

Should the Management Approach to the Anterior Abdominal Stab Wound be Different in Patients with Self-inflicted Abdominal Injury?

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Abstract

Background

Self-inflicted injury is a leading cause of death worldwide. It is hypothesized that due to instincts for self-preservation, the severity of abdominal injury would be decreased following suicidal self-stabbing in comparison to stab wounds from assault, and therefore a more conservative management might be considered.

Methods

All patients with isolated abdominal stab wound (SW) admitted to 19 Trauma Centers in Israel between the years 1997 and 2018 were included in the study. Patients with self-inflicted abdominal SW (Group I) were compared to victims with abdominal SW following assault (Group II).

Results

Group I included 9.4% (314/3324) of patients eligible for this study. Compared to Group II, Group I patients were older (median: 39 years, IQR 28,52 vs. 24 years, IQR 19,33; $p < 0.001$), had more females (28.7% vs 4.9%, $p < 0.001$), had longer length of hospitalization (median: 3 days vs. 2 days; $p < 0.001$), underwent surgery more frequently (55.4% vs. 37.4%; $p < 0.001$), and had higher mortality (2.9% vs. 0.7%; $p = 0.002$). Possible covariates for mortality were examined and following logistic regression, self-inflicted injury remained associated with higher death rates compared to assault (OR 4.027, CI95% 1.380, 11.749; $p = 0.011$).

Conclusion

In this study, patients with isolated self-inflicted abdominal injuries had higher mortality and more frequently underwent abdominal surgery.

Background

Anterior Abdominal stab wounds (AASW) are commonly encountered in trauma units. Suicide is a common cause of death worldwide [1]. However, suicide by self-stabbing is relatively rare and accounts for only 3% of suicide attempts [1]. Several studies showed lower injury severity scores (ISS) in self-inflicted injuries compared to victims of violence [2, 3]. However, mortality rates were not lower. These studies also showed that patients with self-inflicted AASW underwent surgery more often and had a higher rate of non-therapeutic laparotomy (NTL). Theoretically, the lower ISS and the higher rate of NTL could be explained in part by the internal defensive instincts of self-preservation that the patient performing suicide might have at the time of inflicting self-injury.

Since the data on self-inflicted AASW is limited, this study sought to verify previous findings reported by others by using the data in the Israeli Trauma Registry. It was hypothesized that among the Israeli

patients population, self-inflicted AASW would result in less serious injuries and probably less mortality.

Material And Methods

Population and sample

All patients older than 18 years of age with AASW who were admitted to 19 Israeli Trauma Centers between the years 1997 and 2018 were included in the study. The patients were divided into 2 groups. Group I included patients with self-inflicted injury and group II - victims of assault. Patients with concomitant injuries classified as AIS > 2 to non-abdominal organs were excluded from the study in order to rule out other causes that might affect the outcome.

Data sources

The data was retrospectively collected from the records of the Israeli National Trauma Registry (INTR) in the National Center for Trauma and Emergency Medicine Research at The Gertner Institute for Epidemiology and Health Policy Research. The INTR records data from all trauma patients with an ICD-9-CM diagnosis code between 800 and 959.9, except for suffocations, drownings and poisoning, in almost all trauma centers in Israel. The INTR records all casualties hospitalized due to injury, those who died in the ED and those who were transferred to another hospital. The INTR documents more than 90% of all trauma casualties and 98% of the severely injured trauma casualties in Israel. Excluded are casualties who died on scene or en route to hospital. Data is recorded by trained trauma registrars supervised by the trauma director and the trauma coordinator. Electronic files are transferred to the Israel National Center for Trauma and Emergency Medicine Research for quality assurance, in addition to structured logical tests in the registry software

Variables

The data collected from the registry included age, sex, injury severity score (Injury Severity Score (ISS) and Abbreviated Injury Scale (AIS)), systolic blood pressure on admission and mortality. It also included information concerning operations. Patients with systolic blood pressure < 90 mmHg were considered hemodynamically unstable.

Statistical analysis

Differences in proportions between Group I and Group II were analyzed with either Chi-square test of independence or Fisher exact test. Age and hospitalization Length of Stay (LOS) differences were analyzed with Mann-Whitney test. Similar tests were used for categorical and continuous variables when patients who died in Group I were compared to patients who died in Group II. The combined effect of variables that were significantly associated with mortality were investigated using logistic regression. Possible interactions were incorporated into the model. Results are presented as odds ratio and 95% confidence intervals (95%CI). Statistical analysis was performed using SAS statistical software Version 9.2 (SAS Institute Inc., Cary, NC). P-values of less than 0.05 were considered statistically significant.

Numbers, percentages and interquartile ranges (IQR) were approximated to the nearest decimal. Odds Ratio (OR), P value and 95% confidence interval (95%CI) values to the nearest thousandth.

This study was performed without any grants or other type of funding. The authors have not conflict of interest to declare.

Results

Overall, 3,324 patients with AASW were included in the study. Of these, 314 (9.4%) patients were included in the self-inflicted injury (Group I). Comparison of sex and age between the two groups is detailed in Table 1. Almost all the patients in Group II were males. Patients in Group II were also younger when compared to patients in Group I.

Table 1
– Demographics of studied group (N = 3,324)

	Group I – Self-inflicted Injury (n = 314)	Group II – SW Victims of Assault (n = 3,010)	P value
Gender			
Male	224 (71.3%)	2864 (95.2%)	< 0.001
Female	90 (28.7%)	146 (4.9%)	
Age, median years, IQR	39 (28,52)	24 (19,33)	< 0.001
SW = Stab Wound			

Table 2 describes the clinical presentation, ISS, incidence of intra-abdominal organs injury, and mortality across studied groups. There were no differences in frequency of the abdominal wall penetration and the frequency of internal organs injuries. When specific organs were evaluated, the rate of kidney injuries was higher in Group II patients.

Table 2
– Outcomes of injury per study group (N = 3,324)

Outcome	Group I – SW Self-inflicted Injury (n = 314)	Group II – SW Victims of Assault (n = 3,010)	P value
Abdominal Injury			
No penetration	102 (32.5%)	989 (32.9%)	0.9
Penetration with no injury	98 (31.2%)	962 (32.0%)	
Penetration with injury	114 (36.3%)	1059 (35.2%)	
ISS ≥ 16	24 (7.6%)	227 (7.5%)	0.948
Systolic BP < 90	18 (5.7%)	205 (6.8%)	0.467
Abdominal surgery	174 (55.4%)	1125 (37.4%)	< 0.001
Organ injured			
Great vessels	17 (5.4%)	112 (3.7%)	0.185
Liver	29 (9.2%)	267 (8.9%)	0.911
Kidney	1 (0.3%)	116 (3.9%)	0.002
Spleen	2 (0.6%)	73 (2.4%)	0.067
Stomach	16 (5.1%)	117 (3.9%)	0.374
Pancreas	3 (1.0%)	32 (1.1%)	0.859
Small Bowel	31 (9.9%)	279 (9.3%)	0.804
Large Bowel	13 (4.1%)	167 (5.5%)	0.359
LOS, median days (IQR)	3 (1,5)	2 (1,5)	< 0.001
Mortality	9 (2.7%)	22 (0.7%)	0.002
ISS = Injury Severity Score; BP = Blood Pressure; LOS = Length of Stay			

Though no differences in injury severity and frequency of internal injury were noted between the groups, more patients in Group I underwent abdominal surgery. Mortality was higher in Group I patients compared to Group II (2.9% vs. 0.7%, respectively; p = 0.002).

In order to evaluate whether self-inflicted injuries are an independent risk factor for mortality, other possible risk factors for mortality were evaluated (Table 3). The analysis shows that patients who died

were older. Age, ISS, and hypotension on presentation were all significantly associated with mortality and thus could be considered as covariates.

Table 3
– Risk factors for mortality due to abdominal stab wounds (N = 3,324)

	Died N = 31	Survived N = 3293	P value
Sex			
Males	30 (96.8%)	3058 (92.9%)	0.722
Females	1 (3.2)	235 (7.1%)	
Age, median years, (IQR)	35 (23,57)	25 (19,35)	0.003
Abdominal Injury			
No penetration	3 (9.7%)	1088 (33.0%)	< 0.001
Penetration with no injury	3 (9.7%)	1057 (32.1%)	
Penetration with injury	25 (80.6%)	1148 (34.9%)	
ISS \geq 16	19 (61.3)	232 (7.0)	< 0.001
Systolic BP < 90	19 (61.3)	204 (6.2)	< 0.001
Abdominal surgery	24 (77.4%)	1275 (38.7%)	< 0.001
Injury Mechanism			
Self-inflicted	9 (29.0%)	305 (9.3%)	0.002
Assault	22 (71.0%)	2988 (90.7%)	

The combined effect of these variables was investigated using logistic regression (Table 4). When the four significant covariates were analyzed together, all four remained significant, including self-inflicted injury. Possible interaction effects between the four covariates were all non-significant.

Table 4
 – Outcomes of logistic regression analysis of possible covariates of mortality due to stab wounds

Variable	Odds ratio	95% confidence interval	P value
Age	1.037	1.012, 1.064	0.004
Systolic BP < 90	17.175	7.547, 39.085	< 0.001
ISS ≥ 16	10.537	3.875, 28.653	< 0.001
Self-inflicted injury	4.027	1.380, 11.749	0.011
ISS = Injury Severity Score; BP = Blood Pressure			

Discussion

Anterior Abdominal stab wounds (AASW) is a common cause for admission to surgical Emergency Rooms. Only 28% of patients suffering from AASW will end up having internal abdominal injury [4, 5]. Still, due to limitations in arriving to a correct diagnosis, as many as 40-45.8% of said patients will undergo laparotomy. Clear indications for explorative laparotomy in an AASW patient include hemodynamic instability, peritonitis, evisceration, blood in the nasogastric tube, and/or on rectal examination [1, 6]. Since only about a third of the patients with AASW require surgical exploration, further evaluation is warranted. Management approaches may include local wound exploration, computed tomography, diagnostic laparoscopy, or close clinical observation [7–10].

In this study, patients with self-inflicted AASW had a similar frequency of intra-abdominal injury, as well as similar frequency of high ISS compared to stab wound (SW) patients from an assault. Nevertheless, patients in Group I underwent surgery more frequently and they also had a higher mortality. Relatively similar results were presented by Matsomoto et al [2] who compared self-inflicted injuries to those presented due to violence using the Japanese Trauma Data Bank. In their study, 76.4% of abdominal stab wounds were self-inflicted. The authors reported lower ISS with the same mortality rate in self-inflicted injuries compared to those caused by violence. This result suggests that the association of ISS and mortality may be different in patients with self-inflicted injuries compared to assault. Other reports indicate that patients with self-inflicted SW were more commonly operated and that these patients had higher rate of NTL (2, 11). Higher rate of NTL may explain the discrepancy in the number of operations, and it might explain the discrepancy in the mortality. The data registered in the INTR did not allow to evaluate the rate of NTL in this study. The reason for higher NTL observed in other studies is also unclear (2, 3, 11).

In an effort to explain this outcome, we can propose several possible explanations that should be examined in future studies. First, according to the literature, 60–98% of trauma patients due to suicide attempts suffer from mental problems (10). Those disorders include mostly depression and bipolar affective disorders in the older patients and mental distress due to personality crisis in younger patients

(12). In the current study, as is the case in other mentioned studies, the rate of surgical interventions among patients with self-inflicted abdominal SW was higher. Higher rate of surgeries, might be due to communication problems with patient with mental disorder.

Second, patients with self-inflicted abdominal SW have a lower pain threshold, which might have an effect on the way they present pain (13). Since one of the indications for laparotomy include signs of peritoneal irritation, presentation of hypersensitivity might affect the decision to operate those patients. Incidence of hemodynamically instability, another indication for laparotomy, was the same in both groups and accounts for only 5.7–6.8% of the cases (Table 2).

Limitations

This study has several limitations. Though based on data recorded in a very large trauma registry the data that may interpret the results of this study is lacking. We are unable to evaluate why more patients in Group I were operated and why more patients in this group died. We do know, however, that self-inflicted injuries to the abdomen results in similar ISS and a similar injury profile as much as individual abdominal organs are concerned. Future studies dealing with self-inflicted injuries to the abdomen should concentrate on the reasons leading to increased proportion of surgeries and increased mortality rates.

Conclusion

Patients with self-inflicted stab injury to the abdomen have a higher frequency of abdominal surgery and higher mortality compared to patients similarly injured by an assault. The hypothesis that basic instincts for self-preservation would lead to better outcome was refuted. Consequently, management approaches of such patients that are based solely on repeated clinical examination may not be appropriate for these patients.

Abbreviations

SW stab wound, AASW - Anterior Abdominal stab wounds, NTL - non-therapeutic laparotomy, ISS injury severity score, AIS - Abbreviated Injury Scale, INTR - Israeli National Trauma Registry, LOS—length of stay, CI - confidence intervals, IQR - interquartile ranges, OR - Odds Ratio,

Declarations

Ethics approval: This study was approved by the Ethical Committee of the Sheba Medical Center (approval number SMC-18-5138).

Consent for Publication: Not applicable.

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Availability of data and materials: The datasets analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

Authors' contributions: Hershkowitz Y, Jeroukhimov I, Ashkenazy I – Conception, design of the work, interpretation of data, drafted the work. Peleg K, Givon A - the acquisition, analysis and interpretation of data. Bodas M, Shapira Z, Kalman I - substantively revised the work

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