis of pulmonary origin, however, Carrillo, et al. [5]. found that out of 11,183 cases of sepsis of 135 intensive care units from 24 states of the republic, the most frequent etiology of sepsis was infection of abdominal origin in 47% of cases, followed by pulmonary origin in 33%, soft tissues in 8%, renal in 7% and others in 5% (neurologic and osteo-articular) [3,5,6].

Multiple organ failure is the leading cause of death in septic patients; this condition is characterized by the progressive dysfunction of more than one physiological system. In the United States, the treatment of patients with severe intra-abdominal infections usually leads to satisfactory results; recent clinical trials have shown an overall mortality rate of 2-3% in patients with intra-abdominal infection [7-9].

In the intra-abdominal sepsis, the first phase consists of an acute peritonitis because of facultative bacteria, often with a bacteremia associated with a high risk of mortality [2].

There are various scales to determine the mortality of peritonitis, among them is the Mannheim's scale, which takes into account parameters such as age, sex, malignancy, time of onset of the symptoms, type of contamination, peritonitis extension and the presence of signs of organ dysfunction [8-10].

Inflammatory cytokines are produced by the local response (IL-1, IL-6, IL8, TNF- α) they also enter the circulatory system, causing a systemic inflammatory response. This response, depending of the severity, can be associated with hypo-perfusion, tissue injury and multi-organ failure. There is a massive activation of the cytokine cascade and a pathological activation of the reticulo-endothelial system. This leads to the formation of secondary inflammatory substances such as prostaglandins leukotrienes, nitric oxide, oxygen free radicals, phospholipase A2 and platelet activating factor [11-14].

Although the mechanisms that underlie the multiple organ failure in sepsis have been partially elucidated, hypoxia plays a key role. Several factors can promote the progression of an abdominal sepsis leading to a multi-organ failure, both host-dependent factors and factors specific of the underlying disease [12-15].

The objective of the current study was to determine the association of abdominal sepsis in patients with multiple organ failure.

Materials and Methods

Observational, analytic and retrospective study, patients

treated at the General Surgery Service of the UMAE 14 of IMSS from Veracruz, with prior authorization from the Hospital Research and Ethics committee and the Faculty of Medicine.

The research units were the patients' files with diagnosis of Abdominal Sepsis and multiple organ failure, with identified etiology of sepsis, peritonitis extension, treated by the General Surgery Service.

Features of the Peritoneal fluid, complete blood count and clotting times were measured as indicators of multi-organ failure, to analyze the probability that abdominal sepsis is associated with this phenomenon, statistical analysis (OR=Odds Ratio) with a cut off value of $\alpha < 0.05$ was used to reject H0. Later, the data was input in Excel 2013 program, where the corresponding tables were created and the central tendency values were obtained, as well as the contingency tables. The data was analyzed in the program SPSS using the version 22.

Results

An observational, retrospective, analytic and cross-sectional study was carried out in the General Surgery Service of the High Specialty Medical Unit 14 in the city of Veracruz, in which, 42 files were reviewed to demonstrate the association between abdominal sepsis and multiple organ failure.

The gender distribution was 22 females (52.4%) and 20 males (47.6%).

The average age of the cases was 62.1 ± 19.9 . Three deaths happened because of MOF, all of them male patients with 68, 74 and 84 years-old, respectively.

In the reviewed files, the peritoneal liquid was serous in 9 (21.4%); purulent in 30 (71.4%) and fecaloid in 3 (7.1%) patients. Regarding the origin of sepsis, colonic origin was found in 27 patients (64.3%) with complicated appendicitis in 11 cases (40.7%), being the most common diagnosis and non-colonic origin in 15 patients (35.7%). In terms of the peritoneal extent, 16 patients had localized peritonitis (38%) and 26 had generalized peritonitis (62%) (Table 1).

Overall patients' characteristics			
Variables	With MOF	Without MOF	p
Age	58.8 \pm 22.8	54.9 \pm 16.7	NS
Sex (F/M)	30.8% / 69.2%	62.1% / 37.9%	NS
PERITONEAL LIQUID			
Serous	15.40%	24.70%	NS
Purulent	69.20%	72.4	NS

Fecaloid	15.40%	3.40%	NS
EXTENSION			
Localized	23.10%	44.80%	NS
Generalized	76.90%	55.20%	NS
ORIGIN			
Colonic	38.50%	75.9	NS
Non-colonic	61.50%	24.10%	NS
LABORATORY			
Hemoglobin	10.1 ± 2.2	11.3 ± 3.3	NS
Hematocrit	30.4 ± 6.8	24.9 ± 8.1	NS
Leukocytes	17172.3 ± 9081.4	13398.4 ± 73	<0.05
Platelets	294423.1±264013	276727.6±160	<0.05
TP	21.1 ± 2.4	17.4 ± 3.7	NS
TTP	37.8 ± 15.7	31.0 ± 8.1	NS

Table 1: Overall patients' characteristics.

The variables of abdominal sepsis that were associated with multiple organ failure were found in patients with low levels of Hb and Hto, leukocytes were found in 29 (69%)

cases and very prolonged clotting factors were also present in 36 patients (85.7%) (Table 2).

Level	Hemoglobin	Hematocrit	Leukocytes	Platelets	TP	TTP
Low	28 (66.7%)	27 (64.3%)	1 (2.4%)	8 (19%)	0	3 (7.1%)
Normal	14 (33.3%)	15 (35.7%)	12 (25.6%)	30 (71.4%)	6(14.3%)	29 (69%)
High	0	0	29 (69%)	4 (9.5%)	36 (85.7)	10(23.8%)

Table 2: Abdominal sepsis variables associated with multiple organ failure.

The probability analysis of the sensitivity as the capacity of a variable to detect the disease in sick subjects, the variables that obtained the greater sensitivity were: TP (100%), hemoglobin (84.5%) and peritoneal extension (76.9%). In terms of the specificity, which is defined as the

capacity of the variable to identify as negative cases the ones that are truly healthy, the variables that obtained the highest percentages were: platelets (93.1%) and TTP (82.8%).

	Sensitivity	Specificity	+LR	-LR	OR	CI95%	p
Peritoneal Liquid	69.2	27.5	0.96	1.12	0.842	0.30-1.17	NS
Extension	76.9	44.8	1.39	0.52	0.199	1.36-2.92	NS
Origin	38.5	24.1	0.51	2.55	6.152	2.46-18.72	NS
Leukocytes	30.8	69	0.99	0.92	0.988	0.83-0.93	<0.05
Hemoglobin	84.6	41.4	1.44	0.37	3.882	0.59-8.94	NS
Hematocrit	69.2	37.9	1.11	0.81	1.375	0.62-3.64	NS
Platelets	15.4	93.1	2.23	0.91	1.12	0.57-2.39	<0.05
TP	100	20.7	1.26	0.5	1.565	0.74-2.30	NS
TTP	61.5	82.8	3.58	0.23	0.602	0.28-1.28	NS
Sex: female	30.8	37.9	0.5	1.83	0.421	0.21-0.85	NS
Sex: male	69.2	62	1.83	0.5	0.348	0.22-0.51	NS

Table 3: Sensitivity, specificity, OR=Odds Ratio (Probability coefficient) CI^{95%}= Confidence Interval at 95% p Value = alpha at 0.05 in patients with abdominal sepsis associated with multiple organ failure.

In this study, out of 13 patients that showed multiple organ failure, 11 (84.6%) suffered from anemia, while 2 (15.4%) had normal levels of hemoglobin. Regarding leukocytes, 1 patient (7.7%) had leukopenia, 3 cases (23%) had normal levels and 9 patients (69.2%) had leukocytosis (OR=0.998 $p<0.05$). (Table 3)

Discussion

The current study investigated the association between abdominal sepsis and multiple organ failure showing a high sensitivity in the variables TP (100%), hemoglobin (84.5%) and peritoneal extension (76.9%). Sensitivity characterizes the capacity of a test to detect the disease in sick subjects. Specificity shows the capacity of our methodology to identify as negative cases the ones that are truly healthy; i.e. the proportion of healthy individuals that are correctly identified [3].

Regarding the sociodemographic data, Ocampo M, et al. found that the average age of cases was 45 ± 18.9 years-old, and females were more predominant (76,2 %), than males (23,8 %) ($p< 0,05$) [14]. In this study, males predominated (69.2%) over females (30.8%), while the average age was greater than the one previously reported with 58.8 ± 22.8 [14].

Mortality, Neri A, et al. found that patients older than 80 years-old had a risk of mortality 10 times higher than young patients (33.3% vs 3.4%) [9]. While Payá, et al. found that the variables associated with greater mortality were: male sex and age greater than 50 years-old [3]. This is consistent with the results of this study, in which the 3 deceased patients were males and older than 50 years-old [3].

Carillo ER, et al. found that, in the secondary peritonitis, perforation peritonitis had the greater number of patients (60.7%), followed by post-traumatic peritonitis (39.3%) and post-surgery (12.5%) [5]. Barrera E, et al. observed that the causes of peritonitis were: complicated appendicitis 77.66%, abdominal trauma 7.76%, complicated cancer 4.85%, peritoneal tuberculosis 2.91%, hepatic abscess and pathology of the small intestine with 1.94% for each one, and gastric pathology, complicated hernia and complicated diverticulitis with 0.97% for each one [15]. Likewise, they associated that the risk of mortality in patients with peritonitis of non-colonic origin is greater than the risk in patients who have a colonic origin. Non-colonic origin of peritonitis is considered an adverse factor in the Mannheim index, as it was found in our paper [16]. However, this relationship was inconsistent in the Durango Hospital, where it was found a greater mortality in patients with peritonitis of colonic origin [16]. In the current study, 5 patients with MOF (38.5%) had colonic origin, while 8 (61.5%) had non-colonic origin. From the

diagnoses found in the patients' files with MOF, the most frequent was the secondary peritonitis through perforation (4 cases, 30.8%), followed by complicated appendicitis and abdominal trauma (with 15.4% each one) [13,15,16].

In all deceased patients in the study carried out by Barrera E, et al. purulent liquid was found; while in the Durango Hospital, researchers found a greater mortality in the presence of fecaloid liquid (25%), followed by purulent content (6,3%), and finally content of clear liquid (5,8%) [15,16]. In the current study, 2 patients (15.4%) showed serous liquid, 9 (69.2%) showed purulent liquid and 3 (23%) showed fecaloid liquid. The 3 deceased patients showed purulent peritoneal liquid [15,16].

Bracho R, et al. reported that generalized peritonitis was found in 34% of cases, and it was more related to mortality than the localized peritonitis (73% vs 27%). On the other hand, Barrera E, et al. did not find statistically significant difference regarding the extent of peritonitis, either localized or generalized [16]. In the current study, it was found that 3 (23%) cases showed generalized peritonitis [15,16].

Regarding the laboratory data in a study performed by Neri, et al. it was found that out of 142 patients, 52 patients (36.4%) had leukocytes levels greater than 10,000 per microliter, while 11 patients (7.7%) had levels lower than 4,000 per microliter. In addition, 16 patients (11.2%) had the hemoglobin lower than 9g/dl9. In the current study, out of 13 patients that showed multiple organ failure, 9 had anemia and leukocytosis (69.2%) [9].

Severe Sepsis is consistently found to be associated with an impaired coagulation, frequently leading to disseminated intravascular coagulation [13]. These mediators cause platelets deposition, vasodilation, increased capillary permeability and disruption of the natural clotting and inflammation modulators, which eventually cause tissue damage because of the formation of microvascular thrombi [3,4,7,11]. In our study, of the patients who showed MOF, 46.1% had low platelets, 38.5% normal levels of platelets and 15.4% had values above the normal range (OR= 1.120 $p<0.05$). Regarding the TP, 100% of the patients showed high times.

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