















Factors associated with morbimortality in patients with acute traumatic abdomen at the Abel Gilbert Pontón Hospital

Factores asociados a la morbimortalidad en pacientes con abdomen agudo traumático en el Hospital Abel Gilbert Pontón

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Abstract

Introduction: Abdominal trauma is a frequent entity in hospital care. Modifiable factors could be intervened to reduce morbidity and mortality. **Objective:** To identify the factors associated with morbidity and mortality in patients who underwent surgery due to acute traumatic abdomen at the Hospital Abel Gilbert Pontón (HAGP) during the year 2020. **Method:** A retrospective study was conducted in 211 patients over 15 years of age who underwent surgery for abdominal trauma. **Results:** 8.5% of patients presented a complication, and 7.5% died after the first laparotomy. Tachycardia (Complicated 109.2 vs. Uncomplicated 96.7, $p=0.02$), prolonged waiting time for surgery, bowel resection accompanied by ostomy (Complicated 17.2% vs. Uncomplicated 3.3%, $p=0.002$), hemoperitoneum (Complicated 1689.28 vs. Uncomplicated 1025.12, $p=0.001$), leaving the abdomen open (Complicated 66.7% vs. Uncomplicated 14.3%, $p=0.002$) and the need for ICU (Complicated 78% vs Uncomplicated 23.3%, $p=0.001$) had a higher rate of complications. **Conclusions:** After multivariate analysis, tachycardia and leaving the abdomen open increased the risk of complications; and a shock index greater than 1.46, and hemoperitoneum greater than 1200 cc, increased the risk of death after first laparotomy.

Keywords: abdominal trauma, risk factors, morbidity, mortality, complications.

Resumen

Introducción: El traumatismo abdominal es una entidad frecuente a nivel hospitalario, existen factores modificables que podrían intervenir para disminuir la morbimortalidad. **Objetivo:** Identificar los factores asociados a morbimortalidad en los pacientes intervenidos quirúrgicamente por abdomen agudo traumático en el hospital Abel Gilbert Pontón (HAGP) durante el año 2020. **Método:** Se realizó un estudio retrospectivo en 211 pacientes mayores de 15 años de edad operados por traumatismo abdominal. **Resultados:** El 8.5% (18/192) presentó alguna complicación, y el 7.5% (16/195) falleció luego de la primera laparotomía. La taquicardia (Complicados 109,2 vs No complicados 96,7, $p=0.02$), un tiempo de espera para la cirugía prolongado, resección intestinal acompañado de ostomía (Complicados 17,2% vs. No complicados 3,3%, $p=0.002$), el hemoperitoneo (Complicados 1689.28 vs No Complicados 1025.12, $p=0.001$), dejar en abdomen abierto (Complicados 66,7% vs. No Complicados 14,3%, $p=0.002$) y la necesidad de UCI (Complicados 78% vs No Complicados 23,3%, $p=0.001$) tuvieron mayor índice de complicaciones. **Conclusiones:** Tras el análisis multivariado, la taquicardia y dejar el abdomen abierto aumentan el riesgo de complicación; y un índice de shock mayor a 1.46, hemoperitoneo mayor a 1200 cc, y aumenta el riesgo de fallecer luego de realizar la primera laparotomía.

Palabras clave: Traumatismo abdominal, Factores de riesgo, morbimortalidad, complicaciones.

Introduction

Abdominal trauma (AT) represents the first cause of death in the young population, and a relevant cause of death in the general population, only outperformed by cardiovascular disease and cancer in some regions¹. It is estimated that approximately 5 million people die from traumatic injuries yearly, and in America, 11% of all deaths are related to this cause².

AT is an organic injury produced by an external harmful agent integrated with local reactions, leading to specific organic structures suffering some form of damage². AT is classified into closed AT and open AT. In closed AT, two forces are involved: Compression and deceleration³⁻⁵. AT is considered the leading cause of mortality in the first decades of life. In Chile, it was described that by the year 2000, there were over 30,000 deaths between the ages of 15 and 64, and nearly 8,000 were of traumatic etiology. It is worth mentioning that in American countries, the mortality of traumatic injuries is higher in the male sex, with a male-to-female proportion of 2.9 in the United States of America (USA) and Canada, 5.9 in Colombia, 5.0 in El Salvador, 2.4 in Cuba, and 4.2 in Chile⁶.

AT-associated complications are categorized into those that compromise the entire organism resulting in multiorgan failure, and those that are strictly associated with the abdominal wall, such as postoperative hemorrhage, infections, surgical wound dehiscence, compartment syndrome, local or diffuse peritonitis, intra-abdominal abscesses, intestinal obstruction, and acalculous cholecystitis^{1,7}. The complications derived from AT are generated from the traumatic event itself due to hemorrhagic shock, significant transfusions, feces-associated contamination, inadequate surgical technique or poor postoperative management⁸.

The main and most well-known risk factors for developing the aforementioned multiorgan failure are age, trauma severity, type of traumatism (closed or open), trauma location and the organ or multiple organs compromised. Coagulopathy, acidosis, and hypothermia are direct consequences of inflammation and uncontrolled bleeding. As a result, there is great emphasis on adequate fluid reanimation with blood products, low use of crystalloids, and management of the bleeding source through surgical or non-surgical approaches. Other complications are produced directly in the surgical wound, such as infections and wound dehiscence, which is produced due to contamination, devitalized or necrotic tissue, or prolonged surgical time^{9,10}.

Prevention is based on an appropriate initial assessment of the patient, thorough vigilance, using available diagnostic and therapeutic tools, and optimal surgical procedures^{11,12}. This study aims to identify the factors associated with increased morbidity and mortality in acute traumatic abdomen patients surgically treated in the Abel Gilbert Pontón Hospital (AGPH).

Materials and methods

This was a retrospective, observational study of patients admitted due to acute traumatic abdomen in the AGPH of Guayaquil city between 2020 and 2021. The data of the established variables were gathered in an Excel datasheet with prior authorization of the teaching department of the AGPH.

The population was selected through intentional sampling if they were older than 15 years, with a complete medical record, and if they were intervened as a result of AT. Patients that died on hospital arrival or within the first 12 hours were excluded from the study. After applying inclusion and exclusion criteria, 212 patients were selected with abdominal pathology of traumatic etiology that were surgically intervened. Access to the clinical records of these patients was solicited to the competent authorities of the AGPH to carry out this study. Importantly, this activity did not represent any expense to the hospital entity, and appropriate measures were taken to avoid interfering with the institution's standard functioning.

Data was processed and analyzed using the statistical program SPSS v.22. Data was presented as tables and graphics for interpretation and descriptive and inferential purposes. Categorical variables were presented through their frequencies and percentages, and quantitative variables with central tendency and dispersion measures. Crossed tables and graphics were also used depending on the number of variables and Odds Ratio (OR) with the respective confidence interval (CI). Results were considered statistically significant when $p < 0.05$.

Results

The 211 assessed patients were divided into two groups: complicated ($n=18$) and non-complicated ($n=192$). In the complicated group, there was a higher frequency of male patients (77.8%; $n=14$), <45 years (94.4%; $n=17$), shock index <1.1 and a modified shock index (MSI) <1.46 (66.7%; $n=12$), also with Revised Trauma Score (RTS) ≥ 6 (94.4%; $n=17$), penetrating etiology (61.1%; $n=11$). Among those with closed abdominal trauma, traffic accidents were the most common cause (86%; $n=6$), and in those with penetrating abdominal trauma, firearm accidents were the most common cause (100%; $n=11$). Isolated compromise of hollow or solid organ was the principal presentation in complicated subjects (36.7%; $n=11$). Most complicated patients presented hemoperitoneum during the surgical intervention (77.8%; $n=14$) and a greater amount of free blood within the cavity. Primary rafia was the most common procedure in both groups (Complicated 24.1% vs Non-Complicated 48.1%). It was observed that patients with surgical management that included intestinal resection and ostomy had a higher rate of complications (Complicated 17.2% vs Non-complicated 3.3%; $p=0.002$). Patients that were surgically managed through an open abdomen also had an increased rate of complications (Complicated 66.7% vs Non-complicated 14.3%; $p=0.002$).

Those that had Intensive Care Unit (ICU) admission also had a higher frequency of complications (Complicated 78% vs Non-complicated 23.3%; $p=0.001$). Deceased patients had a higher frequency of complications (Complicated 16.7% vs Non-complicated 6.2%) (Table 1).

Table 1. General characteristic of acute traumatic abdomen patients according to complications. Abel Gilbert Pontón Hospital

	Complicated		Non-complicated	
	n	%	n	%
Gender				
Male	14	77,8	179	92,8
Female	4	22,2	14	7,2
Age category (years)				
<45	17	94,4	168	87,1
45 or more	1	5,6	25	12,9
Shock Index (HR/SAP)				
<1.1	12	66,7	153	79,7
1.1 or more	6	33,3	40	20,3
Modified Shock Index (HR/MAP)				
<1.46	12	66,7	148	76,7
1.46 or more	6	33,3	45	23,3
RTS				
<6	1	5,8	3	1,6
6 or more	17	94,4	190	98,4
Trauma Etiology				
Closed	7	38,9	46	23,8
Penetrating	11	61,1	147	76,2
Type of closed abdominal trauma				
Car Accident	6	86	40	87
Fall	1	14	6	13
Type of penetrating abdominal trauma				
Stabbing objects	0	0	42	28,5
Firearms	11	100	105	71,5
Compromised Organ				
Hollow Organ	11	36,7	115	50,9
Solid Organ	11	36,7	79	34,9
Hollow and solid organ	6	20,0	29	12,8
Vascular compromise	2	6,7	3	1,4
Extra-abdominal injuries				
Head	0	0	1	4,2
Neck	0	0	1	4,2
Thorax	1	33,3	11	45,8
Limbs	2	66,7	8	33,3
Pelvis	0	0	3	12,5
Hemoperitoneum				
No	4	22,2	32	16,6
Yes	14	77,8	161	83,4
Coproperitoneum				
No	17	94,4	182	94,8
Yes	1	5,6	10	5,2
Performed procedure				
Primary Raffia	7	24,1	101	48,1
Resection and anastomosis	2	6,9	39	18,6
Splenectomy	5	17,2	29	13,8
Hepatic Packing	4	13,8	12	5,7
Nefrectomy	3	10,3	10	4,8
Resection and ostomy	5	17,2	7	3,3
Pelvic Packing	0	0	4	1,9
Cholecistectomy	0	0	2	1
Other procedures	3	10,3	6	2,9
Abdomen Management				
Open	12	6,7	26	14,4
Closed	6	3,3	155	85,6
ICU requirement				
No	4	22,2	147	76,7
Yes	14	77,8	45	23,3
Death				
No	14	77,8	180	93,3
Yes	4	22,2	12	6,7
Total	18	8,5	192	91,5

HR: Heart Rate, MAP: Mean Arterial Pressure, SAP: Systolic arterial pressure

Concerning the patients' vital signs, reported values did not present significant differences between groups, except heart rate (Complicated HR: $109,2 \pm 30,3$ vs Non-complicated HR: $96,7 \pm 21,6$; $p=0.02$). There were also no significant differences between the laboratory results of the two groups. Patients with prolonged waiting for surgical intervention (time-to-surgery) had a higher frequency of complications ($p<0,001$) (Table 2).

Table 2. Clinical and paraclinical characteristics of acute traumatic abdomen patients. Abel Gilbert Pontón Hospital

	Complicated		Non-complicated	
	n	%	n	%
Age (Years) Median (range)	21	(13-43)	23	(14-44)
Systolic arterial pressure (mmHg) Mean±SD	122,5	27,9	115,0	23,6
Heart rate (bpm) Mean±SD	109,2	30,3	96,7	21,6*
Respiratory rate (bpm) Mean±SD	18,2	1,3	20,4	2,1
O2 saturation (%) Mean±SD	97,5	2,3	97,7	1,9
Time-to-surgery(hours) Mean±SD	13	2,3	3,8	1,9*
Hemoglobin (gr/dL) Mean±SD	12,1	1,7	11,7	1,9
Platelets ($\times 10^3/\text{mm}^3$) Mean±SD	260,6	76,5	254,8	74,4
Thrombin time (sec) Mean±SD	13,3	2,3	13	3,5
Thromboplastin time (sec) Mean±SD	30,5	6,5	28,7	8,8

SD: Standard Deviation

*Student's T test $p<0.05$

Among deceased subjects, there was a clear predilection for men (100%; $n=16$) aged under 45, a shock index <1.1 and an MSI <1.46 (50%; $n=8$), as well as those with an RTS ≥ 6 (93.8%; $n=15$), and penetrating trauma (75%; $n=25$). Traffic accidents were the most common cause of closed abdominal trauma (100%; $n=4$), and firearm accidents were the most common cause of penetrating abdominal trauma (100%; $n=12$). Compromise of hollow organs was most frequent among deceased patients (43.8%; $n=14$), and thoracic trauma was the most common extra-abdominal compromise (100%; $n=4$). Most deceased patients had hemoperitoneum during the surgical intervention (81.3%; $n=13$), with significantly more free blood in the cavity. Regarding the surgery schedule, mortality was highest when the intervention was performed on the night shift (75%; $n=12$). Likewise, patients that received primary raffia or intestinal resection with anastomosis had a higher death frequency (28.6%; $n=8$). Patients that were surgically managed through an open abdomen had a higher mortality (53.3%; $n=8$), similar to those who had an ICU admission (93.8%; $n=15$) (Table 3).

Table 3. General characteristics of acute traumatic abdominal patients according to mortality. Abel Gilbert Pontón Hospital

	Deceased		Non-deceased	
	n	%	n	%
Gender				
Male	16	100	177	90,8
Female	0	0	18	9,2
Age category (years)				
<45	15	93,8	170	87,2
45 or more	1	6,2	25	12,8
Shock Index (HR/SAP)				
<1.1	9	56,3	156	80
1.1 or more	7	43,8	39	20
Modified Shock Index(HR/MAP)				
<1.46	8	50	152	77,9
1.46 or more	8	50	43	22,1
RTS				
<6	1	6,3	3	1,5
6 or more	15	93,8	192	98,5
Trauma Etiology				
Closed	4	25	49	25,1
Penetrating	12	75	146	74,9
Type of closed abdominal trauma				
Car Accident	4	100	42	85,7
Fall	0	0	7	14,3
Type of penetrating abdominal trauma				
Stabbing objects	0	0	42	28,8
Firearms	12	100	104	71,2
Compromised Organ				
Hollow Organ	14	43,8	112	50,0
Solid Organ	9	28,1	81	36,2
Hollow and solid organ	8	25,0	27	12,1
Vascular compromise	1	3,1	4	1,8
Extra-abdominal injuries				
Head	0	0	1	4,3
Neck	0	0	1	4,3
Thorax	4	100	8	34,8
Limbs	0	0	10	43,5
Pelvis	0	0	3	13,1
Hemoperitoneum				
No	3	18,8	33	16,9
Yes	13	81,3	162	83,1
Coproperitoneum				
No	14	87,5	186	95,4
Yes	2	12,5	9	4,6
Surgery Schedule				
Day (8am-5pm)	4	25	77	39,5
Night (6pm-7am)	12	75	118	60,5
Performed procedure				
Primary Raffia	8	28,6	100	47,4
Resection and anastomosis	8	28,6	33	15,6
Splenectomy	3	10,7	31	14,7
Hepatic Packing	4	14,3	12	5,7
Nefrectomy	1	3,6	12	5,7
Resection and ostomy	1	3,6	11	5,2
Pelvic Packing	1	3,6	3	1,4
Cholecistectomy	0	0	2	0,9
Other procedures	2	7,1	7	3,3
Abdomen Management				
Open	8	53,3	31	17,1
Closed	7	46,7	150	82,9
ICU requirement				
No	1	6,2	137	76,7
Yes	15	93,8	44	23,3
Death				
No	14	77,8	180	93,3
Yes	4	22,2	12	6,7
Total	16	8,5	181	91,5

HR: Heart Rate, MAP: Mean Arterial Pressure, SAP: Systolic arterial pressure

Regarding vital signs and admission laboratory parameters, no significant difference was found concerning mortality. Patients that had an increased time-to-surgery interval had a greater frequency of complications ($p < 0,001$) (Table 4).

Table 4. Clinical and paraclinical characteristics of acute traumatic abdomen patients according to mortality. Abel Gilbert Pontón Hospital.

	Deceased		Non-deceased	
	n	%	n	%
Age (Years) Median (range)	21	(13-43)	23	(14-44)
Systolic arterial pressure(mmHg) Mean±SD	105,1	21,8	116,5	24,3
Heart rate (bpm) Mean±SD	105,7	22,5	97,1	22,6
Respiratory rate (bpm) Mean±SD	20,6	3,5	20,3	1,9
O2 saturation (%) Mean±SD	96,8	2,5	98,3	1,8
Time-to-surgery(hours) Mean±SD	11,1	2,3	3,8	1,9*
Hemoglobin (gr/dL) Mean±SD	12,3	1,4	11,7	1,9
Platelets ($\times 10^3/\text{mm}^3$) Mean±SD	251,6	75,8	255,6	74,5
Thrombin time (sec) Mean±SD	14,3	6,7	12,9	3,1
Thromboplastin time (sec) Mean±SD	26,1	6,0	29,1	8,8

SD: Standard Deviation

*Student's T test $p < 0.05$

After multivariate analysis of the risk factors associated with morbidity in patients with AT that were surgically treated, it was observed that those with tachycardia (≥ 110 bpm) had a 2.8 greater risk of developing complications. Moreover, patients treated with open abdomen had a 10.6 times greater risk of presenting complications (Table 5).

Among the mortality-associated factors in AT patients surgically treated, it was observed that those with an $\text{MSI} \geq 1.46$ had a 3.5-fold risk of dying, and those presenting hemoperitoneum ≥ 1200 cc during the surgical intervention had 3.3 greater risk of dying, and leaving the patient with an open abdomen, in the context of damage control surgery, showed a 4.4 greater risk of dying (Table 6).

Table 5. Morbidity-associated factors in abdominal trauma.
Abel Gilbert Pontón Hospital

						CONFIDENCE INTERVAL	
	PATIENTS	COMPLICATED	NON COMPLICATED	p	OR	lower limit	Upper limit
MODIFIED SHOCK INDEX							
≥ 1.46	51	6	45	≤ 0.17	1.6	0.5	4.5
≤ 1.46	160	12	148				
HEART RATE (BPM)							
≥ 110	50	8	42	≤ 0.04	2.8	1.02	7.8
≤ 110	161	10	151				
HEMOPERITONEUM (CC)							
≥ 1200	53	8	45	≤ 0.06	2.6	0.9	7.1
≤ 1200	158	10	148				
OPEN ABDOMEN							
YES	42	12	30	≤ 0.001	10.6	3.7	33.02
NO	169	6	163				
TIME-TO-SURGERY							
≥ 3 HOURS	50	6	44	≤ 0.63	1.6	0.5	4.7
≤ 3 HOURS	161	12	149				

Table 6. Factors associated with mortality in abdominal trauma.
Abel Gilbert Pontón Hospital

						CONFIDENCE INTERVAL	
	PATIENTS	YES	NO	p	OR	Lower limit	Upper limit
MODIFIED SHOCK INDEX							
≥ 1.46	51	8	43	≤ 0.02	3.5	1.2	10.2
≤ 1.46	160	8	152				
HEART RATE (BPM)							
≥ 110	50	5	45	≤ 0.23	1.5	0.45	4.53
≤ 110	161	11	150				
HEMOPERITONEUM (CC)							
≥ 1200	53	8	45	≤ 0.01	3.3	1.1	9.6
≤ 1200	158	8	150				
OPEN ABDOMEN							
YES	42	8	36	≤ 0.01	4.4	1.5	13.03
NO	169	8	161				
TIME-TO-SURGERY							
≥ 3 HOURS	50	3	47	≤ 0.63	0.7	0.19	2.66
≤ 3 HOURS	161	13	148				

Discussion

AT represents one of the most common motives for consultation in our region, affecting nearly 1 of every 3 patients with severe traumatism, which is associated with a 12-18% mortality. In several case series, car accidents are the leading cause of closed AT⁶. This report shows the behavior of this entity in a high-patient volume Ecuadorian hospital. Out of the 211 patients included in this study, 8.5% developed complications, and 7.5% died after the first laparotomy.

Currently, there are several available methods to predict intra-abdominal complications related to concomitant morbidities. Duration of the surgical intervention, type of wound, amount of damaged organs, transfusion of blood products, and the body mass index (BMI) are some of the factors considered to determine the timely surgical intervention in high-risk patients. One of the complications of exploratory laparotomy in AT is abdominal sepsis, which leads to increased healthcare costs, increased chance of reintervention, and severe compromise of the quality of life and risk of mortality¹³.

Amongst the prognostic, the RTS is notable, as it includes the Glasgow coma scale, respiratory rate, and arterial systolic blood pressure. Previously, mortality rates were analyzed in a study of the General Hospital of Latacunga that included 87 patients, using the aforementioned scale in patients diagnosed with trauma after car accidents. There was a predilection for the male sex, and the most compromised organ was the brain, presented as cranioencephalic traumatism. Obtained data from the RTS indicated that 31% of the patients had severe traumatism with a mortality of 32%, which suggests that the RTS scale predicts mortality¹⁴.

Likewise, several factors have been reported to be associated with intra-abdominal sepsis after laparotomy in patients with open AT. In a report of 174 patients, with a mean age of 32 years, predominantly male, where 154 were surgically intervened, sepsis was observed in 10 of them. Similarly, damage control surgery was performed in 20, out of which 9 de-

veloped sepsis. In total, 19 patients developed sepsis, and 18 required surgical reintervention. 25 patients were treated with open abdomen protocols, 13 presented abdominal sepsis, and 6 were treated with closed abdomen. Sepsis-associated factors were reported to be the compromise of the stomach, solid organs, the pancreas, and the duodenum. Surgical wound infection was reported in 1 of every 5 laparotomized patients. According to the severity index of the injury, a score of 15 or higher was associated with increased abdominal sepsis, especially in those with colon, small intestine or stomach compromise, in that order, as a consequence of the anastomotic dehiscence. Other morbimortality-associated factors were damage control surgery and open abdomen protocols¹³.

Our findings resemble those reported by Sánchez et al., where patients treated with open abdomen protocols had significantly greater complication rates. Consequently, open abdomen management did not decrease morbidity despite being implemented in less severe injuries¹⁵. Furthermore, these results concur with those reported by Aymaya et al., who analyzed the treatment given to stabbed patients and the risk factors that influenced their prognosis in the Viedma Hospital (2010-2011). It was evidenced that tachycardia was present in 94% of the patients and that this factor significantly influenced the appearance of complications and increased in-hospital stay¹⁶.

Furthermore, in our study, it was observed that patients who required ICU admission presented more significant mortality and complication ratios than those who did not require ICU admission. Similarly, those who required surgical management through intestinal resection associated with ostomy also presented a higher proportion of complications. These findings are similar to those of Pinilla et al., who observed that implementing colostomies resulted in higher mortality rates and complications. Therefore, the gold-standard procedure is the primary resection in colon and intraperitoneal rectum trauma¹⁷.

On the other hand, among the factors associated with mortality in surgically treated AT patients, it was observed that an $MSI \geq 1.46$ increased 3.5-fold the risk of death. On the other hand, leaving an open abdomen, in the context of damage control surgery, increased the risk of mortality 4.4 times. These findings resemble those of Trapani et al., who analyzed 42 patients that were intervened and left with an open abdomen. They found the mortality rates were more significant in the open abdomen group, irrespective of the trauma etiology. The mortality rate was 52.4%, the most common cause being intra-abdominal sepsis¹⁸.

Lastly, regarding the time-to-surgery in the context of AT, our research showed that patients with longer time-to-surgery intervals had higher mortality. Moreover, tachycardia over 110 bpm increased the mortality risk 1.5 times. In an investigation by Evers et al. that involved specifically splenic trauma patients, out of 116 subjects (85.2% male), concomitant injuries were reported in 75.9% of the sample, diaphragmatic being the most common at 31%, followed by liver at 17.2%, and kidney at 11.2%. The most common trauma mechanism was knife stabbing at 29.3%, firearm accidents at 22.4%, and car accidents at 22.4%. Severity classification resulted in 24.1% grade V injuries and 23.3 grade I injuries. Total splenectomy was performed in 39.7% of the patients, and 15.2% received conservative treatment. Mortality was 4.3%, 3 subjects in the immediate postoperative interval and 2 within the first postoperative week¹⁹. As a result, in patients with penetrating AT, conservative treatment was suggested to be safe, resulting in decreased ICU/traumatology in-hospital stay, with a mean of 1.9 fewer days²⁰.

Conclusions

Among the 211 analyzed patients, 8.5% developed complications, and 7.5% died after their first laparotomy. Patients were mostly male and under 45 years. ICU admission and greater intra-operative hemoperitoneum were associated with greater morbimortality after the laparotomy in AT patients. After multivariate analysis, tachycardia and open abdomen protocols increased the overall risk of complications; similarly, an MSI over 1.46, hemoperitoneum greater than 1200 cc, and leaving an open abdomen increased the risk of death after the first laparotomy.

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