

# Dilemmas Regarding Abdominal Re-Exploration for War Casualties Following On-Site Abdominal Trauma Surgery and Subsequently Delayed Arrival to Medical Care Abroad – An Unusual Scenario

**Amitai Bickel**

Galilee Medical Center

**Konstantin Akinichev**

Galilee Medical Center

**Michael Weiss**

Galilee Medical Center

**Samer Ganam** (✉ [ganamsamer11@gmail.com](mailto:ganamsamer11@gmail.com))

Galilee Medical Center

**Eli Kakiashvili**

Galilee Medical Center

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## Research article

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# Abstract

**Background:** During the Syrian civil war, casualties were treated on-site and only later transferred to foreign medical centers. Significant number needed abdominal re-operation. Our aim is to present our approach to abdominal trauma casualties who survived the on-site surgery and needed abdominal reoperation abroad.

**Methods:** Medical data from all medical records were retrospectively analyzed. Each patient underwent total body computerized tomography on arrival, revealing diverse multi-organ trauma. We divided the casualty population involving abdominal trauma into 4 sub-groups according to the location of abdominal surgical intervention, focusing on missed injuries and post-operative complications in the re-laparotomy sub-group.

**Results:** By July 2018, 236 casualties suffering abdominal trauma (among 1331 trauma casualties) had been admitted to our hospital. Life-saving abdominal interventions had been done in 138 subjects in Syria before arrival to our medical center. Seventy-nine underwent abdominal surgery in Israel, of whom, 46 (33.3%) needed abdominal re-laparotomy. Indications for re-exploration included severe peritoneal inflammation, neglected abdominal foreign bodies, hemodynamic instability and intestinal fistula. Mortality occurred in 37/236 patients, with abdominal trauma as the main cause of fatality in 10 of them (4.2%), usually following urgent re-laparotomy.

**Conclusions:** Clinical presentation of the Syrian casualties following emergency medical care outside our borders, and the fact that re-operation was not done by the same team responsible for the initial abdominal intervention posed major diagnostic challenges and necessitated increased suspicion and changes in our medical approach.

## Background

The horror and tragedy of the civil war in Syria is well-known and documented, including the fact that more than half a million people, mostly civilians, were killed. Beginning in 2013, some Syrian casualties received definitive medical care at civilian hospitals across the border in Northern Israel. This scenario posed political and ethical dilemmas, as Syria and Israel have been in a formal state of war for decades.

Considering the atypical management of war casualties during the Syrian civil war, it is necessary to first describe, in brief, the evolution of the common medical doctrine in order to understand the disparity that manifested in the current crisis. The modern medical approach and management of military trauma in Western armies including in Israel, has evolved over the last 250 years. This doctrine dictates the advancement of dedicated and specialized medical units towards frontlines of the battlefield, together with provision of medical aid (definitive, if possible) as soon as possible, and accelerated transportation of casualties towards trauma medical centers in the frontline. The improvement in understanding and implementing the principles of the modern medical approach to battlefield casualties has been clearly documented throughout history, from the American Revolution and the American Civil War, World Wars I

and II, the Korean, Vietnam and Afghanistan wars, etc. (1–9). There has been a consistent and significant decrease in morbidity and mortality from combat wounds, together with increased knowledge regarding the pathogenesis and management of diverse war injuries and their consequences (10–16). The principles of the modern military medicine have also been fully implemented in the Israeli army (17).

In contrast, the conditions, circumstances and events pertaining to Syrian casualties were different. The medical aid in Syria during the war was mostly sub-optimal as many hospitals were heavily damaged during the massive bombing, and there was a significant lack of specialized medical personnel. Many of the wounded were from mass casualty incidents, so that even when life-saving medical aid was accessible, it was done under extreme conditions that prevented efficient definitive medical care in most cases (18, 19). There were no available data regarding the rate of survivors among the total number of casualties. Wounded survivors who reached our hospital arrived typically days and even weeks after having been wounded in addition to a likely lag in getting initial (or definitive) management, some harboring neglected medical problems. Thus each and every patient presented a medical enigma. Due to lack of any communication across the border between the two countries, we received patients but no medical information about the causes of injury and its consequences, and the medical aid that was provided on scene. No documentation regarding the type of surgery that had been done – whether it was damage control or an attempt at definitive surgical management. No laboratory test results were available to us. The admission of critically injured Syrian casualties in such a scenario created major clinical dilemma, mainly due to the probability of misleading clinical presentation, mandating a change in our medical approach.

In the scenario in which we found ourselves, the issue of urgent re-laparotomy for abdominal trauma in a foreign country (in conjunction with diverse multi-organ injuries) needed special consideration. Obviously, definitive surgery could not be accomplished whenever physiologic considerations regarding evolving hypothermia, metabolic acidosis and coagulopathy were taken on-site. The military medical literature, in contrary to the current scene, usually refers to re-laparotomy following trauma as executed by the surgeons who were involved in the prior abdominal intervention. Consequently, the definition and the type of re-laparotomy in such scenario needed revision (20–24).

The aim of our study was to summarize our cumulative medical experience specifically regarding re-treatment of already-treated abdominal trauma of the Syrian casualties, with an emphasis on re-laparotomy. We searched for the indications for re-laparotomy and prognostic parameters that could have predicted deterioration of medical status, with the aim of changing the strategic mode of care for similar scenarios elsewhere.

## Methods

The study was approved by the institutional Ethics Committee (Helsinki). On their arrival, each patient had been guided immediately into the emergency department for primary assessment and stabilization. Apart from those few who needed immediate urgent surgery, each patient underwent total body

computerized tomography on arrival, for complete physical assessment and to rule out (due to lack of accompanying medical documentation) unexpected abnormal findings. For our study, all the medical charts, together with medical documentation from the emergency room, operating rooms, and Departments of Surgery and Intensive Care were meticulously examined and analyzed by experienced senior surgeons. All the data relating to type of injury, laboratory and imaging findings, indications for abdominal surgery, intra-operative findings and surgical reports, time interval until admission to our hospital, injury severity score, etc., were constructed into an excel matrix, enabling concrete evaluation of data and statistical analysis.

## Statistical analysis

We used the IBM – SPSS statistic software version 25, for the statistical analysis.

Quantitative variables were described by means and standard deviation. Qualitative variables were described by frequencies and percentages. Quantitative variables between sub-groups were compared by the Independent sample t-test or the Wilcoxon rank sum test. The comparison of ordinal data was done by the Wilcoxon rank sum test, while comparison of qualitative data was done by the Chi square test or alternatively by the Fisher's exact test (when expectancy < 5). A p-value equal or less than 0.05 was considered statistically significant.

We used the univariate and multivariate logistic regression analysis to evaluate parameters related to mortality due to abdominal trauma. We have reported the R-square measure, p-value, the Odds Ratio (OR) and 95% confidence interval (CI). The variables that were found to be significant in the univariate analysis (p-value less or equal 10%) were chosen to be included in the multivariate model, using the backward selection method.

## Results

Between 2013–2018, 1331 injured (among total of 1935 patients, including diverse illnesses) victims of the Syrian Civil War were admitted to Galilee Medical Center (Nahariya, Israel). Abdominal involvement was observed in 236 subjects (constituting our study group), with 138 abdominal surgeries apparently having been performed in Syria. The main causes of the abdominal trauma included blast injuries in 7%, shrapnel injuries in 45%, gunshot wounds in 40%, and combined injuries in 8%.

The elapsed time from the occurrence of injury to admission in our medical center was 1–14 days in 77% of arrivals. In 149 casualties, arrival was within the first 7 days. In 12% of casualties elapsed time was between 14 days to 3 months. The remainder are timely distributed up until 3 years.

Seventy-nine casualties underwent abdominal surgery in Israel. In 46 of those 79 patients, the surgery was considered a re-laparotomy, following previous abdominal surgery in Syria (46/138, 33.3%). In 32/79 casualties, it was the first abdominal surgery.

For a better interpretation of the data, we divided our study group (236 patients) into four sub-groups regarding the surgical approach to abdominal trauma: 1). Patients who underwent abdominal surgery only in Syria, total – 93 patients; 2). Patients who underwent abdominal surgery in both Syria and Israel, re-laparotomy – 46 patients; 3). Abdominal surgery only in Israel – 32 patients, and 4). Patients without any abdominal surgical involvement – 65 subjects. The mean age in the study group was  $25.85 \pm 9.35$  years (range 3 to 61 years), without significant difference among the four sub-groups ( $p = 0.12$ , Anova test). Twenty-five patients were young (3 to 16 years), equally distributed among the four sub-groups.

Of 52 subjects operated on the day of arrival, 22 were considered to be a re-laparotomy (sub-group 2, 47.8%). The remaining 30/52 operated on the first day belonged to sub-group 3 (30/32, 93.75%,  $p = 0.001$ , chi square test). In 20/52 subjects the abdominal surgery was urgent, within two hours from arrival to our hospital. Of these 20 patients, 12 belonged to sub-group 3 (12/32, 37.5%), and 8 belonged to sub-group 2 (8/46, 17%,  $p = 0.042$ , chi square test).

Considering total body CT findings on arrival as reflected in our four sub-groups – brain injury rates were significantly higher in sub-groups 3 and 4, who had not undergone abdominal surgery in Syria (16/139 brain casualties in groups 1&2, 11.5%, vs. 28/97 in groups 3&4, 28.9%,  $P = 0.001$ , Chi square test). It may be assumed that under extreme warfare circumstances, fewer abdominal surgeries were done whenever severe head injury was involved. However, the distribution of intestinal injuries (duodenum, rectum, large and small intestine) was significantly higher in sub-group 2 (re-laparotomy) in relation to other sub-groups, without considering associated trauma (27/46 casualties, 58.7%,  $p = 0.001$ , Chi square test). The remaining injuries (liver, spleen, stomach, pancreas, diaphragm) were equally distributed between all sub-groups ( $p = 0.11$  to  $p = 0.52$ , Fisher exact test).

Focusing on the re-laparotomy sub-group (46 casualties, 40 males, mean age 26 years, range 9–55 years), injury types included shrapnel (22 patients), gunshot (16), blast (5), shrapnel and gunshot (1) and unknown reasons (2).

The indications for re-laparotomy were urgent in 39 patients, and planned in seven.

The indications for the planned re-laparotomy were loop colostomy (following successful abdominal surgery in Syria) for severe spine injury leading to paraplegia in two patients, and "closure" of colostomy / ileostomy (Intestinal re-anastomosis) following life- saving abdominal surgery abroad, in five patients.

Time elapsed from the trauma insult until arrival to our medical center was recorded on the day of trauma (3 casualties), one day following trauma – 4, Two days – 2, three days – 5, four days – 4, five days – 2, six days – 1, seven days – 4, one to four weeks – 7, and above.

Time elapsed from arrival to our center until urgent re-laparotomy for 22 casualties was recorded on the day of arrival (in eight patients, re-laparotomy was done within the first two hours of arrival). In three subjects, re-laparotomy was done on day 2 and the remaining re-laparotomies were done on days 3, 4 and 5 (one patient each), day 6 (two patients), and the others distributed through day 65.

The main indications for the emergent re-laparotomies were missed traumatic injuries in 19 casualties (19/39, 48.7%), and complications of the previous surgery in 22, including 8 casualties for whom we noted a combination of missed injury with post-surgical complications. Other miscellaneous indications were noted in six patients.

Missed injuries and complications following previous abdominal surgery and miscellaneous indications requiring urgent re-laparotomy are detailed in Table 1. All the above left unattended could have led to various severe clinical consequences such as peritonitis, abscess formation, sepsis and hemodynamic instability.

Table 1

Diverse disorders leading to urgent abdominal re-operation, due to missed injuries, following previous surgical complications, and miscellaneous indications.

<b>Missed injuries</b>	<b>Number of patients</b>
Rectal perforation	2
Laceration of Lt. large intestine	5
Laceration of ureter	1
Diaphragmatic laceration, leading to traumatic hernia	2
Uncontrolled hepatic hemorrhage	1
Shrapnel injury to IVC	1
Gastric perforation, leading to sepsis and hemodynamic instability	1
Segmental intestinal necrosis	1
Gallbladder perforation	1
Colo-cutaneous fistula	1
Perforation of Rt. Colon	1
Recto-urinary bladder fistula	1
Recto-vaginal fistula	1
Small-bowel to retro-peritoneum fistula	1
<b>Complications following previous abdominal surgery</b>	
Failure of anastomosis of large intestine	2
Failure of abdominal wall suturing leading to evisceration	3
Failure of anastomosis of small bowel	4
Segmental necrosis of small bowel	1
Injury to femoral vessels	1
Failure of gastric suturing	1
Failed splenic hemostasis	1
Post-operative internal hernia	1
Failed suture of urinary bladder	1
Pancreatic necrosis	1
<b>Miscellaneous indications</b>	

Missed injuries	Number of patients
Removal of foreign body (medical pads)	1
Removal of neglected foreign bodies	4
Second-look exploratory laparotomy following multi-organ injury and hemodynamic instability	1

Clinical presentation as the main factor leading to urgent abdominal surgical re-intervention (without straightforward imaging evidence of intra-abdominal abnormalities) was noted in eight patients (Table 2).



Table 2

Assessing the role of clinical presentation and abdominal computed tomography as the dominant factor leading to re-laparotomy .

Findings	Number of patients
<b>Clinical presentation</b> as the main factor leading to urgent re-laparotomy (without straightforward imaging evidence of intra-abdominal abnormalities – 8 subjects)	
Hemodynamic instability	3
Septic shock	1
Active bleeding (blood emerging out of drains)	1
Fecal content emerging from surgical drains	2
Acute abdomen	2
Small bowel obstruction	1
Abdominal wall evisceration	2
<b>Abdominal computed tomography</b> findings as the dominant factor leading to re-laparotomy (in face of a paucity of abnormal clinical presentation – 14 cases)	
Intra-abdominal free air and significant fluid	4
Intra-abdominal foreign materials	3
Intra-abdominal shrapnel in the vicinity of vital organs (IVC...)	2
Inflammatory peritoneal involvement, fat opacity and fluid collections	4
Suspected colo-rectal and urinary bladder injury	5
Intestinal fistula to vagina and urinary bladder	3
<b>Combined abnormal clinical presentation and abdominal CT</b> modalities leading to urgent re-laparotomy – 39 cases	
Hemodynamic instability and penetrating wound together with Free abdominal gas and active vascular bleeding	1
Intra-abdominal fecal drainage together with extra-luminal Intra-abdominal gas and fluid collections, fat opacity	4
demonstration of traumatic diaphragmatic herniation (stomach, intestine)	1
Abdominal tenderness and penetrating wound together with intra-peritoneal gas, fluid collections and foreign bodies	1

<b>Findings</b>	<b>Number of patients</b>
Hemodynamic instability and abdominal compartment syndrome together with peritoneal free gas and fluids	<b>1</b>
Sepsis, abdominal tenderness, fecal drainage together with peritoneal Shrapnel, intestinal wall thickening, free fluid and gas	<b>3</b>
Drainage of bile and worms from abdominal wound together with free gas and fluid and free peritoneal intestinal contrast fluid	<b>1</b>
Drainage of bile and worms from abdominal wound together with free gas and fluid and free peritoneal intestinal contrast fluid	<b>1</b>
Dirty drainage out of pleural drain together with supra-hepatic free fluid with gas bubbles	<b>1</b>
Open chest wound, severe abdominal wall wound and protruding pads, together with foreign body in the proximity of large intestine, and free abdominal gas	<b>1</b>
Fever, tachycardia, gluteal dirty drainage together with gas bubbles and Fluid anterior to psoas muscle	<b>1</b>
Suspected intestinal fistula and fecal drainage together with intestinal obstruction, shrapnel and free peritoneal fluid and gas bubbles	<b>2</b>

Abnormal computed tomography findings as the dominant factor in the decision for re-laparotomy (and a paucity of abnormal clinical presentation) were noted in 14 cases (Table 3).

Table 3  
Various surgical procedures following re-laparotomy regarding our casualties.

<b>surgical procedure</b>	<b>Number of patients</b>
Removal of abdominal foreign bodies	<b>4</b>
Repair of interruption of sutures of abdominal wall	<b>3</b>
Repair of intestinal fistula to vagina, urinary bladder and skin	<b>2</b>
Peritoneal lavage and debridement following peritonitis	<b>29</b>
Drainage of abscesses	<b>8</b>
Debridement of pancreatic necrosis	<b>1</b>
Revision and reconstruction of ileostomy	<b>2</b>
Suture of inferior vena cava	<b>1</b>
Hemostatic suturing of gastric vessels	<b>1</b>
Suture of Diaphragm	<b>2</b>
Various surgeries of the large intestine	<b>15</b>
Cholecystectomy	<b>1</b>
Re-hemostasis of hepatic and splenic bleeding	<b>3</b>
Resection of spleen	<b>2</b>
Various surgeries of the small intestine and duodenum	<b>9</b>
Resection of urinary bladder and creation of ileum conduit	<b>1</b>
Creation of colostomy or ileostomy	<b>6</b>
Gastro-intestinal anastomosis	<b>1</b>

Combined abnormal clinical factors together with abnormal CT modalities were responsible for that decision in 17 patients (Table 2).

Accordingly, various surgical procedures regarding those 39 casualties (urgent re-laparotomy) were performed (Table 3)

Following meticulous data evaluation, we exposed three cases for whom (according to our subjective conclusions), earlier surgical re-intervention in our hospital would likely have improved medical outcome. All three casualties were alert and have hemodynamic stability on arrival, without peritoneal irritation and fever, following abdominal surgery for shrapnel and gunshot injuries. Abdominal CT revealed abnormal findings including large fluid collections containing free gas bubbles, free abdominal gas, fat opacity, suspected diaphragmatic laceration and intra-peritoneal shrapnel. Re-laparotomy had been performed

following fecal draining on the fifth day (due to missed sigmoid perforation and pelvic fecal collection), on the 13th day following biliary peritonitis sepsis and sub-diaphragmatic abscess (due to missed perforation of gallbladder, and on the 15th day after arrival following gradual clinical deterioration and fecal drainage out of the surgical wound (due to purulent peritonitis without obvious intestinal perforation).

Following admission to our medical center, 37 casualties had deceased. The time interval in Syria until arrival to our hospital in those 37 fatalities could be obtained for only 21 of those subjects. Among them, 10 were admitted within 24 hours of injury, six following a 24-48- hour stay in Syria, and three following 48–72 hours. We could not draw significant conclusions regarding the association between delayed arrival time and fatality rate. Eighteen casualties among the deceased (48.6%) had already undergone abdominal surgery in Syria and 12/37 casualties had abdominal surgery in our hospital. In eight of those 12 patients (67%) it was a repeated abdominal surgical intervention, following previous abdominal surgery in Syria.

Forty-four patients among our study group had suffered severe brain injury (44/236, 18.6%). Nineteen among those casualties deceased (19/44, 43.2%,  $p = 0.001$ , Fisher exact test). Mortality rate in the remaining casualties without significant brain injury approached 9.4% (18/192). It seems that brain injury was a significant factor for fatality in our abdominal trauma study group. Following meticulous medical investigation, our experienced senior surgeons validated abdominal trauma as the primary cause of death in 10 casualties (mainly due to fecal peritonitis, septic shock and blood loss, including additional multi-organ trauma), resulting in 10/236 casualties (4.2%). Regarding those 10 deceased, all had undergone abdominal surgery. Two had been operated only in Syria, three had primary abdominal surgery in Israel and five had re-laparotomy in Israel following urgent surgery in Syria. As 7/10 of the deceased had had abdominal surgery in Syria, it can be stressed that 5/7 (71.4%) needed repeat abdominal surgical intervention in Israel (group 2).

The main causes of death included severe brain injury (8 fatalities), septic shock and peritonitis (3), severe pulmonary trauma and sepsis (5), multi-organ trauma and failure (pulmonary, vascular, orthopedic trauma) – 15, vascular and orthopedic trauma including gas gangrene and septic shock – 1, and multi-organ failure involving hemorrhagic shock (5 subjects).

The mean Injury severity score (ISS) of the survivors was  $23.3 \pm 13$  while ISS of those who deceased was  $41.4 \pm 14.5$ ,  $p < 0.001$ , t-test. The mean ISS was not significantly different among the four sub-groups ( $p = 0.23$ , Fisher exact test and  $p = 0.16$ , Kruscal-Wallis test).

Following multivariate analysis using the backward method, five parameters were selected to be in accordance with mortality due to abdominal cause. The final list included severe spleen injury ( $P = 0.019$ ), intestinal trauma ( $p = 0.064$ ), ISS above 50 ( $p = 0.021$ ), AST above 200u ( $p = 0.012$ ), and the need for an urgent abdominal surgery on the first day of arrival ( $p = 0.038$ ). Hemodynamic instability was not included as it does not necessarily represent abdominal trauma as the main etiology regarding multi-trauma setting.

## Discussion

In our study we describe our experience dealing with a significant percentage of military casualties undergoing re-laparotomy following initial abdominal intervention in a foreign country during a civil war. Despite the repeat abdominal surgery being the main issue, we decided not to detach the main topic from the extraordinary and complex circumstances regarding all the casualties as a group, in order to try and gain an optimal understanding of the situation and to establish the proper conclusions.

The Syrian civil war was a tragedy that has led to more than half a million victims. The Israeli attempt at medical assistance in this unique situation posed humanitarian dilemmas that were associated with ethical, moral, military and political aspects (25). Those casualties who survived the battlefield and the prolonged transportation time actually represent a selected group of severely wounded patients, some with very complex medical problems. The medical policy regarding the approach to the wounded, and the life-saving link between the (sometimes unsuspecting at least on the Syrian side) medical teams on both sides of the border, was largely different from recent warfare history (1–9, 26–28).

Many survivors who managed to approach the border had undergone life-saving surgical procedures in Syria under extremely sub-optimal settings. Those casualties did not carry with them any documentation related to their medical status and the relevant surgical interventions. Such situations necessitated altering the common medical approach by including meticulous re-evaluation for each subject together with total-body computerized tomography that not infrequently revealed unexpected intra-abdominal findings (29). Such approach consequently led to abdominal surgery even in those casualties who presented hemodynamic stability on arrival and following what had seemed to be definitive abdominal surgical intervention in Syria.

According to the data, abdominal surgical intervention in a foreign country did not eliminate the need for repeated surgical intervention in our medical center (sometimes urgent). As we speculate that most surgeries abroad were life-saving and done under extreme conditions, we did not approach them as definitive surgical solutions in most cases (most abdominal surgeries were done on the first day of admission). We assumed that abdominal trauma in those cases was so severe, that only life-saving procedures could have been done, and repeat surgery was indeed obligatory. All the above reflect the significantly high proportion of re-laparotomies in our study (33.3%), undertaken mainly due to missed injuries and post-operative complications. As was expected, patients with abdominal missed injuries (together with additional traumatic factors) reflected severely injured casualties, and were associated with severe morbidity (30, 31). Comparing our re-laparotomy sub-group to the others, showed that the rate of abdominal interventions was statistically higher, reflecting increased intestinal injury. This again emphasized that a recent previous abdominal surgery was not a guarantee for a definitive procedure.

However, it seems that in spite of high alertness, pitfalls still may occur, as surgeons in our hospital were misled in three cases, all of them leading to delayed re-laparotomy, as clinical presentation was deceptively benign while the imaging modalities indicated need for immediate abdominal intervention. This stresses, once again, our argument favoring a very high grade of suspicion in such settings.

As abdominal trauma usually involved multi-organ injuries, it should not be overlooked that severe brain injury significantly influenced mortality rate in all sub-groups. We also surmised, that occurrence of severe brain injury reduced the rate of abdominal surgical intervention in Syria, due to the inability to sustain fair atmosphere for proper medical care.

Regarding mortality in such a setting, the cause of death primarily due to abdominal trauma (in addition to other severe comorbidities) should be highlighted. Following meticulous medical analysis of 37 deceased casualties, we found 10 who deceased mainly due to abdominal trauma. All of these underwent abdominal surgery, including five who had undergone surgery in Syria, and subsequent repeat emergency abdominal intervention in Israel (re-laparotomy in 5/7, 71.4%), stressing again the severity of trauma affecting those cases, and leading to high fatality rate.

Following univariate and multivariate logistic regression analysis, we attempted to look for parameters that might disclose their association with mortality due to abdominal trauma in a multiple trauma scenario. However, in practice, we did not intend to rely solely on those parameters, due to the complexity and interplay of many medical and other factors that were related to those casualties. All the above data mandate the adaptation of the medical approach as relevant and applicable even in similar warfare scenarios elsewhere.

Studies regarding damage control resuscitation and re-laparotomy for trauma have already shown that proper approach (including immediate surgical intervention, limiting crystalloids, delivering higher doses of plasma and platelets and keeping permissive hypotension etc.) was associated with favorable outcome and increased survival (32). A recent paper from a hospital in Damascus, Syria, reported results regarding penetrating abdominal injuries during the Syrian war. Re-laparotomies were not reported, a delayed transportation to hospital was not mentioned, and the decision for abdominal intervention was based mainly on clinical evaluation (33). Studies have already emphasized the importance of planned and urgent reoperations for severe trauma that should be decided by the surgeon who orchestrates the initial intervention and is actively involved in the subsequent ongoing recovery of the trauma patients and the timing of the required re-laparotomy, to avoid complications and to reduce mortality rate (20, 21, 24, 34, 35, 36). Various factors affect the outcome of re-laparotomy in non-traumatic intra-peritoneal sepsis as well, and early identification and intervention are of medical benefit (22, 23). The published rate of re-laparotomy ranges from 1–21%, higher in trauma casualties (21–23, 34–38).

The above studies highlight the exclusive and distinctive situation when we willingly cared for foreign citizens from a hostile neighboring country. Proper approach to those wounded was impossible on scene in most cases, transport to hospital for definitive treatment was prolonged, and for those casualties who did managed to reach the border, we relied on clinical judgment together with imaging modalities to retrieve the maximal medical information. The medical teams responsible for the initial treatment were not able to accomplish their therapeutic mission, and transfer of medical documentation was lacking. Precise statistics regarding mortality was incomplete, and eventually re-laparotomy rates were high, approaching 33.3% (reflecting many missed injuries and post-op. complications).

The main limitation of our study lies in our inability to obtain enough informative data concerning casualty event itself or any relevant medical documentation (including intra-operative findings) about our patients. This, however, is exactly what made the situation so unusual.

## Conclusion

Supreme clinical suspicion is warranted when handling such an exceptional, tragic and unusual scenario, while considering each casualty as potentially harboring an abdominal catastrophe requiring urgent abdominal exploration even in cases following previous abdominal surgery and a seemingly fair (but sometimes deceptive) initial clinical presentation.

## Abbreviations

CT – computer tomography , US – Ultrasound , OR- Odds Ratio.

## Declarations

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### Ethics approval and consent to participate

The study was approved by the institutional Ethics Committee (Helsinki)

### Consent for publication

Written informed consent was obtained from the patients for publication of this Study and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

### Availability of data and materials

**All data generated or analysed during this study are included in this published article [and its supplementary information files].**

### Competing interests

The authors declare that they have no competing interests.

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## Authors' contributions

AB- made substantial contribution to conception and design and analysis and interpretation of data , participated in drafting of the article and gave final approval of the version to be published.

KA- made substantial contribution to conception and design and analysis and interpretation of data, participated in drafting.

MW – made substantial contribution to the article , and participated in revised it critically.

SG - made substantial contribution to the article , and participated in revised it critically

EK - made substantial contribution to the article , and participated in drafting.

All the authors have approved the submitted version.

All the authors have agreed to be personally accountable for their own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which they were not personally involved, are appropriately investigated and resolved, and the resolution documented in the literature.

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