ORIGINAL ARTICLE

Is it possible to predict mortality in patients with high-grade blunt liver injury? A single trauma center study

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ABSTRACT

BACKGROUND: Blunt abdominal trauma constitutes a significant portion of trauma cases and is often associated with liver injury. Given that high-grade liver injuries remain life-threatening, identifying patients who will likely require more vigilant attention and care is crucial. This study aims to determine the parameters that increase mortality in patients with high-grade liver trauma.

METHODS: This study enrolled 38 patients with Grade III or higher liver injuries, treated by the general surgery department between 2008 and 2023. Eleven patients who died were categorized into Group 1, and 27 survivors were placed in Group 2. We evaluated their respective mechanisms of injury, imaging results, Glasgow Coma Scale scores, Base Excess, Lactate levels, pH, and Injury Severity Score findings. Receiver Operating Characteristics (ROC) analysis was performed for parameters with significant differences, and certain cutoff values were determined.

RESULTS: The grade of liver injury and additional abdominal organ injuries were significantly higher in Group 1 ($p<0.05$). The difference in extra-abdominal injury sites was statistically insignificant between the groups ($p>0.05$). Erythrocyte suspension requirements were significantly higher in Group 1 ($p<0.05$). Average lactate and base deficit values were also significantly higher in Group 1 ($p<0.05$), while leukocyte counts were significantly lower in Group 1 ($p<0.05$).

CONCLUSION: Base deficit, hemoglobin (Hb), lactate levels, injury severity, liver injury grade, accompanying abdominal injuries at admission, and erythrocyte suspension demands were found to be associated with increased mortality rates. Certain cutoff values for the aforementioned parameters could be established. However, further data are required to confirm these findings.

Keywords: Blunt abdominal trauma; high grade liver injury; mortality-increasing factors.

INTRODUCTION

In the modern era, trauma is still the leading cause of mortality among the adult and young adult populations.[1] While gunshot and stab wounds frequently result in penetrating injuries, traffic accidents, physical assaults, and falls are the primary causes of blunt abdominal trauma, often affecting abdominal solid organs due to the sheer force of the trauma.[2] Although mild liver and spleen injuries make up the majority of these blunt injuries and can mostly be managed nonoperatively,[3] a significant proportion of high-grade liver injuries still pose a significant threat to patients' lives. In some instances, these injuries are so severe that they do not allow the surgeon time to transfer the patient to the operating theater.[4] As a result, high-grade liver injuries are associated with increased complication and mortality rates.[5] Patients with high-grade liver injuries may be unresponsive at admission for various reasons, including trauma severity, hemodynamic instability, or being under the influence. Thus, treatment options may range from nonoperative management (NOM) to emergent laparotomy. Therefore, predicting the severity and mortality of patients with high-grade liver injury is of paramount importance. In

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this article, we aim to present patients with high-grade liver injuries and identify predictors of mortality.

MATERIALS AND METHODS

Patients who were hospitalized and treated by the general surgery department for high-grade (Grade III or higher) blunt liver trauma between January 2008 and November 2023 were included in the study. Ethical approval was obtained from our hospital's local ethics committee on November 23, 2023 (B.1 0.1.TKH.4.34.H.GP.0.01/448). Data from these patients were prospectively recorded during their admission. Subsequently, a retrospective analysis was conducted focusing on demographics, the mechanism and site of injury, mortality and morbidity rates, findings from multidetector computed tomography (MDCT) and Focused Assessment with Sonography for Trauma (FAST), results from arterial blood gas analysis (including lactate, pH, Base Excess [BE]), additional abdominal organ injuries, the necessity for surgeries beyond liver-related procedures, angioembolization requirements, the presence of pneumothorax and the application of tube thoracostomy, length of hospital stay and intensive care unit admissions, hemoglobin and white blood cell (WBC) counts, vital signs (pulse rate, respiration rate, blood pressure), Glasgow Coma Scale (GCS) scores, Injury Severity Score (ISS), calculated Revised Trauma Score (cRTS), the requirement for blood transfusion, and the type of treatment administered. The patients were then categorized into two groups: those who died (Group 1) and those who survived (Group 2). A subsequent study will reclassify this population into two different groups based on their requirement for abdominal surgery.

Statistical Analysis

The statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software program, version 28.0 (IBM Corp., released in 2021; IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp). The distribution of variables was assessed with the Kolmogorov-Smirnov test. Independent quantitative data were analyzed using the unpaired t-test, Kruskal-Wallis, Analysis of Variance (ANOVA), and Mann-Whitney U tests. Dependent qualitative data were analyzed using the McNemar test. Independent qualitative data were analyzed with the Chi-square and Fisher tests. P-values lower than 0.05 were considered statistically significant. The ability of the evaluated parameters to predict mortality was analyzed through Receiver Operating

Table 1. Demographics and trauma-associated variables

	Total (n=38)	Deceased (n=11)	Survived (n=27)	p
Age	32 (8-77)	30 (8-60)	39 (12-77)	0.872
Men	33 (86.8%)	8 (72.7%)	25 (92.6%)	0.134
Liver Injury (n=38)				<0.001
Grade III	24 (63.2%)	1 (9.1%)	23 (85.2%)	
Grade IV	10 (26.3%)	6 (54.5%)	4 (14.8%)	
Grade V	4 (10.5%)	4 (36.4%)	0 (0%)	
Additional Abdominal Organ Injury (n=38)				0.02
0	22 (57.9%)	3 (27.3%)	19 (70.4%)	
1	10 (26.3%)	4 (36.4%)	6 (22.2%)	
2	5 (13.2%)	4 (36.4%)	1 (3.7%)	
3	1 (2.6%)	0 (0%)	1 (3.7%)	
Additional Injury Site (n=38)				0.405
0	5 (13.2%)	1 (9.1%)	4 (14.8%)	
1	11 (28.9%)	2 (18.2%)	9 (33.3%)	
2	12 (31.6%)	6 (54.5%)	6 (22.2%)	
3	9 (23.7%)	2 (18.2%)	7 (25.9%)	
4	1 (2.6%)	0 (0%)	1 (3.7%)	
GCS	15 (3-15)	6 (3-15)	15 (4-15)	<0.001
cRTS	7.84 (0.73-7.84)	3.97 (0.73-7.84)	7.84 (5.03-7.84)	<0.001
ISS	28.13±11.57	37.36±10.12	24.25±9.74	0.001
Pulse (bpm)	100 (0-130)	105 (0-130)	100 (65-120)	0.558
Systolic Blood Pressure (mmHg)	110 (40-150)	76.0±31.25	112.59±18.31	0.005

GCS: Glasgow Coma Scale cRTS: calculated Revised Trauma Score ISS: Injury Severity Score. Data are presented as mean ± SD, median (min-max) or n (%).

Characteristics (ROC) analysis. A 5% type-1 error threshold was used to determine a statistically significant cutoff value while evaluating the area under the curve.

RESULTS

Table 1 presents a comparison between the groups mentioned above. On average, the age of the patients was 32 (range: 8-77). Male patients constituted the majority of cases (86.8%). The most common mechanism of injury was motor vehicle accidents (MVA), involving 26 (68.4%) patients (Table 2). MDCT was performed on 29 (76.3%) patients at admission. The rate of MDCT evaluation at admission was statistically significantly higher for Group 2 (p<0.05). A repeated MDCT evaluation was conducted for 6 (15.8%) patients (Table 3). No statistically significant difference was observed between the groups (p>0.05). The total numbers of grade III, IV, and V liver injuries were 24 (63.2%), 10 (26.3%), and 4 (10.5%), respectively. Group 1 had statistically significantly more severe liver injuries (p<0.05). Sixteen patients had additional abdominal organ injuries (Table 4). The numbers of patients with one,

Table 2. Mechanism of injury

Mechanism	Group 1 (n)	Group 2 (n)	Total (n)
Motor Vehicle Accidents	6 (15.8%)	20 (52.6%)	26 (68.4%)
PI	4 (10.5%)	6 (15.8%)	10 (26.3%)
IVTA	1 (2.6%)	7 (18.4%)	8 (21.2%)
MA	1 (2.6%)	7 (18.4%)	8 (21.2%)
Fall From Height	3 (7.9%)	6 (15.8%)	9 (23.7%)
Crush	1 (2.6%)	1 (2.6%)	2 (5.3%)
Assault	1 (2.6%)	0	1 (2.6%)

IVTA: In-vehicle traffic accident; MA: Motorcycle accident; PI: Pedestrian injury.

Table 3. Radiological and clinical findings at admission

	Total (n=38)	Deceased (n=11)	Survived (n=27)	p
Performed MDCT	29 (76,3%)	5 (45,5%)	24 (88,9%)	0,009
Control MDCT	6 (15,8%)	0 (0%)	6 (22,2%)	0,154
Blood Extravasation in MDCT report	7 (22,6%)	3 (60%)	4 (15,4%)	0,062
Pneumothorax	14 (36,8%)	5 (45,5%)	9 (33,3%)	0,712
FAST Evaluation	14 (36,8%)	4 (36,4%)	10 (%37)	0,968
FAST Positivity	13 (92,9%)	3 (75%)	10 (100%)	0,285

MDCT: Multidetector Computed Tomography FAST: Focused Assessment with Sonography in Trauma. Data are presented as mean ± SD, median (min-max) or n (%).

Table 4. Additional abdominal injuries

Injured Organ	Group 1 (n)	Group 2 (n)	Total (n)
Spleen	4 (10.5%)	5 (13.1%)	9 (23.7%)
Kidney	1 (2.6%)	3 (7.9%)	4 (10.5%)
Diaphragm	2 (5.3%)	1 (2.6%)	3 (7.9%)
Vena Cava Inferior	2 (5.3%)	0	2 (5.3%)
Colon	0	1 (2.6%)	1 (2.6%)
Adrenal Gland	0	1 (2.6%)	1 (2.6%)
Bladder	1 (2.6%)	0	1 (2.6%)
Small Bowel	1 (2.6%)	0	1 (2.6%)

Table 5. Extra-abdominal injuries

Injury Site	Group 1 (n)	Group 2 (n)	Total (n)
Thorax Trauma	7 (18.4%)	24 (63.2%)	31 (81.6%)
Pelvic and Extremity Injury	6 (15.8%)	11 (28.9%)	17 (44.7%)
Cranial Injury	7 (18.4%)	7 (18.4%)	14 (36.8%)
Maxillofacial Injury	0	5 (13.2%)	5 (13.2%)
Vertebrae Fracture	0	3 (7.9%)	3 (7.9%)

Table 6. Laboratory findings. clinical follow-up features. and interventions

	Total (n=38)	Deceased (n=11)	Survived (n=27)	p
LoICUS (day)	0 (0-1.75)	0 (0-1)	0 (0-25)	0.867
LoHS(day)	4.5 (0-32)	1 (0-2)	7 (1-32)	<0.001
Angioembolization	3 (7.9%)	0 (0%)	3 (11.1%)	0.542
Tube Thoracostomy	13 (34.2%)	6 (54.5%)	7 (25.9%)	0.135
ES Transfusion (unit)	2 (0-14)	8 (0-14)	2 (0-6)	<0.001
Lactate at Admission (mmol/L)	5.31 (0.8-14.8)	5.31 (5.0-14.8)	5.31 (0.8-6.1)	0.016
pH	7.24 (6.9-7.4)	7.24 (6.9-7.3)	7.24 (7.2-7.4)	0.347
BE	-5.51 (-23.4-3.6)	-5.51 (-23.4- -5.5)	-5.51 (-11.4-3.6)	0.017
Hemoglobin at Admission (g/dL)	12.86±2.38	10.6±2.34	13.59±2.14	0.001
Minimum Hemoglobin (g/dL)	8.77±2.16	7.91±3.12	8.96±1.75	0.315
Leukocyte at Admission (10^3/ µl)	19.10±7.7	10.92±6.24	21.92±6.17	<0.001

LoICUS: Length of Intensive Care Unit Stay LoHS: Length of Hospital Stay BE: Base Excess ES: Erythrocyte Suspension. Data are presented as mean ± SD. median (min-max) or n (%).

Table 7. ROC analysis of significant parameters

	AUC (95%CI)	p	Cut-off acording to Youden Index	Sensivity (%)	Specifity (%)
Lactate at admission	0.731 (0.563-0.898)	0.027	4.9	100%	63.0%
BE at admission	0.724 (0.559-0.888)	0.032	-5.4	37.0%	100%
Leukocyte at admission (10^3/ µl)	0.909 (0.769-1.000)	<0.001	15.400	92.6%	90.9%
Systolic Blood Pressure (mmHg)	0.855 (0.687-1.000)	0.001	95	81.5%	81.8%
GCS	0.897 (0.773-1.000)	<0.001	11.5	92.6%	81.8%
cRTS	0.924 (0.808-1.000)	<0.001	5.96	96.3%	81.8%
ISS	0.813 (0.669-0.957)	0.003	23.5	100%	48.1%
ES Transfusion (unit)	0.860 (0.709-1.000)	0.001	3.5	81.8%	77.8%

BE: Base Excess ES: Erythrocyte Suspension GCS: Glasgow Coma Scale cRTS: calculated Revised Trauma Score ISS: Injury Severity Score. Data are presented as mean ± SD, median (min-max) or n (%).

two, and three additional abdominal organ injuries were 10 (26.3%), 5 (13.2%), and 1 (2.6%), respectively. No additional abdominal injuries were found in 22 (57.9%) patients. Group 1 had a statistically significantly higher number of accompanying abdominal injuries ($p<0.05$). Extra-abdominal site injuries were present in 33 patients (Table 5). There were one, two, three, and four extra-abdominal site injuries in 11 (28.9%), 12 (31.6%), 9 (23.7%), and 1 (2.6%) patients, respectively. Five patients 5 (13.2%) did not have extra-abdominal site injuries. No significant difference was observed between groups re-

Table 8. Type of abdominal surgical procedures

Procedure	Group 1 (n)	Group 2 (n)	Total (n)
Packing	10 (26.3%)	3 (7.9%)	13 (34.2%)
Splenectomy	3 (7.9%)	0	3 (7.9%)
Diaphragm Repair	1 (2.6%)	1 (2.6%)	2 (5.3%)
Hepatic Vein Ligation	2 (5.3%)	0	2 (5.3%)
Right Hemicolectomy	0	1 (2.6%)	1 (2.6%)
Segmental Hepatectomy	0	1 (2.6%)	1 (2.6%)

garding the presence of accompanying extra-abdominal injuries ($p>0.05$). Blood extravasation was detected by MDCT in 7 (22.6%) patients. Group 1 had a proportionally higher rate of extravasation, although this finding was not statistically significant ($p>0.05$). Angioembolization was performed in 3 (7.9%) patients, with no significant difference in the rates of angioembolization between groups ($p>0.05$). Pneumothorax was observed in 14 (36.8%) patients, and tube thoracostomy was performed in 13 (34.2%) patients. Neither the rates of pneumothorax nor tube thoracostomy showed any significant difference between groups ($p>0.05$). The average length of hospital stay (LoHS) was 8.3 days, while the average length of stay in the intensive care unit (LoICUS) was 3.1 days. Group 2 had a significantly longer average LoHS ($p<0.05$), whereas the difference in LoICUS remained insignificant ($p>0.05$). FAST was performed in 14 (36.8%) patients at emergency admission, with positive results in 13 (92.9%) of them. The differences in both parameters were found to be insignificant between groups ($p>0.05$). The average transfusion requirement was 2 units of erythrocyte suspension (ES). Group 1 required significantly more ES transfusions ($p<0.05$). Average lactate, pH, and BE values at admission were 4.24±2.53 mmol/L, 7.3 (range: 6.9-7.4), and -4.32±4.79, respectively (Table 6). Group 1 had significantly higher lactate values and significantly lower BE values at emergency admission ($p<0.05$), while the difference in pH values remained insignificant ($p>0.05$). The average hemoglobin (Hb) and WBC values at admission were 12.86±2.38 g/dL and 19.10±7.7(103/µl), respectively. Group 1 had significantly lower Hb values and higher WBC counts at emergency admission ($p<0.05$). The average of the lowest Hb values was 8.77±2.16 g/dL. The difference between groups was found to be insignificant ($p>0.05$). The average pulse and systolic blood pressure (SBP) rates at admission were 100 bpm and 110 mmHg, respectively. Group 1 had significantly lower SBP ($p<0.05$), while the difference in pulse rates remained insignificant ($p>0.05$). The average GCS, cRTS, and ISS values at admission were 15 (range: 3-15), 7.84 (range: 0.73-7.84), and 28.13±11.57, respectively. Group 1 had significantly lower GCS and cRTS values and significantly higher ISS values at admission ($p<0.05$).

ROC analysis of significantly different parameters is presented in Table 7. ROC curves are demonstrated in Figures 1-8. The ROC analysis revealed a predictive cutoff value for ES transfusion requirement of 3.5 units. Predictive cutoff values for lactate, BE, WBC, SBP, GCS, cRTS, and ISS were found to be 4.9, -5.4, 15,400, 95, 11.5, 5.96, and 23.5, respectively. Their respective sensitivity and specificity rates are given in Table 7.

Types of abdominal surgical procedures are listed in Table 8. One patient developed bile fistula formation, which was

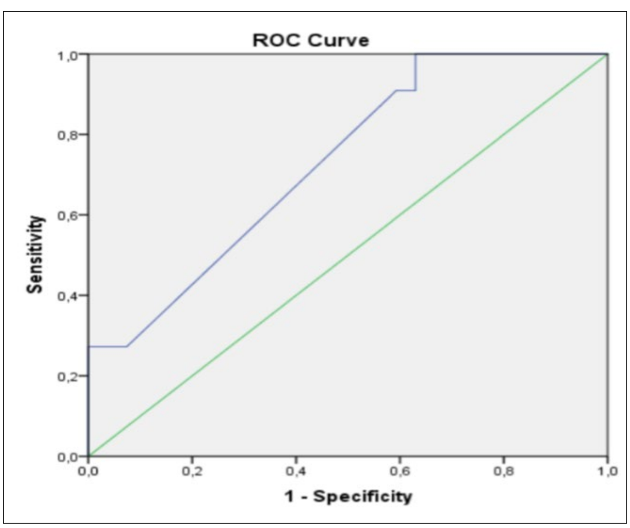

Figure 1. Lactate ROC analysis.

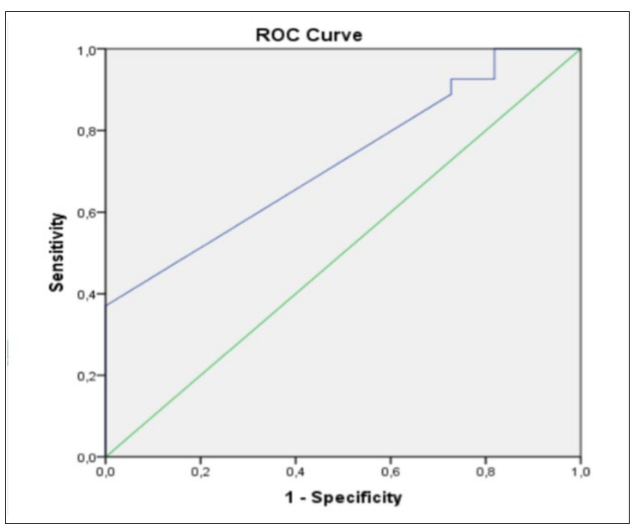

Figure 2. Base excess ROC anaysis.

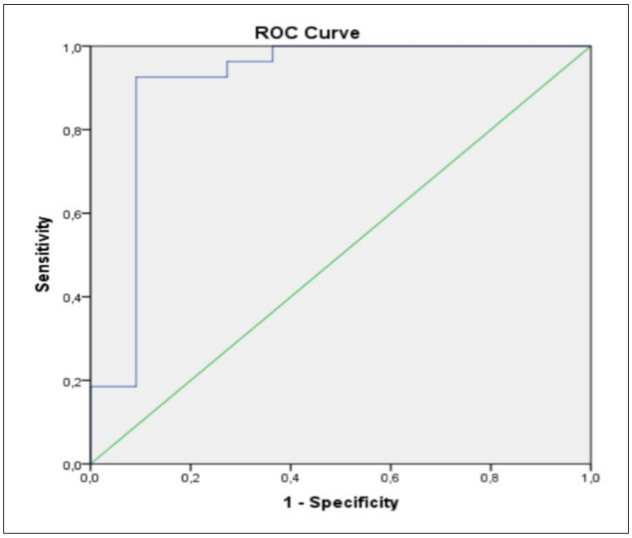

Figure 3. WBC ROC analysis.

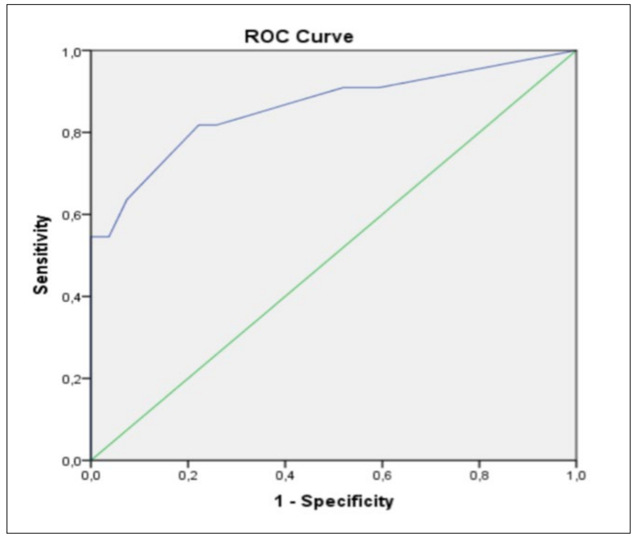

Figure 4. ES transfusion ROC analysis.

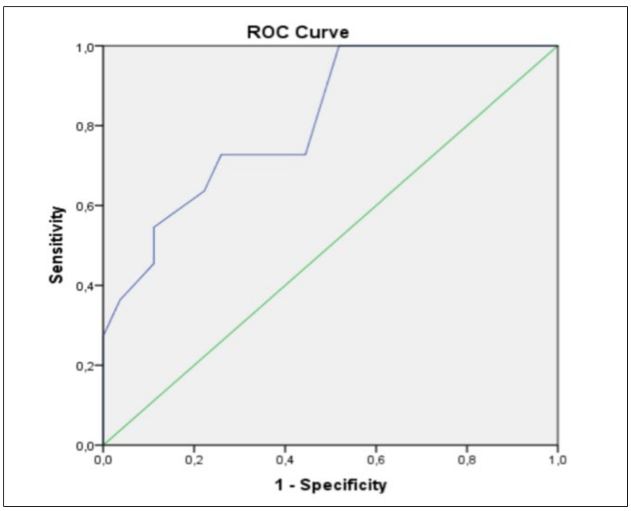

Figure 5. ISS ROC analysis.

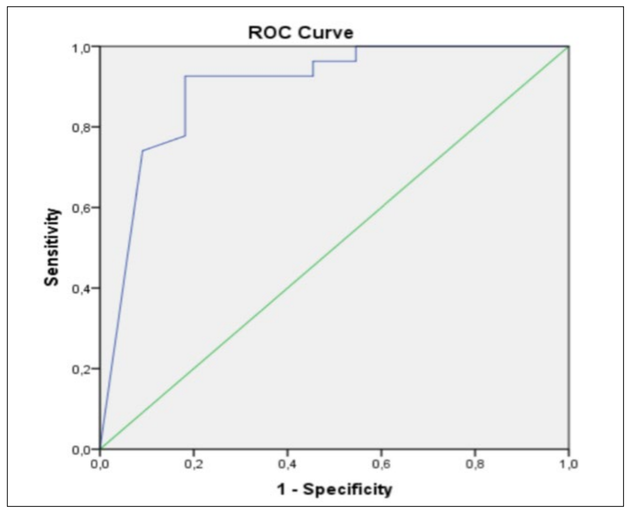

Figure 6. GCS transfusion ROC analysis.

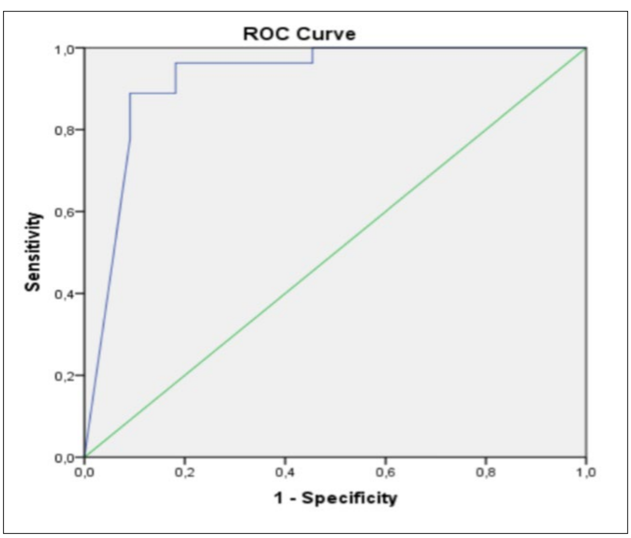

Figure 7. cRTS ROC analysis.

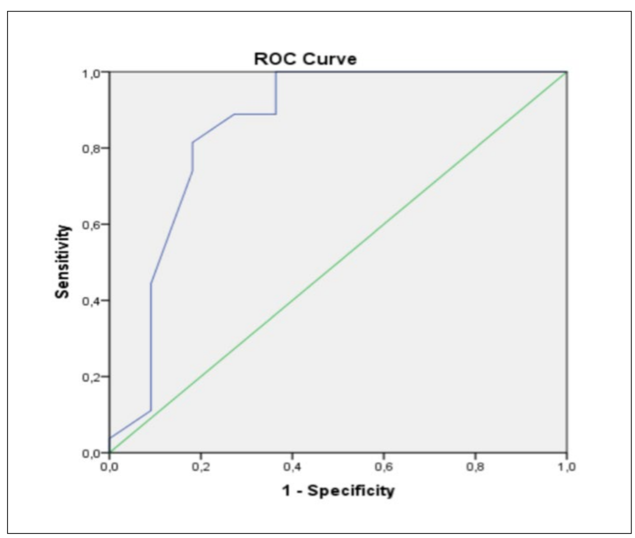

Figure 8. SBP ROC analysis.

treated with percutaneous drainage (PD). Another patient developed biloma formation, which was addressed with both Endoscopic Retrograde Cholangiopancreatography (ERCP) and PD.

DISCUSSION

High-grade liver injury still poses a significant threat to life and carries a great risk of complications. Therefore, identifying patients at greater risk becomes paramount when first evaluating a patient at emergency admission.

Both study groups consisted predominantly of adult male patients, a finding consistent with the literature.[6] Patients who died had proportionally higher-grade liver injuries, an expected outcome that aligns with contemporary literature.[7,8] The most common mechanism of injury was MVAs, followed by falls, which is in line with the literature identifying MVAs as the leading cause of blunt abdominal liver injury (BALI). Falls constitute a proportionally smaller segment of injury mechanisms in the literature, accounting for less than 10% of cases.[9,10,11] Our study, however, has discovered that nearly a quarter of the cases were associated with falls. Various factors could account for this discrepancy, including differences in patients' occupationals and related workplace safety measures. We believe these factors are not directly relevant to the objectives of our study.

Additional abdominal organ injuries were found to be associated with increased mortality rates in our study. Similar findings were suggested by Schnüriger et al. and Hommes et al. in their trials, indicating that additional abdominal organ injuries are related to both increased liver injury grades and mortality rates.[10,12] Our study, however, did not find a relationship between increased mortality rates and the presence of extra-abdominal site injuries. Additionally, in our findings, the rates of pneumothorax and thoracic tube placement did not significantly increase mortality rates. The literature presents conflicting views on this matter. Pimentel et al. suggested that extra-abdominal site injuries increase mortality in cases of blunt abdominal trauma.[13] Haddad et al. found that only head and chest injuries increased mortality rates, while thoracic tube placements had no impact on mortality.[14] Matthes et al. argued that only pneumothorax increases mortality rates, and accompanying extra-abdominal site injuries do not affect survival outcomes.[15] Paplawski et al. suggested that thoracic tube placement, which may become necessary in more than 30% of patients, significantly increases mortality rates.[16] The reasons for these conflicting outcomes could be varied, including differences in study design, patient inclusion criteria, and the exclusion of patients operated on immediately, among others. Despite these differences, future pooled analyses of available data will clarify the true impact of the aforementioned phenomena on mortality.

Patients deemed critically ill were evaluated using FAST upon admission. It is acknowledged that the sensitivity of FAST is operator-dependent, with a range from 63% to 100%.[17] The FAST positivity rates for both of our groups align with the literature. However, this does not yield valuable insights regarding the mortality rates and differences between the groups. Over half of the deceased patients could not be transported to the MDCT room for evaluation due to hemodynamic instability, leading to a statistically significant difference in patient evaluation by MDCT between the groups. It is established that in unstable trauma patients, no time should be wasted, even if this means foregoing a highly accurate MDCT evaluation.[18] This finding suggests that the ability to perform MDCT does not improve survival; instead, signs of hemodynamic instability that prevent MDCT evaluation and necessitate immediate surgery lower survival chances in patients with BALI. Control MDCT evaluations were only necessary for a subset of patients in Group 2, a difference that did not reach statistical significance. Control MDCT is indicated for patients under NOM with suspicious or subtle abdominal signs of concurrent injury, potentially requiring surgical exploration.[19] Since all patients in Group 1 died within 48 hours of admission, no control MDCT evaluations were performed in this group.

Angioembolization is considered an adjunctive treatment option for patients under NOM, whose Hb values continue to decrease under NOM or following damage control surgery, and in whom an active bleeding site, such as blood extravasation, can be identified radiologically.[3] Although angioembolization is associated with various complications, including hepatic necrosis and biloma formation, it has a high success rate in controlling bleeding.[20] In Group 2, three patients underwent angioembolization, and their bleeding was successfully stopped. Group 1 required significantly more ES replacement and had significantly lower Hb values upon admission compared to Group 2. Current literature suggests that when the requirement for ES exceeds 4 units, the chance of NOM decreases, and when the ES requirement exceeds 10 units, the chance of mortality increases.[4,21] Although the median ES replacement in Group 1 was found to be 8 units, it is important for physicians to remember that ES replacement is a dynamic process and can only be performed as long as the patient is alive. Since it was stated above that all of these patients died within a small time frame of 48 hours, it is safe to assume that if these patients had survived, they would have needed more ES replacement, and the findings would be more closely correlated with the literature. Nevertheless, our study was able to establish a cutoff value for ES replacement, which was 3.5 units or higher on average.

Group 1 had significantly higher lactate levels, lower BE and Hb values at admission compared to Group 2. Given that higher grades of liver injury are associated with a more severely exsanguinating pathology, and Group 1 had a significantly higher proportion of higher grades of liver injury, this finding is entirely expected.[22] The average SBP measurements of Group 1 were also significantly lower. Malhotra et al. stated that lower SBP and BE values are associated with poorer outcomes.[11] Yanar et al. and Franklin et al. reported similar results, adding that increased lactate levels at admission also play a role in morbidity.[23,24] Franklin further stated that base deficit levels of 6 or higher and serum lactate levels of 5 or higher are associated with worse outcomes. Kozar et al. stated that the chance of mortality increases if a patient's SBP at admission is lower than 110 mmHg and the base deficit is 4 or higher.[5] Our study revealed that lactate values greater than 4.9 and BE values lower than -6.7 are associated with increased mortality rates. We were also able to determine a cutoff value for SBP measurements, which was 95 mmHg or lower.

Group 1 had significantly higher ISS and lower cRTS values. It is recognized that ISS values of 15 or higher can be interpreted as major trauma, and increased ISS values are associated with increased mortality rates.[2,25,26] Thus, our findings align with the literature in this regard. However, to our knowledge, no specific cutoff value recommendations related to this aspect have been defined yet. Decreased GCS values have also been reported to be associated with increased mortality in trauma patients.[8,27] Based on the findings of this study, our cutoff suggestions for GCS, cRTS, and ISS values are <11.5, <5.96, and >23.5, respectively.

Regarding leukocytosis, the literature suggests that higher grades of liver injury are associated with increased WBC counts.[28,29] We found that Group 1 had significantly lower WBC counts compared to Group 2. Since we believe both the literature and our data are robust, we can anticipate that WBC counts within the normal range or increased less than expected may be a specific indicator of increased mortality rates. Additionally, this study managed to reveal a cutoff value for WBC counts. We found that WBC counts less than 15,400 were associated with increased mortality rates.

This study has several limitations. Firstly, its structure is retrospective. Although the data for trauma patients are recorded daily, this still exposes the study to selection bias. However, structuring a prospective study and randomizing patients under such life-threatening conditions is extraordinarily difficult. Therefore, we believe that every piece of objective data contributed holds value. Our study population is relatively small, and although we have identified significant differences between groups and established cutoff values for certain parameters, these results might be subject to change with an increase in the study size. Consequently, we believe that our findings are not final and anticipate that pooled analyses of available data and future comprehensive reviews will establish more reliable cutoff values and mortality-related associations. Nevertheless, we are satisfied to have contributed to the literature.

CONCLUSION

This study has demonstrated that increased liver injury grades, additional abdominal organ injuries, heightened ES transfusion requirements, elevated lactate levels at admission, lower BE, Hb, and SBP at admission, as well as increased ISS values and decreased GCS and cRTS values, are directly associated with mortality in patients with BALI. Further studies are needed to confirm the suggested cutoff values for these parameters.

Ethics Committee Approval: This study was approved by the Umraniye Training and Research Hospital Ethics Committee (Date: 23.11.2023, Decision No: 436).

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ORİJİNAL ÇALIŞMA - *ÖZ*

Yüksek dereceli künt karaciğer yaralanmalarında mortaliteyi öngörmek mümkün mü? Tek travma merkezli çalışma

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AMAÇ: Künt karın travmaları tüm travma vakalarının önemli bir bölümünü oluşturur ve sıklıkla karaciğer yaralanmaları ile ilişkilidir. Yüksek dereceli künt karaciğer yaralanmaları ise günümüzde dahi hayatı tehdit eden klinik tablolara sebebiyet verebilmektedir. Bu nedenle daha yakın takip ve tedavi gerekecek kritik hastaların tanınması önem arz etmektedir. Bu minvalde mortaliteyi arttıran faktörlerin tespiti için bu hastalardaki deneyimimizi paylaşmayı amaçladık.

GEREÇ VE YÖNTEM: 2008 ve 2023 yılları arasında acil kliniğinde künt travma sonrası grade 3 ve üzeri karaciğer yaralanması tanısı almış 38 hasta çalışmaya dahil edildi. Vefat eden 11 hasta 1. gruba alınırken, sağ kalan 27 hasta 2. gruba dahil edildi. Gruplar yaralanma mekanizması, görüntüleme sonuçları, glasgow koma skorları, travma şiddeti skorları, başvuru esnasındaki baz açığı, laktat ve pH değerleri yönünden karşılaştırıldı. Anlamlı fark olan parametrelerde eşik değeri bulmak için ROC analizi kullanıldı.

BULGULAR: Karaciğer yaralanma derecesi ve ek abdominal organ yaralanma oranları 1. grupta anlamlı daha yüksekti ($p<0.05$). Ekstraabdominal organ yaralanması yönünden gruplar arasında fark yoktu ($p>0.05$). Eritrosit suspansiyonu ihtiyacı 1. grupta anlamlı daha yüksekti ($p<0.05$). Ortalama laktat ve baz açığı değerleri 1. grupta anlamlı daha yüksekti ($p<0.05$). Lökosit değerleri 1. grupta anlamlı daha düşük bulundu ($p<0.05$).

SONUÇ: Baz açığı, hemoglobin, laktat, travma şiddeti skoru, karaciğer yaralanma derecesi, eşlik eden abdominal yaralanmalar ve eritrosit suspansiyon ihtiyacı artmış mortalite ile ilişkili bulunmuştur. Yukarıda belirtilen parametreler ile alakalı net eşik değerlerinin belirlenebilmesi için daha fazla veriye ve yayına ihtiyaç vardır.

Anahtar sözcükler: Künt abdominal travma; mortaliteyi arttıran faktörler; yüksek dereceli karaciğer yaralanması.

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