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The Etiology of the Traumatic Abdominal Injuries in Diyarbakır, Turkey: A 4-Year Retrospective Analysis

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Abstract

Objective: The injury mechanism of abdominal trauma differs worldwide and within individual countries. The aim of this study was to determine the most common etiology of abdominal trauma in our region and evaluate the factors that affect the mortality and morbidity of the patients.

Methods: This retrospective study was conducted in the general surgery department of Gazi Yaşargil Training and Research Hospital from January 2016 to December 2020. All patients admitted with a diagnosis of abdominal trauma during the study period were included in the study, regardless of age or gender. A total of 240 patients with abdominal trauma were examined. Depending on the type of injury, conservative or operative treatment was used. Postoperatively, the patients were followed up for detection and treatment of complications.

Results: Penetrating trauma was more common than blunt trauma. Of the patients, 212 (88.3%) were male and 28 (11.7%) were female. Most patients were within the age group of 21 to 30 years. The liver was the most frequently injured solid organ, while the small intestine was the most commonly injured hollow viscus organ. Traffic accidents were the most common causes of blunt trauma, and knife injuries were the most common cause of penetrating abdominal trauma. The mortality rate was higher among the patients with gunshot wounds than among those with other trauma etiologies.

Conclusion: The study results show that the liver was the most frequently injured solid organ, and the small intestine was the most commonly injured hollow viscus organ. Firearm injury is the most common cause of death.

Keywords: Abdominal trauma, blunt, injury pattern, penetrating, traffic accident

Travmatik Abdominal Yaralanmalarımız, Diyarbakır, Türkiye; Dört Yıllık Retrospektif Analiz

Öz

Amaç: Karın travmasında yaralanma mekanizması dünya çapında ve her ülkede farklılık gösterir. Bu çalışma, bölgemizdeki karın travmalarının etiyolojisini belirlemeyi, mortalite ve morbiditeyi etkileyen faktörleri değerlendirmeyi amaçlamaktadır.

Yöntemler: Bu retrospektif çalışma, Ocak 2016-Aralık 2020 tarihleri arasında Diyarbakır Kayapınar'da bulunan Gazi Yaşargil Eğitim ve Araştırma Hastanesi Genel Cerrahi Kliniği' nde yürütülmüştür. Bu dönemde karın travması tanısı ile başvuran tüm hastalar yaş veya cinsiyetten bağımsız olarak çalışmaya dahil edildi. Karın travmalı toplam 240 hasta incelendi. Yaralanma tipine göre konservatif veya cerrahi tedavi uygulandı. Postoperatif hastalar komplikasyonların tespiti ve tedavisi için takip edildi.

Bulgular: Penetran travma künt travmaya göre daha yaygındı. Hastaların 212'si (%88,3) erkek, 28'i (%11,7) kadındı. 21-30 yaş arası hastalar en sık görülen yaş grubuydu. Karaciğer en sık yaralanan solid organ iken, ince bağırsak en sık yaralanan lümenli organdı. Künt travmaların en sık nedeni trafik kazaları (RTA), penetran karın travmalarının en sık nedeni bıçak yaralanmalarıydı. Ateşli silah yaralanmalarında (ASY) ölümler diğer travma etiyolojilerine göre daha yüksekt.

Sonuç: En sık yaralanan solid organ karaciğer, en sık yaralanan lümenli organ ince bağırsaktı. Ateşli silah yaralanması en yaygın ölüm nedenidir.

Anahtar Kelimeler: Karın travması, künt, penetran, trafik kazaları, yaralanma paterni

Major trauma is a significant threat to human health. In developing countries such as Turkey, the incidence rates of abdominal trauma due to civil violence and crime have been increasing. Abdominal trauma is traditionally classified as blunt or penetrating.[1]

Compared with penetrating abdominal trauma, blunt trauma is challenging to diagnose even for experienced surgeons because in the first hours of trauma, the patient's consciousness level is reduced. Moreover, additional pathologies often divert the surgeon's attention away from potentially life-threatening intra-abdominal pathology. Therefore, in the

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first hours of trauma, the patient's anamneses and clinical findings are unreliable.

Regional and worldwide differences in the etiological spectrum of abdominal trauma are well documented in the literature.[2] In this study, we revealed the etiology of abdominal trauma in Diyarbakir, Turkey, patients' clinical conditions, organs injured after abdominal trauma, treatments used, postoperative complications, and factors that affected mortality and morbidity.

Methods

This study was conducted in accordance with the principles stipulated in the 2008 Declaration of Helsinki. Approval to conduct the study was obtained from the institutional ethics committee of Gazi Yaşargil Training and Research Hospital before the start of the study. The study included 240 patients who incurred abdominal traumas within a period of 4 years, from January 2016 to December 2020. All patients with blunt and penetrating abdominal traumas, regardless of age and sex, who required hospitalization and treatment were included in the study. Patients who had external abdominal traumas, did not require inpatient treatment, did not accept hospitalization, or did not want to participate in the study were excluded from the study.

All patients with abdominal trauma were initially evaluated and managed according to Advanced Trauma Life Support (ATLS) protocol in the emergency department by trauma team members.[3] After hemodynamic stabilization, the patient was transferred for radiological examinations, including chest and abdominal radiography, abdominal ultrasonography (USG), and computed tomography (CT). After the patient's vitals were stabilized, the trauma history was recorded, and a detailed clinical examination was performed. Through patient's interviews, information on the exact location and nature of the trauma, the direction and strength of the object that caused the trauma, and the patient's age, sex, education, occupation, residence, socioeconomic status, time from onset of injury to hospital arrival, and histories of associated diseases was collected. If the patient was unable to provide the information, it was sought from the patient's relatives or companions.

Laboratory examinations such as complete blood count, blood glucose, serum creatinine, serum electrolyte, human immunodeficiency virus and hepatitis B virus status, and urine analyses were performed. Depending on the type of injury, the patients were treated conservatively or surgically. The decision to operate was usually based on the patient's clinical condition. For patients with stable clinical conditions, the decision to operate was made after whole abdominal CT imaging. Conservative treatment included close monitoring of the vital parameters in the surgical intensive care unit, adequate intravenous fluid administration until the urine output was 50 cc/h, and blood transfusion when necessary. Failure of the patient to respond to conservative treatment, worsening condition despite adequate resuscitation, the presence of air under the diaphragm on abdominal radiography, and ongoing intra-abdominal bleeding indicated the need for laparotomy in our patients.

The remaining patients were treated conservatively. Surgical exploration was performed after obtaining written informed consent from the patient and the patient's relatives. Administration of broad-spectrum antibiotics was initiated in all the patients who underwent surgery, and the antibiotics were changed depending on the wound culture results. Surgical details on the injured organ and the surgical procedure to be performed were recorded. When necessary, surgical specimens were sent for histopathological examination. The opinions of other specialists were obtained regarding the treatments of other abdominal injuries. All the patients received postoperative follow-up for complications. The collected data were entered in MS Excel spreadsheets and analyzed using the chi-square test. Results from the research and observation were discussed and compared with those reported in the relevant literature.

Results

The study included 240 patients with abdominal traumas who were hospitalized and treated conservatively or surgically. The predominant age groups represented were 15-30 years (57.4%) and 30-45 years (25.8%). Of the 240 patients examined, 212 (88.3%) were male and 28 (11.7%) were female (Figure 1).

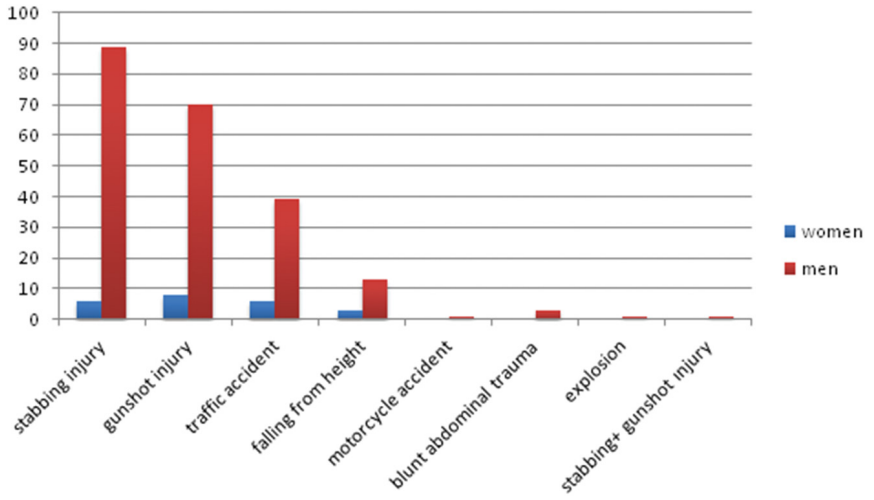

Figure 1. Distribution of the causes of trauma among men and women.

The men's and women's mean (SD) ages were 29.94 (12.3) years and 32.2 (16.1) years, respectively (Table 1).

The most common causes of abdominal trauma in the patients were stab wounds (39.6%) and gunshot wounds (32.5%), with entrance wounds primarily in the right upper quadrant (Figure 2).

Total abdominal CT was performed for 107 patients, of whom 85 (79.4%) had abnormal CT findings secondary to trauma. Emergency USG was performed for 29 patients, of whom 13 (44.8%) had abnormal USG findings. For 104 patients (43.3%) whose general conditions were poor or who showed hypotension, surgery was immediately performed (Table 1).

The most frequently injured hollow viscus organ was the small intestine (17.4%), while the most commonly injured solid organ was the liver (19.5%). Of the 175 patients who underwent laparotomy, 126 (72.0%) required therapeutic laparotomy, 27 (15.4%) had organ damage but did not require treatment (non-therapeutic laparotomy), and 22 (12.6%) of them who had injuries showed no pathologies (negative laparotomy) (Table 2). On the basis of these results, 49 patients (28.0%) could be observed.

The interventions used in 27 patients who underwent non-therapeutic laparotomy were examined. Although 12 patients had a liver injury, they did not receive any intervention. Hemostasis was performed in 11 patients who had bleeding from trauma, and the bleeding was successfully stopped in all the patients. Serosal repair of the small intestine was performed in 3 patients, and gastric and colon serosal repair was completed on 1 patient. Mesentery repair stopped the bleeding in 3 patients with injuries of the small intestine or colon. Retroperitoneal bleeding control was performed in 2 patients.

The most common surgical interventions observed in our study were perforation closure (17.5%) and primary repair of the liver with sutures (17.1%). A significant number of patients (78, 32.5%) had gunshot injuries, many of whom were injured in the Syrian war and transferred to our hospital. Injuries resulting from bullet shrapnel often required more than one surgical procedure for abdominal organ injuries.

Fifteen patients had renal injuries, of whom 6 (2.5%) underwent nephrectomy and the remaining 9 (3.75%) had a primary renal repair. Nephrectomy was performed by a urologist for grade 3-4 renal injury due to bleeding and ınjury. Bladder injury was present in 5 patients (2.1%), for which primary bladder repair was performed.

Wound infection developed in 24 patients (10.0%). Four patients (1.6%) required reoperation for postoperative ileus. Abscess drainage using interventional radiology was performed in 1 patient with an intra-abdominal abscess. Pneumothorax, which developed after chest injury in 5.8% of the patients, was the most common extra-abdominal injury in our study.

Six patients were substance addicts. Eighteen patients developed posttraumatic stress disorder. Twenty-four patients were referred to psychiatrists and underwent psychiatric treatment.

The patients' mortality rate was 2.1%. One patient had a cardiac arrest in the emergency department, 2 patients died of aortic injury caused by gunshots, and 1 patient had a significant liver injury and died. One patient died from a portal vein injury incurred after a traffic accident. The mean (SD) lengths of stay in the intensive care unit and hospital were 6.2 (10.2) days and 10.8 (17.9) days, respectively.

Table 1. General Distribution of the Trauma Cases

Patient Characteristic	n	%
Male sex	212	88.3
Female sex	28	11.7
Male mean (SD) age, years	29.9 (12.3)	-
Female mean (SD) age, years	32.2 (16.1)	-
15-30 years	138	57.4
31-45 years	62	25.8
46-60 years	23	9.6
>60 years	17	7.2
SWI	95	39.6
GSI	78	32.5
Blunt abdominal trauma	3	1.25
SWI + GSI+ blunt abdominal trauma	1	0.4
TA	62	25.84
Motorcycle accident	1	0.4
Falling from a height	16	6.7
Explosion	1	0.4
No diagnostic radiological examination	104	43.3
CT (+)	85	35.4
CT (–)	22	9.2
USG (+)	13	5.4
USG (–)	16	6.7
Operation	126	52.5
Follow-up	65	27.1
Non-therapeutic laparotomy	27	11.2
Negative laparotomy	22	9.2
Duration of hospital stay, days	10.8	SD 17.9
Postoperative reoperation	4	1.6
Abdominal abscess	1	0.4
Wound site infection	24	10
EX	5	2.1

GSI, gunshot injury; SWI, stab wound injury; TA, traffic accident; CT, computed tomography; USG, ultrasonography; EX, exitus.

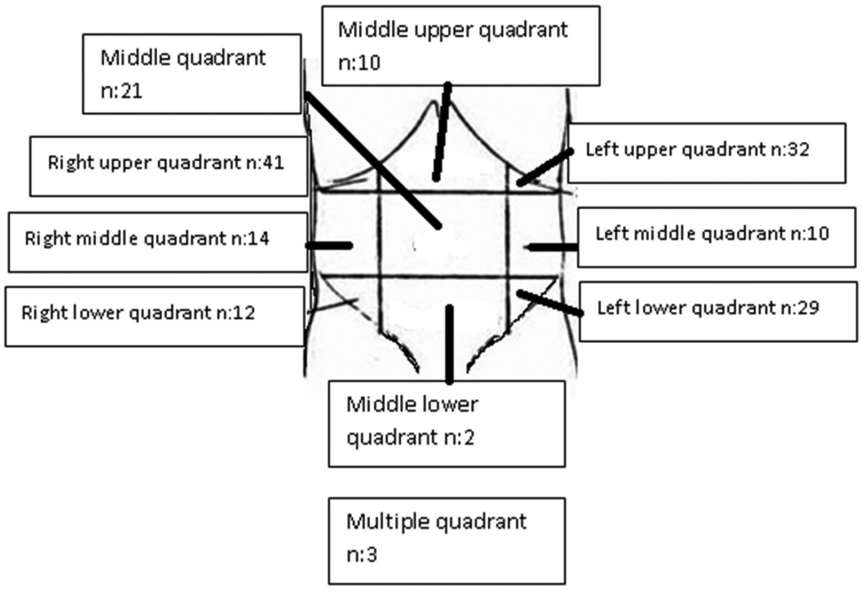

Figure 2. Number of entrance wounds in the abdominal quadrant that were caused by gunshot and stabbing.

Discussion

Trauma continues to be a significant public health problem worldwide. It can affect all age groups and is associated with high morbidity and mortality in all countries. In this study, the most affected age group was 15–30 years (57.4% of the 240 patients), followed by 30–45 years (25.8%). Similar observations have been reported in various studies.[4,7-18] In the studies conducted by Mukhopadhyay et al,[6] the most frequently affected age group was 31–40 years. Patients in this age group are economically productive individuals, and trauma in these patients causes economic loss to both their families and country.

The male-to-female ratio in this study was 7.5:1. The male predominance was consistent with that in other reported studies[8-10,18] and was due primarily to men being income-generating members of their families, the most exposed to outdoor activities, and more likely to be involved in violent acts in Diyarbakir, Turkey.

The ratio of penetrating trauma to blunt trauma was 9.7 : 1. This finding is similar to those of Musau et al[7] and Gad et al[8] but contrary to the lower ratio reported by Manohar et al[10] Male-to-male conflict is a universal phenomenon. Penetrating abdominal injuries result in high mortality and morbidity in Diyarbakir, Turkey, because of the high level of terrorist incidents and easily accessible piercing and cutting tools in the region.

Conservative treatment was performed in 65 patients (27.1%) with hemodynamically stable solid organ injuries. Liver damage was the most common injury treated conservatively, followed by the spleen and renal injuries. These findings are consistent with those of Goedecke et al[19] but contrary to those of Audumbar and Mehta et al.[9]

Currently, trauma and emergency laparoscopies have become important to decrease the rate of unnecessary laparotomies and avoid negative open surgeries and thereby reduce the length of hospital stay and morbidity.[20] In addition, the overall costs of hospitalization and return to normal activities can be minimized by using emergency laparoscopy.[21] In our study, diagnostic laparoscopy was performed in 4 patients (2.3%), bleeding control and termination of operation were performed in 3 patients (1.7%), and laparotomy was performed in 1 patient (0.6%). Of the patients, 27 (15.5%) had organ damage but did not require treatment (non-therapeutic laparotomy) and 22 (12.6%) had injuries with no pathologies (negative laparotomy result). We could have avoided unnecessary laparotomy by performing diagnostic laparoscopy in 49 patients (28.0%).

The liver was the most common solid organ injured in blunt abdominal trauma (5.8%), followed by the spleen (5%). These results are consistent with those of the studies of Gopalswamy[14] and Ayman-El-Menyar et al[17] However, they contradict the results of various national and international studies.[4,9-12] In our study, the most common injured organ associated with penetrating abdominal trauma is the small intestine. These findings are consistent with those of various national and international studies.[10,13]

The most common postoperative complication was infection, with an incidence rate of 10%. Idriss et al[22] and Hilderbrand et al[23] reported incidence rates of wound infection to be 10% and 11.3%, respectively. Improved sepsis control, early recognition of complications, early use of antibiotics, and treatment in advanced intensive care unit facilities have improved abdominal trauma care over the past decade.

The mortality rate in our study was 2%, similar to that in a study of Idriss et al[22] but lower than those in many other studies.[14,15] In this study, most patients (57.4%) were young people aged 15-30 years who had low comorbidities. Patients with comorbidities (aged > 60 years) represented only 7.2% of the cases. The destructive nature of bullet shrapnel often caused multiple-organ injuries to the abdomen. Hemorrhagic shock due to significant vascular injury was responsible for all the fatal injuries reported in this study. The mean (SD) hospitalization period of the patients was 10.8 (17.9) days, similar to that observed by Babar et al[14] but more prolonged than that documented by Idriss et al.[22]

Table 2. Injured Organs

Organ	Operation	Number of Patients	Percentage
Stomach		19	7.9
	Primary stomach repair	16	6.7
	Gastric resection/anastomosis	3	1.2
Small bowel		47	19.6
	Primary small bowel repair	18	7.5
	Small bowel resection/anastomosis	29	12.1
Colon		37	15.4
	Primary colon repair	8	3.3
	Colonic resection/anastomosis	29	12.1
Liver		42	17.4
	Primary liver repair	41	9.6
	Liver segment resection	1	0.41
Spleen		20	8.3
	Primary spleen repair	2	0.8
	Splenectomy	13	5.4
Pancreas		4	1.7
	Pancreatic primary repair	2	0.8
	Pancreatectomy	2	0.8
Diaphragm		16	6.6
	Primary diaphragm repair	16	6.6
Vascular		11	4.6
	Primary vascular repair	11	4.6
Kidney		15	6.25
	Primary renal repair	9	3.75
	Nephrectomy	6	25
Lung	Pneumothorax, chest tube placement	14	5.8
Bone	Bone fracture operation	14	0.4
Bladder		5	2.1
	Primary bladder repair	5	2.1
Ureter		1	0.4
	Stent placement in the ureter	1	0.4
Testes	Orchiectomy	1	0.4
Brain	Subarachnoid hemorrhage	2	0.8

In Diyarbakir, Turkey, knife-related injuries are the primary cause of penetrating abdominal trauma, and traffic accidents are the primary cause of blunt abdominal trauma. Tight controls of the use of cutting and piercing tools and strict adherence to traffic rules reduce abdominal trauma. Laparoscopy can be used to avoid a non-therapeutic laparotomy and to perform therapeutic interventions for these patients.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Health Science University Gazi Yaşargil Training and Research Hospital (Date: May 29, 2021, Number: 762).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – E.Y., İ.T.; Design – E.Y., İ.T.; Supervision – E.Y., İ.T.; Resources – E.Y., İ.T.; Materials – E.Y., İ.T.; Data Collection and/or Processing – E.Y., İ.T.; Analysis and/or Interpretation – E.Y., İ.T.; Literature Search – E.Y., İ.T.; Writing Manuscript – E.Y., İ.T.; Critical Review – E.Y., İ.T.

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