Open abdomen: Analysis of indications, prognostic factors of mortality and outcomes in non-trauma patients undergoing emergency surgery

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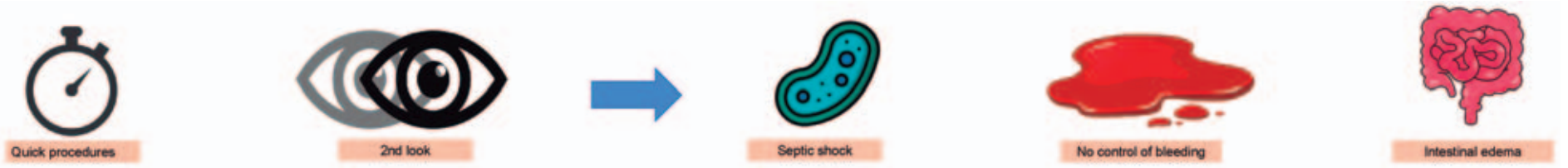
Introduction

The open abdomen (OA), is a surgical technique applied in the diagnostic and therapeutic management of complex surgical patients with compromised physiology that emerge from the concept of damage control.



OA facilitates quick procedures and a second look without damaging the abdominal fascia. It is useful in case of septic shock, inability to control the source of infection or bleeding, loss of abdominal wall and important visceral oedema, the demand of a deferred intestinal anastomosis, the need to remove the surgical packing used to achieve hemostasis or to confirm the viability of intra-abdominal organs The OA aim is to achieve definitive abdominal wall closure in another surgery when tolerated by the physiology of the patient.

Technical aspects, importance of intraoperative findings, and data about morbidity and mortality have not been rigorously protocolized nor described in OA on non-trauma patients. Projects such as IROA, led by the World Society of Emergency Surgery (WSES), have been initiated to solve this lack of information, but it is still not achieving its objectives nowadays.

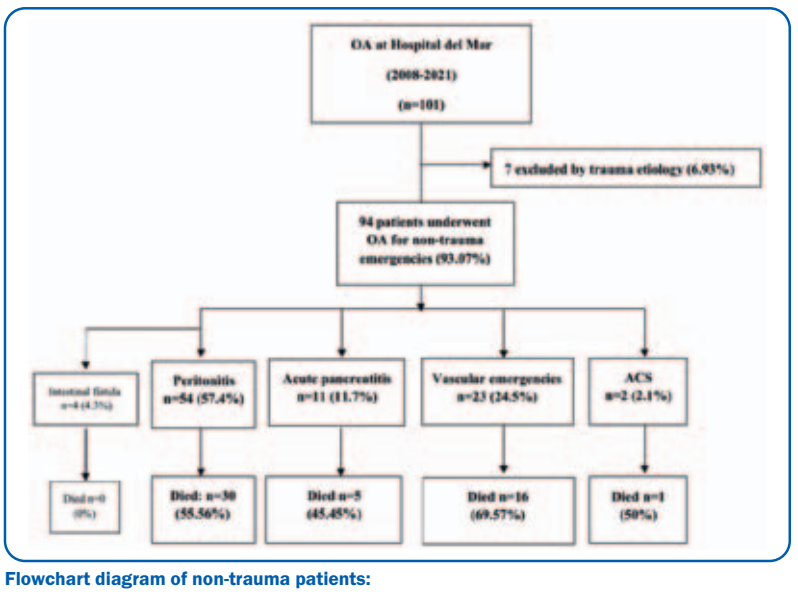
The aim of this study is to analyse and report indications, prognostic factors of mortality and the results of the application of OA in non-trauma patients, through the description and analysis of the collected data about 94 non-trauma patients who underwent OA across a 13-year period in the Hospital del Mar of Barcelona.

Material and methods

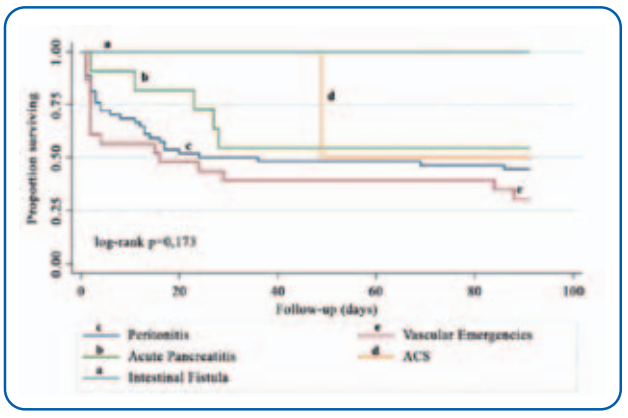
Patients between July 2008 and August 2021 who underwent OA for non-traumatic emergencies, by the Digestive and Emergency Surgery Department of the Hospital del Mar in Barcelona, were incorporated into a prospective after the surgeries. Patients who underwent OA for trauma were excluded. Patients included in this study were followed up for 90 days after the first OA surgery. We collected demographic and clinical data, comorbidities, indications, intraoperative findings, surgical technique, materials, definitive closure (DC) rates, duration of OA, complications, reinterventions, and length of admission, among others. Surgical risk has been calculated by different common scales.

OA was carried out in patients who presented non-trauma emergencies encompassed mainly within the diagnosis of peritonitis, vascular emergencies, acute pancreatitis, abdominal compartment syndrome (ACS), or intestinal fistula. A decisive factor was the presence of at least one OA trauma criterion: serum pH<7.25, arterial systolic blood pressure (SBP) ?70mmHg, hypothermia <35ºC, international normalized ratio (INR) ?1.7 or transfusion of 5 or more packed red blood cells (RBCs).

Results



Flowchart diagram of non-trauma patients:



Kaplan-Meier survival analysis of the occurrence of death

	Survivors (n=42) Median [IQR] or n (%)	Exitus (n=52) Median [IQR] or n (%)	Univariate analysis p
Age (years)	65.0 [56.0; 72.0]	72.0 [60.0; 79.0]	**0.016***
Age (>70 years)	13 (31.0%)	27 (51.9%)	0.059
Gender (male)	23 (54.8%)	35 (67.3%)	0.286
ASA	3.0 [3.0; 4.0]	4.0 [3.0; 4.0]	**0.036***
ASA ≥ 3	36 (85.7%)	51 (98.1%)	**0.042***
Charlson Comorbidity Index	1.5 [0.0; 3.0]	2.0 [1.0; 5.0]	**0.050***
Age-adjusted Charlson Comorbidity Index	4.0 [2.0; 6.0]	5.0 [4.0; 8.0]	**0.020***
OA trauma criteria			
pH < 7.25	14 (33.3%)	41 (78.8%)	**<0.001***
Hypothermia < 35ºC	1 (2.4%)	3 (5.8%)	0.814
INR ≥ 1.7	10 (23.8%)	21 (40.4%)	0.061
SBP ≤ 70 mmHg	35 (83.3%)	51 (98.1%)	**0.020***
Transfusion ≥ 5RPC	2 (4.8%)	7 (13.5%)	0.181
Number of OA criteria	1.0 [1.0; 2.0]	2.0 [1.0; 3.0]	**0.003***
pH	7.3 [7.2; 7.3]	7.1 [7.1; 7.2]	**<0.001***
Temperature	36.5 [36.0; 38.2]	36.1 [35.4; 37.4]	**0.036***
INR	1.4 [1.2; 1.7]	1.6 [1.3; 1.9]	**0.042***
Lactic acid (mmol/L)	2.5 [1.4; 4.9]	7.9 [2.5; 12.3]	**<0.001***
Lactic acid ≥ 3mmol/L	17 (40.5%)	37 (71.2%)	**0.003***
Glucose levels (mg/dL)	149.0 [108.0; 179.0]	153.4 [106.0; 211.0]	0.880
Hemoglobin (g/dL)	9.6 [8.2; 11.0]	9.4 [8.4; 11.2]	0.915
Leukocytes (10^3/µL)	13.5 [7.0; 19.8]	12.8 [8.5; 19.3]	0.879
Creatinine (mg/dL)	1.3 [0.8; 2.5]	2.1 [1.4; 2.8]	**0.010***
Urea (mg/dL)	77.0 [47.0; 115.0]	104.7 [63.1; 156.5]	**0.012***
Peritoneal fluid culture	32 (76.2%)	44 (84.6%)	
Positive culture	26 (61.9%)	28 (53.8%)	0.162
GNB	18 (42.9%)	15 (28.8%)	0.095
GPC	13 (31.0%)	16 (30.8%)	0.558
Anaerobic	2 (4.8%)	5 (9.6%)	0.457
Fungus	8 (19.0%)	8 (15.4%)	0.455
SOFA	5.0 [1.0; 8.0]	9.0 [5.0; 12.0]	**<0.001***

Univariate analysis of prognostic factors of mortality at 90 days

Conclusions

OA is a controversial but safe surgical indication for selected non-trauma patients who have a high probability of morbimortality.
Age, comorbidities (higher ASA and Charlson scores), organ failure and altered physiology (acidosis, higher lactic rates, renal failure, higher SOFA score) hinder better survival rates.
Peritonitis and acute pancreatitis could benefit the most in terms of survival.
Further studies are necessary to protocolize and establish indications and techniques, among others, to objectivize decision-making and avoid interhospital variability.

	HR [CI 95%]	p value
Age (>70 years)	1.625 [0.856; 3.083]	0.138
Gender (male)	0.938 [0.444; 1.985]	0.868
BMI (Kg/m2)	1.065 [1.016; 1.116]	**0.008***
Charlson Comorbidity Index	1.198 [1.061; 1.352]	**0.003***
pH < 7.25	2.652 [1.226; 5.734]	**0.013***
SBP ≤ 70 mmHg	1.423 [0.174; 11.662]	0.743
Transfusion ≥ 5RBCs	1.681 [0.599; 4.712]	0.324
Lactic acid ≥ 3mmol/L	1.637 [0.807; 3.318]	0.172
Creatinine clearance	0.996 [0.987; 1.005]	0.383

Statistically significant values are given **in bold and ***

HR, Hazard ratio; CI, confidence interval; BMI, body mass index; pH, potential of hydrogen; SBP, systolic blood pressure; RBC, red blood cells

Multivariate analysis prognostic factors of mortality at 90 days

Hospital del Mar

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