

# TRAUMA PATIENTS WITH SOLID ORGAN INJURY: RESULTS FROM A BORDER TOWN HOSPITAL IN TURKEY

## Original Article

## SOLİD ORGAN YARALANMALI TRAVMA HASTALARI: TÜRKİYE'NİN BİR SINIR İLİ HASTANESİNİN SONUÇLARI

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## ABSTRACT

**Introduction:** We aimed to categorize retrospectively trauma patients by using an anatomical (Injury Severity Score - ISS) and a physiological (Revised Trauma Score - RTS) scoring system in our center, which is established near the east border of Turkey where the specialists are working temporarily during their compulsory medical service.

**Material and methods:** Twenty-five trauma patients who admitted in Igdır Government Hospital with Abbreviated Injury Scale (AIS) scores >3 who has undergone life saving surgery due to a hemodynamically unstable solid organ injury between September 2010 to September 2011 were evaluated retrospectively. The  $\chi^2$  test was used for categorical variables, the Student t test was used for comparisons of continuous variables. The Mann-Whitney U test was used for other nonparametric quantitative data. A P value less than 0.05 was considered statistically significant.

**Results:** Mean age of the patients was 32.4 years (19-64) and male/female ratio was 19/6. The most frequently detected trauma mechanism was traffic accident (n=12). The most frequently injured solid organ was liver (n=14). The mean initial ISS was 23.6±19.9 and RTS was 6.7±1.8. ISS was higher than 60 pts in four patients, in parallel with their lower mean

RTS scores ( $3.1\pm 1.8$ ) ( $p<0.05$ ). The mortality rate of this subgroup was 100% ( $p<0.001$ ). Overall, 7 (28%) of patients had multiple traumas with a mortality rate of 57.1%, while in 4 of them all three body cavities were traumatized.

**Conclusion:** In our level II trauma center which does not have full availability specialties, personnel and equipment; health care, transfer and management of the severe trauma patients who couldn't be referred to major trauma centers were accomplished properly in accordance with surgical treatment algorithms and trauma scores of the patients. Treatment results of our patients appear to be similar to those reported in the current literature.

**Keywords:** *Injury Severity Score; Revised Trauma Score; Multitrauma.*

## ÖZET

**Giriş:** Türkiye'nin doğu sınırında yeralan, uzmanlarının çoğu devlet hizmet yükümlülüğü kapsamında geçici süre ile çalışan hastanemize başvuran travma olgularının anatomik (Yaralanma Ciddiyet Skoru - YCS) ve fizyolojik (Revize Travma Skoru - RTS) skora sistemlerine değerlendirilmesi amaçlandı.

**Yöntem ve Gereç:** Eylül 2010 - 2011 arasında Iğdır Devlet Hastanesi'ne travma nedeniyle getirilen, Kısaltılmış Yaralanma Ölçeği (KYÖ)  $>3$ , solid organ yaralanması saptanmış ve hemodinamik instabilite nedeniyle cerrahi uygulanan olgular retrospektif olarak değerlendirildi. Kategorik veriler  $\chi^2$  testi, sürekli değişkenler student *t* testi, non parametrik veriler Mann Whittney U testi kullanılarak analiz edildi. P değerinin 0,05'ten düşük olması istatistiksel anlamlı kabul edildi.

**Bulgular:** Yirmi beş olgunun yaş ortalaması 32,4 (19-64) olup, erkek/kadın oranı 19/6 idi. Trafik kazası ( $n=12$ ) en sık travma mekanizması, karaciğer en sık yaralanan solid organdı ( $n=14$ ). Ortalama YCS  $23,6\pm 19,9$  ve RTS  $6,7\pm 1,8$  idi. YCS

60'ın üzerinde olan dört olguda buna paralel olarak ortalama RTS'nin düşük olduğu saptandı ( $3,1\pm 1,8$ ) ( $p<0,05$ ). Bu subgrupta mortalite %100'dü ( $p<0.001$ ). Tüm olguların 7'sinde (%28) multitravma olup mortalite %57,1 idi, bu dört olguda da üç boşluğu etkileyen multitravma mevcuttu.

**Sonuç:** Tam donanımlı travma merkezi kapsamında sayılmayan II. seviye acil hizmeti sunan hastanemizde kısıtlı imkanlara rağmen, üst merkezlere sevki edilemeyecek ciddi travma olgularının cerrahi algoritmalara uygun ve travma skorları ile örtüşecek şekilde bakım, sevk ve idaresinin yapıldığı görülmüştür. Tedavi sonuçları mevcut literatür ile benzer bulunmuştur.

**Anahtar kelimeler:** *Yaralanma Ciddiyet Skoru; Revize Travma Skoru; Multitravma.*

## INTRODUCTION

In regions where level of development is lower with uncontrolled social changes and migrations, increased vehicle accidents and criminal injuries are among important factors for increased mortality, morbidity and in developed countries they are leading causes of death among younger population (1, 2). They take the first place in the 1-44 age group, while rank third in all age groups (3). In our country; age group of 1-44 years are mostly (81.8% of the total population) affected from traumas (4).

Traumas are categorized into 2 groups according to their mechanism of development as blunt and penetrating wounds. Though, abdominal traumas constitute 5% of all traumas and are responsible for 10% of all traumatic deaths, after spinal, cranial and thoracic traumas (4). Chest traumas account for 25% of all traumatic deaths. In multiple organ injuries; mortality is 2.5-fold higher relative to chest traumas per se. (5, 6, 7). With accurate diagnosis and appropriate

surgical approach, rates of morbidity and mortality can be reduced (8).

In developed countries, scoring systems have been used for nearly 30 years and these scoring systems have been continuously developed to improve diagnostic process and management of the patients.

In our study, we aimed to evaluate demographic characteristics and daily trauma scoring system scores of the patients with solid organ injuries brought into our hospital which is not a fully-equipped trauma center, due to lack of any means to transfer patients to a reference hospital by highway.

## MATERIAL AND METHODS

In this retrospective clinical study, medical records of the trauma patients who admitted to the Emergency Service of Iğdir Government Hospital between September 2010, and September 2011 with a history of trauma and Abbreviated Injury Scale (AIS) scores over 3 points at admission were included. Upon further analyses, evidence of solid organ injury was detected and these patients underwent surgery. Patient files, discharge reports, computer registers, operative reports, emergency trauma ID cards and polyclinic records were evaluated.

For patients without any missing data, data related to the age and gender of the patients, mechanism of injury, relevant vital parameters, laboratory values, trauma scoring system [Glasgow Coma Scale (GCS), Abbreviated Injury Scale (AIS), and Injury Severity Scale (ISS), Revised Trauma Score (RTS)] scores, organ injuries, surgical techniques performed, length of hospital and intensive care unit stays, blood product replacements, mortality and morbidity rates were recorded.

All trauma patients admitted to the emergency unit were evaluated by a multidisciplinary team. Primarily, ABCDEF system was used as a first assessment tool. All patients underwent a detailed pre-operative physical examination. Vital parameters [arterial blood pressure (ABP), heartbeats per minute (BPM), electrocardiographic (ECG) findings, hourly urine output, respiratory rate and oxygen saturation (SO<sub>2</sub>)] of the patients were monitorized. All patients referred to the emergency service underwent routine preoperative tests (blood chemistry, whole blood count, blood coagulation tests, chest X-ray, and ECG).

As a consequence of evaluations performed, hemodynamically unstable patients with AIS >3 and documented solid organ injury underwent emergency trauma surgery.

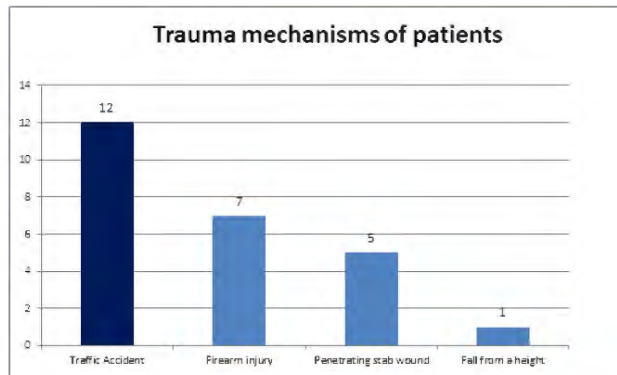
Preoperatively, all patients received single prophylactic doses of ampicillin/sulbactam. Duration of antibiotherapy was extended dependent on the postoperative risk of infection and required monitorization period.

**Statistical Analysis:** Data were analyzed using the Statistical Package for Social Sciences 17.0 for Windows (SPSS Inc., Chicago, IL). The  $\chi^2$  test was used for categorical variables and are expressed as counts and percentages. Continuous data are expressed as means with standard deviation. The Student *t* test was used for comparisons of continuous variables. The Mann-Whitney U test was used for other nonparametric quantitative data. A P value less than 0.05 was considered statistically significant.

## RESULTS

Of the 25 patients (19 males, 6 females) whose charts were reviewed, the mean age of the patients was 32.4 (range 19 to 64) years. Evidence of blunt (n=14; 56%) and penetrating trauma (n=11; 44%) were detected in patients. When

mechanisms of traumas were examined, the patients had suffered from traffic accidents (n=12; 48%), firearm injury (n=7; 28%), penetrating stab wounds (n=5; 20%), and fall from a height (n=1; 4%) respectively (**Table 1**).



**Table 1.** Trauma mechanisms of patients.

Abdominal (n=12;48%), thoracoabdominal (n=6;24%) and multiple (n=7;28%) traumas were detected in patients.

Initial laboratory findings and evaluation data of the patients at admission are shown in **Table 2**.

	GCS	Hb (g/dl)	Hct %	RR	BPM	Sys AP	Dias AP
All patients	11.6±3.6	9.1±2.4	27.2±6.3	17.4±6.3	105.3±22.8	94±19.5	63.8±14.1
ISS ≥60	4.7±2.3	5.6±0.9	17.7±3.7	10.5±13.4	82.5±49.2	67.5±22.1	45±19.1
ISS <60	12.9±1.8	9.3±2.6	28.8±4.89	18.7±3.1	109.6±11.7	99±14.8	67.4±9.9
p value	<0.001	0.008	0.002	0.154	0.695	0.004	0.011

Abbreviations: GCS: Glasgow Coma Scale, RR: Respiratory rate (per minute), BPM: Heart beats per minute, Sys AP: Systolic arterial pressure (mmHg), Dias AP: Diastolic arterial pressure (mmHg)

All data shown are means ± SDs

**Table 2.** Admission parameters of patients.

Ten patients (40%) were operated following cardiopulmonary resuscitation.

When patients with intraabdominal solid organ traumas were investigated; liver (n=14; 56%), spleen (n=6; 24%), liver

and spleen (n=2; 8%), spleen and a hollow organ (n=2; 8%), liver and a hollow organ (n=1; 4%) injuries were detected. Primary hepatic wound repair or hemostasis with (n=2; 8%) or without splenectomy (n=15; 60%) and only splenectomy (n=8; 32%) were performed surgical procedures.

When the presence of associated intraabdominal organ injuries was investigated, in 7 (28%) patients any accompanying organ injury was not found. However, in 4 (16%) patients concomitant pancreas injuries and also other organ injuries in various percentages were detected (**Table 3**).

Accompanying organ injury	n	%
No any accompanying organ injury	7	28
Minor pancreas	4	16
GIS	2	8
GIS + minor pancreas	2	8
Bile duct or gallbladder	2	8
Pancreas + bile duct	1	4
Kidney	1	4
Kidney + enlarging retroperitoneal hematoma	1	4
Kidney + uretra	1	4
GIS + enlarging retroperitoneal hematoma	1	4
GIS + bladder + vagina	1	4
Uterus + enlarging retroperitoneal hematoma	1	4
Enlarging retroperitoneal hematoma	1	4

Abbreviations: GIS: Gastrointestinal system

**Table 3.** Accompanying organ injuries in patients with solid organ injury.

Any additional surgical intervention was not required in 64% (n=16) of these patients. A diverting stoma was created for one patient. In 3 patients, packing was applied as a damage control intervention. Mortality rate was 66.6% in who had been managed with packing. Two patients required a secondary intervention .

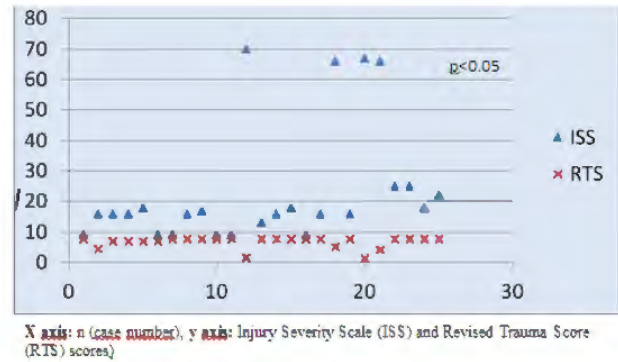


Debridement, thin layer skin flap and rotational flap were applied for one patient with an indication of a decubitus wound. One patient underwent depacking procedure 48 hours after application of a packing.

In 14 (56%) patients, any thoracic intervention was not required, while closed underwater thoracic drainage (n=9; 36%) and thoracotomy (n=2; 8%) were also performed for indicated patients. Diaphragmatic injuries were detected in 6 (24%) patients. Diaphragmatic injuries were repaired by laparoscopy during diagnostic laparoscopy in 2 patients and by open surgery in 4 patients.

Three (12%) trauma patients were pregnant. One of them, who was at term at 36 weeks of her pregnancy with liver and spleen injury firstly underwent C-section because of in-utero fetal death and then hysterectomy, splenectomy and packing to relieve uterine atony. The other patient required C-section and oophorectomy with the indication of in-utero fetal death, and these two patients survived. The third case was at 13 weeks of her pregnancy and gave birth to a live term baby long after she was discharged from the hospital.

The patients were evaluated based on their trauma scores and Abbreviated Injury Scale (AIS) scores were estimated as 3 (n=13), 4 (n=5), and 5 (n=7) points (pts), respectively. Mean Injury Severity Score (ISS) was calculated as 23.6±19.9 (range, 9-67) pts. Distribution of ISS scores was as follows: 4-20 pts (n=18), 20-60 pts (n=3), and >60 pts (n=4). Mean Revised Trauma Score was 6.7±1.8 (range, 1,5-7.8) pts. (Table 4).



**Table 4.** The distribution of patients' trauma scores in a scatter chart.

All patients (n=4, 100%) with ISS >60 and RTS 3.1±1.8 did not survive (p<0,001) (Table 5).

Case (n)	ISS	RTS	Mortality (n)	Mortality	p value
21	<60	7.4	0	0%	<0.001
4	>60	3.1	4	100%	

ISS: Injury Severity Scale (pts), RTS: Revised Trauma Score (pts)

**Table 5.** Trauma scores of the patients and mortality rates.

Mean hospital stay was 8.4±6.6 days (1-32 days). Twenty patients (80%) required postoperative monitoring in the intensive care unit (ICU) and mean ICU stay was 1.7±2.07 days (range, 1-9). Early complications were observed in 9 patients and the most frequently seen complication was bleeding (n=4). As a long-term complication chronic wound (n=1) and permanent neural damage (n=1) developed in 2 separate patients.

Three patients were deceased during operation and another one was deceased within the first postoperative 24 hours (mortality rate, 16%).

## DISCUSSION

Trauma is the first cause of death in the age group of 1-44 years and ranks third among all age groups (3). In our study, median age of our patient population was 32.4 years similar to literature findings.

Traffic accidents were most commonly detected as a trauma mechanism.

Multitrauma is an important health problem increasing in frequency dependent on technological advances and acts of violence with its resultant higher disability and mortality rates. Since younger population is more vulnerable to traumas, traumatic events lead to labor loss, social and economic problems.

In the evaluation of patients with multitraumas, many trauma scoring systems have been used in addition to intensive care scoring systems. Glasgow Coma Scale (GCS) developed by Jennett and Teasdale is especially used in the evaluation of neurological status and cerebral dysfunction in multiple traumas associated with head traumas (10).

In 1988, Champion et al. included parameters of respiratory rate and systolic blood pressure in GCS scale to formulate revised trauma scores (3). In addition to GCS, Revised Trauma Score (RTS) is a physiological score used to evaluate pathophysiological state of multitrauma patients (12, 13). For the calculation of RTS values, it is not necessary to obtain information about all injured organs and it can be easily used at the scene of the accident (14). In our case series, a strong correlation was detected between RTS and mortality. Mortalities were noted among patients with revised trauma scores above 7.1. Many other studies where RTS values were evaluated and compared with other scoring systems, have demonstrated increases in mortality rates and need for intensive care in patients with relatively lower trauma scores (15, 16). Revised trauma scores and GCS scores increase as a consequence of head traumas, multisystem injuries and major physical alterations, as well. Concomitancy between lower RTS and higher Injury Severity Scale (ISS) values has been observed. In our study, mean RTS value was calculated as  $6.7 \pm 1.8$  pts, while ISS values were above 60 pts ( $p < 0.05$ ).

Regarding their clinical short-term follow-up, it may be considered to evaluate patients with RTS scores below 4 pts in the trauma centers.

Injury Severity Score is an anatomical scoring system which can be applied on all patients with multiple traumas. Thus, ISS is a preferred scoring system in critical events as mortality, morbidity and hospitalizations. The weak point of this system is that an inaccurate evaluation in Abbreviated Injury Scale (AIS) might also increase probability of erroneous assessment of ISS scores (17).

Literature studies indicate increased mortality rates in patients with ISS scores above 16 pts. In our study, ISS scores were found to be  $< 20$  pts in 18 and  $> 20$  pts in 7 patients, while it was  $> 60$  pts in 4 multitraumatized patients (18). Severity of trauma and mortality is closely correlated, and in our study higher rates of mortality were observed among patients with ISS scores above 60 pts.

Despite multidisciplinary approach, abdominal traumas with solid organ injuries are surgical emergencies with higher mortality rates especially in the presence of multitraumas. In thoracic traumas, vital organs such as heart, major vessel, and lungs are sensitive to be traumatized. Mortality rate in isolated thoracic traumas ranges between 4-8%, while it rises to 13-15% and 30-35% if one and more than one additional organ systems are affected respectively (19).

Early diagnosis and prompt intervention in multitraumatized patients with concomitant thoracic traumas are influential factors on morbidity and mortality (17). In our study, thoracic ( $n=13$ ) and abdominal traumas ( $n=6$ ) were detected, while in 7 patients concurrent multitraumas were observed. In 11 patients, clinical need for thoracic intervention was arisen and 4 of seven patients with associated multitraumas (30%) died. Similar to other studies performed, in the present study,

effectiveness of trauma scoring system has been demonstrated in the determination of the general health state and mortality rates of the patients (19).

Severely multitraumatized patient should be evaluated promptly, accurately and systematically. General approach to multitraumatized patient is analyzed in two main categories as before and during hospitalization. Mortality and morbidity can be considerably avoided in a multitraumatized patient using a systematic approach (20).

Potential complications which might be expected to develop during the postoperative period, markedly decrease in patients whose general health states improve following regulation of acute phase reactants and biological responses. Thus, problems which might emerge in multitraumatized patients such as hemostatic abnormalities, severe systemic inflammatory response, multiorgan failure and increased mortality rates can be brought under control (21). In our study, 10 (40%) patients were operated after cardiopulmonary resuscitation, and 3 patients died during the surgery and one patient within the first postoperative 24 hours. Early stage complications were observed in 9 patients and bleeding was the most frequent complication which was seen in 4 patients.

Although initial and emergency treatment timely performed is an important factor in prognosis, monitorization of the patient in an intensive care unit of a trauma center has also crucial importance. American College of Surgeons, classified hospitals in the United States of America into 5 levels and did not include pediatric trauma centers in this classification. Accordingly, level I hospitals have the most sophisticated equipment and facilities. Level III hospitals have fundamental equipment and operate in integration with level I health care organizations. These hospitals provide health care services in main branches for 24 hours. A Level III trauma center has limited facilities and it does not

have the full availability of specialists, they have resources for resuscitation and surgery, but have transfer agreements for serious trauma patients. In health care services guideline published by Turkish Ministry of Health, General Directorate for Therapeutic Services in 2011 which requires special planning, emergency services were categorized in 3 levels. Differently in Turkey, level III institutions are considered as highly equipped emergency services (9). Level II centers of trauma and emergency services described in this guideline realize initial evaluation and monitorization of trauma patients. Government hospital of our town is a secondary care health institution which provides level II emergency department. Every day, nearly 800 to 1000 patients are consulted to our emergency outpatient department. Through, our hospital is approximately 300 km away from the nearest level III health institution in a geographic region with dispersed rural settlement around the city center, patients admitted with severe trauma are provided to have an emergency care with its restricted facilities. Despite our limited number of severely traumatized case series, the data we obtained are similar to those cited in the literature.

We think that this case series presentation will be able to contribute to raise awareness in the population at risk, preventive health politics of our country and statistical records about traumas.

## CONCLUSION

Trauma scores have an important place in fast but proper implementation of the first aid, resuscitation, diagnostic and therapeutic procedures, transportation and appropriate triage of the trauma patients. The present study will conceivably contribute to our understanding of the relationships among types of traumas, frequently affected body parts and regions, mortality rates and might have an effective role in the

prediction of the prognosis, need for intensive care of these trauma patients.

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