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The journal aims to publish scientifically high quality articles which can contribute to the literature and written in the emergency medicine field and other related fields. Review articles, case reports, editorial comments, letters to the editor, scientific letters, education articles, original images and articles on history and publication ethics which can contribute to readers and medical education are also published.

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Editorial Comments: Editorial comments aim at providing brief critical commentary by the reviewers having expertise or with high reputation on the topic of the research article published in the journal. Authors are selected and invited by the journal. Abstract, Keywords, Tables, Figures, Images and other media are not included.

Review Articles: Reviews which are prepared by authors who have extensive knowledge on a particular field and whose scientific background has been translated into high volume of publication and higher citation potential are taken under review. The authors may be invited by the journal. Reviews should be describing, discussing and evaluating the current level of knowledge or topic used in the clinical practice and should guide future studies. Please check Table 1 for limitations for Review Articles.

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Tables

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Table 1. Limitations for each manuscript type.

Type of manuscript	Word limit	Abstract word limit	Reference limit	Table limit	Figure limit
Original Article	5000 (Structured)	200	50	6	7 or total of 15 images
Review Article	5000	200	50	6	10 or total of 20 images
Case Report	1500	200	10	No tables	10 or total of 20 images
Letter to the Editor	500	N/A	5	No tables	No media
Scientific letter	900	N/A	10	No tables	2 or total of 4 images
Clinical Imaging/ Visual Diagnosis	400	N/A	5	No tables	3 or total of 6 images
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Publication ethics	900	N/A	10	No tables	No media

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Figures, graphics and photographs should be submitted as separate files (in TIFF or JPEG format) through the submission system. The files should not be embedded in a Word document or the main document. When there are figure subunits, the subunits should not be merged to form a single image. Each subunit should be submitted separately through the submission system. Images should not be labelled (a, b, c, etc.) to indicate figure subunits. Thick and thin arrows, arrowheads, stars, asterisks and similar marks can be used on the images to support figure legends. Like the rest of

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When a drug, product, hardware, or software mentioned within the main text product information, including the name of the product, producer of the product, city of the company and the country of the company should be provided in parenthesis in the following format: "Discovery St PET/CT scanner (General Electric, Milwaukee, WI, USA)"

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Limitations, drawbacks and shortcomings of original articles should be mentioned in the "Discussion" section before the conclusion paragraph.

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Scientific or Technical Report: Smith P. Golladay K. Payment for durable medical equipment billed during skilled nursing facility stays. Final report. Dallas (TX) Dept. of Health and Human Services (US). Office of Evaluation and Inspections: 1994 Oct. Report No: HHSIGOE 169200860.

Thesis: Kaplan SI. Post-hospital home health care: the elderly access and utilization (dissertation). St. Louis (MO): Washington Univ. 1995.

Manuscripts accepted for publication, not published yet: Leshner AI. Molecular mechanisms of cocaine addiction. N Engl J Med In press 1997.

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EDITORIAL

My Dear Colleagues,

It is our pleasure to welcome you in the 1st issue of Eurasian Journal of Emergency Medicine in 2019 and I hope you find it interesting. In this issue, we present 9 original articles, 3 case report, 1 image of interest and a letter to editor.

I hope that the Eurasian Journal of Emergency Medicine helps you through conveying your valuable experiences in the field of emergency medicine.

We kindly ask our readers to share their opinions for exploring new ways to make the journal more useful and practical.

Finally, I would like to thank all of our dear authors for submitting their articles. We wish to receive your continuing support and contributions.

Sincerely

Dr. Ahmet Kenan Türkdoğan

Editor in Chief

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Comparison of Trauma Scoring Systems in Pediatric Trauma Patients

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Abstract

Aim: We aimed to evaluate and compare the performance of BIG score (Base deficit, INR, GCS), pediatric trauma score, revised trauma score, injury severity score, new injury severity score (NISS) in mortality and stay intensive care unit.

Materials and Methods: One thousand five hundred ten pediatric patients aged less than 18 years who were admitted to the emergency department with multi-trauma between 1 July 2012 and 1 July 2016 were included in the retrospective research. Demographic data, vital signs in the emergency department, trauma location, injury severity indexes and follow up of patients were examined.

Results: One thousand five hundred ten patients were included, 40.5% were female and 59.5% were male. Mean age was 7.81±4.8; mortality was 4.2%. The best score to evaluate mortality was "probability of survival 2014 (PS14)". The best score to force the stay in ICU was found as NISS, the most sensitive system was NISS and PS14 (94.9%) and the most specific was NISS (86.7). PS14 was the first to evaluate the survival. In our research, 94.3% of patient had blunt trauma and 5.7% had penetrating trauma. PS14 was found the best score to determine survival and mortality for blunt trauma patients.

Conclusion: Although all scoring systems appeared similarly predictive among pediatric trauma patients, The PS14 score was more predictive for mortality and survival, and the NISS score for the need of intensive care admission. The NISS score was the most predictive score for intensive care admission in blunt and penetrating traumas combined. Particularly the newly developed PS14 score can be used as a powerfully predictive scoring system for outcomes among all pediatric trauma patients, irrespective of trauma mechanism.

Keywords: Pediatric trauma, trauma scores, BIG, probability of survival 2014, pediatric trauma score, revised trauma score, injury severity score, new injury severity score

Introduction

Trauma is one of the major causes of death among all age groups. It is the leading cause of death and disability among children older than 1 year of age (1). In addition to designing pre-hospital and hospital trauma organizations, taking meticulous preventive measures and providing public education are greatly important for efforts aimed at reducing trauma-related mortality (2). Initial assessment and management of multi-trauma patients is a difficult task requiring a rapid and systematic approach.

According to the ATLS principles, injured patients are assessed and treated based on their vital signs, level of consciousness, and injury mechanism (3). Additionally, a variety of trauma severity scoring systems has been devised to predict trauma severity and to predict and prevent trauma-related death (4). Trauma severity scoring refers to the process of prediction and quantification of the risks associated with death, hospitalization, and discharge (5). Trauma severity scores assess trauma in terms of its anatomic and/or physiological properties. abbreviated injury scale (AIS) and injury severity score (ISS) take into account injury's anatomic

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properties; Glasgow coma scale (GCS) and revised trauma score (RTS) deals with physiological condition; trauma and injury severity score (TRISS) takes makes a simultaneous assessment of anatomic injury and a patient's physiological condition (6); BIG Score takes into account anatomic and laboratory parameters (7); and PS14 developed by The Trauma Audit and Research Network simultaneously assess anatomic injury and physiological condition (8). Trauma severity scores provide useful guidance for initial pre-hospital assessment, injury severity, patient transportation to an appropriate center, hospital assessment, and mortality prediction.

Here in, we aimed to assess and compare the performances of the BIG Score, PS14, PTS, RTS, ISS, and NISS for predicting mortality and intensive care unit admission in pediatric trauma patients admitted to emergency department. Also, prior to diagnosis of specific injury is important, as they do not therefore help with where patients should go or their resource use in the ED.

Materials and Methods

This retrospective clinical study was approved by the Local Ethics Committee at Dışkapı Training and Research Hospital (date: 04/04/2016- no: 28/23) and conducted at Dışkapı Training and Research Hospital Emergency Department.

This study included a total of 1510 pediatric patients aged less than 18 years who were admitted to the emergency department with multi-trauma between 1 July 2012 and 1 July 2016. Patients older than 18 year, with simple trauma and incomplete file records were excluded from the study. Patients' medical information was accessed via hospital automation system and written medical records. Age, sex, nationality, site of trauma, injury type (blunt-penetrating), trauma mechanism, vital signs, and laboratory results were recorded on a previously prepared study form. Patients' Injury severity scores (PTS, AIS, ISS, NISS, GCS, BIG, RTS, PS14), admission to the consulting department, and in-hospital outcomes were recorded on patient information forms during their emergency department stay. The newly developed BIG and PS14 scores were calculated as described below:

BIG score: Developed by Borgman et al. (7) in 2011. They retrospectively analyzed data from 2002 to 2009 and showed that base deficit, international normalized ratio (INR), and GCS were correlated to mortality. These variables were formulated as [(base deficit + (INRx2.5) + (15-GCS)] in the BIG scale. This equation was then adapted to a formula predicting mortality. Predicted mortality = $1/(1+e^{-x})$, $x=0.2 \times$ (BIG score) - 5.208 (9,10).

PS14 score: Survival probability of each patient is calculated using logistic regression coefficients. Natural logarithm is used; ISS is converted using the fractional polynomial equation for the model fitting better.

MCCI represents categorized modified Charlson' Comorbidity index.

b=is defined as the linear combination of the regression coefficients and related patient's characteristics (ISS, GCS, modified CCI, age and sex) and the constant e=2.718282 (base of Napieran logarithms) (11).

Statistical Analysis

The statistical analysis of the study data was performed with SPSS-17 software package. Normality of continuous variables was tested with Kolmogorov-Smirnov test. Mann-Whitney U test was used to compare variables that did not meet normality criteria. Surviving and deceased patients were compared using Mann-Whitney U test. Penetrating and blunt traumas were separated and compared with Mann-Whitney U test. ROC curves of the trauma scores were drawn using the Med Calc statistical software.

Results

A total of 1510 patients were included. The mean age of the patients was 7.81 years. Ninety-three percent (n=1404) patients were of Turkish nationality, 6.8% (n=102) were Syrian, and 0.3% (n=4) were from other nations. Table 1 summarizes patients' vital signs, laboratory parameters, site of injury, trauma mechanism, and injury location. Nineteen point four percent (n=293) of patients were admitted to the intensive care unit directly from the emergency department or sent to another hospital where

Table 1. Patients' demographic, laboratory parameters, vital signs

	n	%
Male	898	59.5
Female	612	40.5
The place where the injury occurred		
Outside	1069	70.8
Nursery and school	178	11.8
Home	263	17.4
Mechanism of trauma	n	%
In-car traffic accident	319	21.1
Extravehicular traffic accident	351	23.2
Bicycle crash	133	8.8

Table 1. Continued

Motorcycle accident	38	2.5
Falling from high	219	14.5
Fall on plain ground	101	6.7
Falling objects	161	10.7
Assault	93	6.2
Cutter tool injury	67	4.4
Injury with a firearm	19	1.3
Others	9	0.6
Injury zone	**n**	**%**
Head and neck	1040	68.9
Face	557	36.9
Thorax	636	42.1
Abdomen	906	60
Spine	265	17.5
Pelvic	366	24.2
Upper extremity	577	38.2
Lower extremity	579	38.3
Vital signs	**Mean ± SD**	**Minimum - maximum**
Age	7.8±4.8	0-18
Systolic blood pressure (mmHg)	89.4±18.9	0-150
Diastolic blood pressure (mmHg)	63.2±11.8	0-90
Pulse (minute)	96.9±21.2	0-161
Respiratory rate (minute)	27.6±5.6	0-42
Saturation (%)	93.4±10.6	0-100
Laboratory	**Mean ± SD**	**Minimum - maximum**
Leucocyte	12.4±5.4	3.6-51.8
Hemoglobin	12.9±1.6	5-17.7
Hematocrit	39.6±5.1	15.5-52
INR	1.1±0.2	0.8-4.5
BE	-0.7± 4.1	-29.0-11.1
Anyon gap	11.8± 6.9	-26.0-61.5
Lactate	1.8± 1.8	0.1-17
Trauma scores	**Mean ± SD**	**Minimum - maximum**
BIG	7.87±5.85	2.35-44.8
PS14	94.18±16.5	8.84-99.9
PTS	7.51±3.19	-6-12
RTS	6.77±1.52	0-7.84
ISS	10.86±12.25	1-75
NISS	11.38±13.11	1-75
GCS	12.87±3.16	3-15
Out-come	**n**	**%**
Discharge from emergency cer	746	49.4
Admitted to clinic	312	20.7
Admitted to the intensive care unit	213	14.1
Referred to another hospital	177	11.7
Exitus in emergency cervise	62	4.2

INR: International normalized ratio, PTS: Pediatric trauma score, RTS: Revised trauma score, ISS: Injury severity score, NISS: New injury severity score, GCS: Glasgow coma scale, PS14: Probability of survival 2014, SD: Standard deviation

they were admitted to intensive care unit. Among patients either admitted to hospital ward or intensive care unit, referred to another center, or treated at the emergency department, 88.6% (n=1338) were discharged with improvement of their status whereas 11.4% (n=172) died (Table 1).

The powers of the trauma scores for mortality prediction were analyzed with ROC curves. Accordingly, BIG had an AUC value of 0.984 (0.976-0.990), a sensitivity of 92.4%, and a specificity of 96.6%. PS14 score had an AUC of 0.994 (0.988-0.997), a sensitivity of 96.51%, and a specificity of 96.64%. PTS had an AUC of 0.957 (0.946-0.967), a sensitivity of 90.7%, and a specificity of 90.4%. RTS had an AUC of 0.976 (0.967-0.983), a sensitivity of 91.9%, and a specificity of 93.1%. ISS had an AUC of 0.992 (0.986-0.996), a sensitivity of 93.6%, and a specificity of 97.3%. NISS had an AUC of 0.993 (0.987-0.997), a sensitivity of 95.9%, and a specificity of 95.5%. GCS had an AUC of 0.987 (0.979-0.992), a sensitivity of 95.4%, and a specificity of 94% (Figure 1).

Table 2. A comparison of the trauma scores' ROC curves for mortality

	AUC	95% Accuracy	Sensitivity	Specificity
BIG	0.984	0.976-0.990	92.44%	96.64%
PS14	0.994	0.988-0.997	96.51%	96.64%
PTS	0.957	0.946-0.967	90.7%	90.4%
RTS	0.976	0.967-0.983	91.86%	93.12%
ISS	0.992	0.986-0.996	93.6%	97.31%
NISS	0.993	0.987-0.997	95.93%	95.52%
GCS	0.987	0.979-0.992	95.35%	94.02%

PS14: Probability of survival 2014, PTS: Pediatric trauma score, RTS: Revised trauma score, ISS: Injury severity score, NISS: New injury severity score

Table 3. A comparison of the trauma scores' ROC curves for intensive care unit

	AUC	95% Accuracy	Sensitivity	Specificity
BIG	0.895	0.878-0.910	83.62%	83.98%
PS14	0.925	0.911-0.938	94.88%	82.33%
PTS	0.851	0.832-0.869	75.09%	83.24%
RTS	0.903	0.887-0.918	88.05%	84.06%
ISS	0.934	0.920-0.946	92.83%	88.00%
NISS	0.936	0.923-0.948	94.88%	86.69%
GCS	0.913	0.898-0.927	89.76%	82.91%

PS14: Probability of survival 2014, PTS: Pediatric trauma score, RTS: Revised trauma score, ISS: Injury severity score, NISS: New injury severity score

Table 4. Comparing trauma scores for blunt and penetrating injuries

Trauma scores	Blunt	Penetrating	p
BIG (mean ± SD)	7.98±5.88	6.13±5.08	0.000
PS14 (mean ± SD)	94.10±16.53	95.42±16.13	0.321
PTS (mean, IQR)	8, 4	8, 2	0.356
RTS (mean ± SD)	6.76±1.51	7.09±1.56	0.003
ISS (mean, IQR)	6, 11	3, 9	0.000
NISS (mean, IQR)	6, 11	3, 9	0.000
GCS (mean, IQR)	14, 3	15, 1	0.000

Mann-Whitney U test, $p<0.05$ significantly different
SD: Standard deviation, INR: International normalized ratio, PTS: Pediatric trauma score, RTS: Revised trauma score, ISS: Injury severity score, NISS: New injury severity score, GCS: Glasgow coma scale, PS14: Probability of survival 2014

Table 5. Comparison of ROC curves for mortality prediction in blunt and penetrating trauma

Blunt	AUC	95% Accuracy	Sensitivity	Specificity
BIG	0.983	0.975-0.989	92.22%	96.42%
PS14	0.993	0.988-0.997	96.41%	96.58%
PTS	0.956	0.944-0.966	90.42%	89.98%
RTS	0.975	0.966-0.983	91.62%	93.08%
ISS	0.992	0.986-0.996	93.41%	97.14%
NISS	0.993	0.987-0.996	95.81%	95.23%
Penetrating	AUC	95% Accuracy	Sensitivity	Specificity
BIG	1.000	0.958-1.000	100%	100%
PS14	1.000	0.958-1.000	100%	100%
PTS	1.000	0.958-1.000	100%	100%
RTS	0.995	0.949-1.000	100%	97.53%
ISS	1.000	0.958-1.000	100%	100%
NISS	1.000	0.958-1.000	100%	100%

PTS: Pediatric trauma score, RTS: Revised trauma score, ISS: Injury severity score, NISS: New injury severity score, PS14: Probability of survival 2014

Table 6. A comparison of the scoring systems and the ROC analysis for prediction of intensive care unit admission

Blunt	AUC	95% Accuracy	Sensitivity	Specificity
BIG	0.897	0.880-0.912	85.11	83.45
PS14	0.927	0.912-0.940	95.39	81.7
PTS	0.852	0.833-0.870	75.89	82.92
RTS	0.905	0.888-0.919	87.94	83.63
ISS	0.936	0.921-0.948	93.62	87.65
NISS	0.937	0.923-0.949	95.04	86.34
GCS	0.914	0.899-0.928	91.13	82.40
Penetrating	AUC	95% Accuracy	Sensitivity	Specificity
BIG	0.882	0.795-0.942	100	76
PS14	0.913	0.832-0.963	90.91	89.33
PTS	0.865	0.774-0.929	90.91	77.33
RTS	0.865	0.774-0.929	90.91	90.61
ISS	0.921	0.842-0.968	90.91	89.33
NISS	0.934	0.859-0.976	100	89.33
GCS	0.921	0.843-0.968	100	89.33

PTS: Pediatric trauma score, RTS: Revised trauma score, ISS: Injury severity score, NISS: New injury severity score, PS14: Probability of survival 2014

A comparison of the trauma scores' ROC curves for mortality revealed that the PS14 scoring system had the best sensitivity (Figure 1, Table 2). A comparison of the trauma scores' ROC curves for intensive care unit admission showed that the NISS score had the best sensitivity (Table 3).

Among the study subjects, 5.7% (n=86) had penetrating trauma and 94.3% (n=1424) had blunt trauma. Trauma scores were compared with regard to blunt and penetrating injuries. Although PTS and PS14 scores were not significantly different with respect to blunt and penetrating trauma ($p>0.05$), other trauma scores were significantly different ($p<0.05$) (Table 4). Comparison of ROC curves for mortality prediction in blunt trauma revealed that the NISS and PS14 scoring systems were the most predictive scores. Comparison of ROC curves for mortality prediction in penetrating trauma showed that all scores except for the RTS score were equally predictive (Figure 2, Table 5).

The ROC analysis of GCS for penetrating trauma revealed an AUC value of 1.000 (0.958-1.000), a sensitivity of 100%, and a specificity of 100% (Figure 2, Table 6). A comparison of the scoring systems for prediction of intensive care unit admission revealed that the NISS and ISS were the most predictive ones (Table 6).

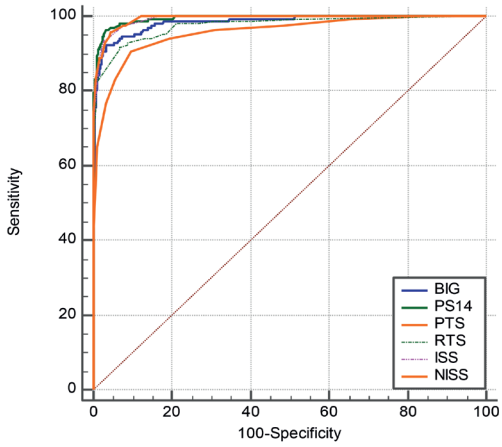

Figure 1. A comparison of the trauma scores' ROC curves for mortality

PTS: Pediatric trauma score, RTS: Revised trauma score, ISS: Injury severity score, NISS: New injury severity score, PS14: Probability of survival 2014

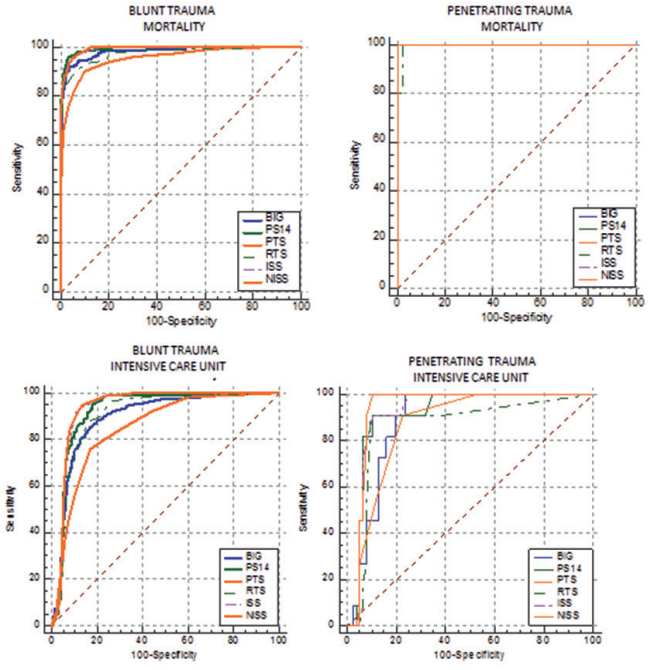

Figure 2. A comparison of the scoring systems and the ROC analysis for prediction of intensive care unit admission

PTS: Pediatric trauma score, RTS: Revised trauma score, ISS: Injury severity score, NISS: New injury severity score, PS14: Probability of survival 2014

Discussion

Trauma is one of the leading causes of death in all age groups, particularly children. Trauma is the leading cause of death after the age of 4 years in underdeveloped and developing countries and between the ages of 1 and 14 years in developed countries (52%). Trauma ranks second after infection among as a cause of death between the ages of 1 and 4 years in under-developed regions (9).

BIG score was developed by Borgman et al. (7) in 2011 and first studied in children. Borgman et al. (7) retrospectively analyzed data from 2002 to 2009 and found that base deficit, INR, and GCS were significantly correlated to mortality. Then, they put these variables into the BIG score (base deficit + (INR x2.5) + (15-GCS). In that pediatric study, the BIG score had an AUC of 0.89 for mortality prediction (10). The BIG score was reported to be superior to RTS, ISS, and other pediatric scores used for this indication (7). In 2013 Brockamp et al. (10) used the BIG score in an adult population for the first time. That study compared the BIG, TRISS, PSO9 scores and found that the BIG score was equally predictive for mortality in adults. In line with those studies, we also found an AUC of 0.89 for the BIG score for mortality prediction. The BIG score was more predictive for mortality than the RTS and PTS scores. The most striking advantage of the BIG score compared to other complex scoring systems is its easy calculability with the formula: base deficit + INR + GCS. We are of the opinion that the BIG score can be effectively used for mortality prediction in pediatric trauma patients. In the BIG score developed by Borgman et al. (7) a score of <12 predicts a mortality rate of <5% and a BIG score of >26 is indicative of a mortality risk exceeding 50%. In that study, TRISS and PSO9 showed the best performance when all trauma types were concerned where as the BIG score performed as well as TRISS and PSO9 when penetrating trauma alone was concerned (10). In accordance with the previous studies, our study revealed a mortality rate exceeding 50% for a BIG score of greater than 26.

A comparison of ROC curves for mortality pertaining to different trauma scores indicated that PS14 was the most sensitive score (AUC; 0.99, sensitivity; 96.51%, and specificity; 96.64%) followed by NISS, ISS, GCS, BIG, RTS, and PTS. A retrospective study involving patients with major bleeding found no significant difference between PS14 and ISS with regard to mortality prediction (11). Assessing a combination of sex, age, ISS, GC, intubation, and comorbidity status as well as including a higher number of mortality-related factors than other scoring systems possibly increased the PS14's predictive power for mortality. Honarmand and Safavi (12) in a study on trauma victims admitted to intensive care unit, showed that NISS predicted the need for intubation and ventilation better than ISS did (12). Lavoie et al. (13) compared ISS and NISS in moderate and severe head trauma and found that NISS was better for predicting the need for intensive care and duration of hospital stay. In our study, the NISS score was the most predictive scoring system for intensive care unit admission (AUC: 0.936). The most sensitive ones were NISS and PS14 (94.8%), and the most specific one was the NISS (86.69%). In this sense, our findings were in accordance with previously reported studies. PS14 having the same sensitivity as the NISS system suggests that it can be used as a novel scoring system to predict intensive care unit admission. We are of the opinion that PS14 may be more

predictive for intensive care unit admission when NISS is used instead of the ISS score, one of the PS14 score's parameters. In a previous study TRISS had an AUC value of 0.88 and ISS 0.67 for predicting survival (14). Our study revealed that PS14 was the most predictive score among others for survival (AUC: 0.99). Solely anatomic or physiological trauma scores remain incapable of predicting trauma-associated outcomes. Thus, PS14 being both an anatomic and physiological index explains its success at predicting trauma outcome.

A comparison of trauma scores for blunt and penetrating injuries showed no difference between PS14 and PTS. Despite being effective for blunt trauma, many trauma scores remain ineffective at assessing penetrating injuries. Our finding suggests that PS14 and PTS can be safely used for penetrating trauma. The reasons of PS14 and PTS having more predictive power in penetrating trauma may include both systems making an anatomic and physiological assessment and the presence of similar parameters in both scores such as PTS taking into account the presence of an open wound, neurological status, and airway while PS14 taking into account ISS, GCS, and intubation status.

A significant correlation was reported between the number of injured organs and mortality and morbidity (15). In blunt trauma PS14 and NISS were the most predictive scores for mortality, with no significant difference having been shown between the two (AUC: 0.99). PS14 had the highest sensitivity (96.41%) and ISS had the highest specificity (97.14%) for mortality in blunt trauma. Survival analysis for blunt trauma revealed similar results as mortality, with the PS14 score being the most predictive score. It was considered that PS14 may be as predictive as ISS for mortality in blunt trauma. No study on that subject has been published in the literature.

Many studies published so far have advocated that penetrating trauma is associated with more fatal consequences and more commonly cause organ injuries in children than adults due to the body composition of the former (16,17). In our study RTS alone had an AUC value of 0.995 while the other scores had AUC values of 1.000 for mortality prediction among penetrating trauma patients. In the survival analysis of penetrating traumas, RTS had an AUC value of 0.949 and the others had AUC values of 1.000.

All scores studied in our study showed similar predictive performances possibly due to the province of our hospital being a pediatric trauma center, cases with higher mortality being referred to our hospital, and our series involving a lower number of patients with penetrating trauma. No previous study has been yet published about this subject.

Borgman et al. (7) reported that TRISS and PSO9 showed the best predictive power when all trauma types are concerned whereas the BIG score showed a similar predictive power for mortality when penetrating trauma alone is concerned.

Ninety percent of children with blunt abdominal trauma does not need any surgical intervention but a close follow-up and intensive care (18). A ROC analysis for the need of intensive care unit admission after blunt trauma showed that the NISS score (AUC: 0.937) was more predictive than the other scores. Moreover, PS14 had the best sensitivity (95.39%), and ISS had the best specificity (87.65%). A ROC analysis for the need for intensive care unit admission after penetrating trauma also showed that the NISS score (AUC: 0.934) was predictive. The NISS, BIG, and GCS scores had the best sensitivities (100%) whereas the RTS had the best specificity. No previous study has been yet published about this subject.

Conclusion

In conclusion, although all scoring systems appeared similarly predictive among pediatric trauma patients, The PS14 score was more predictive for mortality and survival, and the NISS score for the need of intensive care admission. The NISS score was the most predictive score for intensive care admission in blunt and penetrating traumas combined. Particularly the newly developed PS14 score can be used as a powerfully predictive scoring system for outcomes among all pediatric trauma patients, irrespective of trauma mechanism.

Ethics

Ethics Committee Approval: This retrospective clinical study was approved by the Local Ethics Committee at Dışkapı Training and Research Hospital (date: 04/04/2016-no: 28/23) and conducted at Dışkapı Training and Research Hospital Emergency Department.

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: H.S., S.Ö., Design: H.S., T.E.S., Data Collection or Processing: H.S., N.K., Analysis or Interpretation: H.S., S.Ö., Literature Search: H.S., S.Ö., Writing: H.S., T.E.S.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. National Center for Health Statistics: Health, United States, 2007, with Chartbook on Trendsin the Health of Americans.Hyattsville, MD, U.S. Department of Heath and Human services, Centers for Disease Control and Prevention, National Center for Health Statistics 2007.

2. Ertekin C, Belgerden S. Travmalı hastaya ilk yaklaşım. Ulus Travma Derg. 1995;1:117-25.

3. American College of Surgeons, Committee on Trauma: Advanced Trauma Life Sup-port for Doctors, Instructor Course Manual, 6th ed. Chicago, American College of Surgeons, 1997.

4. Moore L, Lavoie A, LeSage N, Abdous B, Bergeron E, Liberman M, et al. "Statistical validation of the Revised Trauma Score." J Trauma. 2006;60:305-11.

5. Kilgo PD, Meredith JW, Osler TM. Injury Severity Scoring and Outcomes Research In: Feliciano DV, Mattox KL, Moore EE editors. Trauma, 6th Edition. McGraw-Hill Companies 2008.p.83-90.

6. Erez I, Lazar L, Gutermacher M, Katz S. Abdominal injuries caused by bicycle handlebars. Eur J Surg. 2001;167:331-3.

7. Borgman M, Maegele M, Wade CE, Blackbourne LH, Spinella PC. Pediatric trauma BIG score: predicting mortality in children after military and civilian trauma. Pediatrics. 2011;127:892-7.

8. https://www.tarn.ac.uk/Content.aspx?c=3515.

9. Güloğlu R, Yanar H. Karın Yaralanmaları. Ertekin C, Taviloğlu K, Güloğlu R ve Kurtoğlu M ed. 1. baskı. İstanbul Yayıncılık, 2005.s:875-85.

10. Brockamp T, Maegele M, Gaarder G. Comparison of the predictive performance of the BIG, TRISS, and PS09 score in an adult trauma population derived from multiple international trauma registries. Critical Care. 2013;17:R134.

11. Mothukuri R, Battle C, Guy K, Mills G, Evans PA. The Implementatıon Of Massıve Haemorrhage Protocol (Mhp) For The Management Of Major Trauma: A Ten Year, Sıngle Centre Study Of Patıent Outcomes. Emergency Medicine Journal. 2015;32:991.

12. Honarmand A, Safavi M. The new Injury Severity Score: a more accurate predictor of need ventilator and time ventilated in trauma patients than the Injury Severity Score. Ulus Travma Acil Cerrahi Derg. 2008;14:110.

13. Lavoie A, Moore L, LeSage N, Liberman M, Sampalis JS. The Injury Severity Score or the New Injury Severity Score for predicting intensive care unit admission and hospital length of stay? Injury. 2005;36:477-83.

14. Rutledge R, Osler T, Emery S, Kromhout-Schiro S. The end of the Injury Severity Score (ISS) and the Trauma and Injury Severity Score (TRISS): ICISS, an International Classification of Diseases, ninth revision-based prediction tool, outperforms both ISS and TRISS as predictors of trauma patient survival, hospital charges, and hospital length of stay. J Trauma. 1998;44:41-9.

15. Demircan O, Yağmur Ö, Boğa Z, Erkoçak EU, Alabaz Ö. The Factors Affectıng Postoperatıve Mortalıty In Blunt Abdomınal Trauma Patıents. Ulusal Travma Dergisi. 1995;1:81-5.

16. Cotton BA, Nance ML. Penetrating trauma in children. Semin Pediatr Surg. 2004;13:87.

17. Wessen DE, Stylianos S, Pearl RH. Thoracic injuries, abdominal trauma, in Grosfeld JL, O'neill JA (eds): Pediatric Surgery. 6th Edition, Philadelpia. Mosby Inc. 2006.p:275.

18. Haller JA, Papa P, Drugas G, Colombani P. Nonoperative management of solid organ injuries in children.İs it safe? Ann Surg. 1994;219:625-8.

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Evaluation of Postoperative Clinical and Radiological Outcomes of Thoracolumbar Vertebral Fractures

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Abstract

Aim: The aim of this study was to measure a variety of clinical and radiological outcomes in a group of patients with thoracolumbar fractures who underwent surgery at a single center.

Materials and Methods: We retrospectively analyzed 50 consecutive patients who underwent surgery for thoracolumbar vertebral fractures between September 2000 and December 2011. We assessed clinical outcomes with the visual analogue scale (VAS) for pain, Oswestry disability ındex (ODI), and Frankel scale. We measured radiological outcomes using the sagittal index (SI), Local Kyphosis Angle (LKA), and anterior corpus height loss (ACHL).

Results: Preoperative, postoperative, and final visit mean VAS values were 82 mm, 60 mm, and 13.5 mm, and mean ODI values were 65%, 40%, and 15%, respectively. These clinical outcome improvements were all statistically significant ($p<0.05$). Similarly, mean SI values were 20°, 14°, and 15°, mean LKA values were 17°, 9°, and 13°, and mean ACHL values were 45%, 25%, and 28%, respectively. The preoperative to postoperative radiological outcome improvements were all statistically significant ($p<0.05$), whereas the postoperative to final visit measures actually demonstrated loss of correction, although these changes were not statistically significant.

Conclusion: Although major progress has been made in the treatment of thoracolumbar vertebral fractures, the lack of standardized, verified clinical and radiological outcome measures continues to pose a challenge to the accurate assessment of the results of management.

Keywords: Anterior corpus height loss, Local Kyphosis Angle, sagittal index, thoracolumbar fracture, visual analogue scale

Introduction

The most common vertebral fractures occur in the thoracolumbar area, which is the transitional area of the spine (1-3). Thoracolumbar fractures occur most commonly in young adults (15 to 30 years of age) and may be associated with neurological deficits in 15 to 20% of patients (4,5). These fractures are proportionally on the increase, primarily because of the rising incidence of occupational and traffic accidents (1,2,4,5).

This upturn in the rate of thoracolumbar fractures has led to additional developments in surgical techniques and instrumentation technology. As a result, even patients with short life expectancies and poor quality of life related to a broad range of co-morbidities, who undergo surgery, seem to subsequently experience improved life expectancy and the ability to resume regular activities. Yet despite updated techniques, posterior, anterior, and combined surgical approaches have been used in the treatment of thoracolumbar fractures for the past five decades with several studies reporting excellent results (6-9).

The main surgical indications for thoracolumbar vertebral fractures are the associated presence of neurological deficit and vertebral instability (6,10-14). Nevertheless, a number of issues continue to hamper the process of determining the optimal

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management of thoracolumbar fractures. These include the lack of a widely recognized and validated thoracolumbar fracture classification, similar results obtained for some patient groups with either surgical or conservative treatment, and ambiguity about how best to understand and define the concept of spinal instability (3,15). Furthermore, the ideal parameters to use for measuring outcomes remain unclear.

In the present study, we aimed to measure a variety of clinical and radiological outcomes in a group of patients with thoracolumbar fractures who underwent surgery at a single center.

Materials and Methods

This retrospective study included 50 consecutive patients who underwent surgery for a thoracolumbar spine fractures between September 2000 and December 2011 at Ankara University Faculty of Medicine, Department of Orthopedics, by one of the two authors. We obtained approval from our institutional ethics committee for this study, and we conducted it in accordance with the principles of the Declaration of Helsinki. A written informed surgical consent was obtained from each patient.

We obtained clinical outcome responses from patients via the visual analogue scale (VAS) and the Oswestry disability index (ODI), which were both assessed preoperatively, postoperatively, and at the final visit. The 100-mm VAS was used to measure the intensity of pain associated with the fracture. The ODI was employed to measure the degree of disability associated with the fracture (16). If all 10 sections of the ODI are completed, the score can range from 0 to 50. Scores are calculated as a percentage (out of 50), and depending upon results, patients are described as minimally disabled (0% to 20%), moderately disabled (21% to 40%), severely disabled (41% to 60%), crippled (61% to 80%), or bed-bound / exaggerating symptoms (81% to 100%).

The Frankel scale, a 5-point severity scale, was used to determine the severity of spinal cord injury associated with the fracture (17). On this scale, spinal injuries are classified as complete (grade A), sensory only (grade B), motor useless (grade C), motor useful (grade D), or no neurological deficit (grade E). This was measured preoperatively, postoperatively, and at the final visit.

The sagittal index (SI), Local Kyphosis Angle (LKA), and anterior corpus height loss (ACHL) were measured using plain radiography preoperatively, postoperatively, and at the final follow-up visit. The SI is a measurement of the kyphotic vertebral segmental deformity corrected for the normal sagittal contour at the level of the deformed vertebral segment, and it was calculated as the angle between the posterior walls of the fractured vertebra and the intact vertebra immediately below it. The LKA is used to classify the sagittal plane deformity in the setting of traumatic thoracolumbar spine fractures, was measured using the Cobb method, and was defined as the angle formed between a line drawn parallel to the superior endplate of the intact vertebra one level above the fracture and a line drawn parallel to the inferior endplate of the intact vertebra one level below the fracture (18). The ACHL was calculated as the height of the fractured vertebra divided by the mean height of the intact vertebrae just above and below the fractured vertebra, and it was reported as a percentage.

Following the initial physical examination, patients underwent localized computed tomography (CT) and bilateral radiographs of any suspicious regions based on pain or tenderness. If examination revealed any neurological deficit, magnetic resonance imaging (MRI) was performed immediately. The vertebral fractures were classified based on the Thoracolumbar Injury Severity Scale and Score (TLISS) as well as the Denis classification system (5,10,19-21). The TLISS is based on three major injury characteristics: 1) the fracture morphology, 2) the integrity of the posterior ligamentous complex (PLC), and 3) the neurologic status of the patient. The Denis classification system divides the spine into three columns (and disruption of two or more columns results in instability): anterior column (anterior longitudinal ligament plus anterior half of vertebral body), middle column (posterior half of vertebral body plus posterior longitudinal ligament), and posterior column (pedicles, facet joints, supraspinous ligaments). The Denis system classifies fractures into four types - compression, burst, flexion-distraction, and fracture-dislocation - and differentiates each of these into five subtypes, A through E.

Patients most commonly remained hospitalized for three days after surgery. They typically underwent postoperative imaging one day after surgery. Postoperative VAS and ODI responses and Frankel scale measurements were generally obtained one week after surgery. Follow-up visits were routinely done at 1 week, 1 month, 3 months, 6 months, and 1 year after surgery. Final visit determination of VAS, ODI, and Frankel scale as well as imaging for calculation of SI, LKA, and ACHL, were done 1 year after surgery in most patients.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) Statistics for Windows, Version 17.0 (SPSS Inc., Chicago, IL, USA). Descriptive data are primarily presented as means. Friedman's test and univariate logistic regression were implemented to assess and compare outcome results. Statistical significance was defined at the 5% ($p<0.05$) level.

Table 1. Distribution of 50 patients with thoracolumbar vertebral fractures, by the 3 major injury characteristics of the Thoracolumbar Injury Severity scale and score[1], Ankara University Faculty of Medicine, Department of Orthopedics, September 2000-December 2011

Fracture morphology	Fracture n (%)
Compression	8 (16)
Burst	39 (78)
Translation-rotation	3 (6)
Distraction	0 (0)
Posterior ligamentous complex integrity	
Intact	3 (6)
Suspected/Indeterminate	24 (48)
Injured	23 (46)
Neurologic status (level of involvement)	
Intact	42 (84)
Nerve root	3 (6)
Conus medullaris - complete	4 (8)
Conus medullaris - incomplete	1 (2)
Cauda equina	0 (0)

[1]The Thoracolumbar Injury Severity scale and score is based on three major vertebral injury characteristics: 1) fracture morphology, 2) integrity of the posterior ligamentous complex, and 3) neurologic status (level of neurologic involvement) (10,19-21)

Table 2. Distribution of 50 patients with thoracolumbar vertebral fractures, by the Denis classification system[1], Ankara University Faculty of Medicine, Department of Orthopedics, September 2000-December 2011

Compression (n=8)	Fracture n (%)
Type A	0 (0)
Type B	3 (6)
Type C	0 (0)
Type D	5 (10)
Burst (n=39)	
Type A	8 (16)
Type B	27 (54)
Type C	0 (0)
Type D	1 (2)
Type E	3 (6)
Flexion-distraction (n=0)	
Fracture-dislocation (n=3)	
Type A	0 (0)
Type B	0 (0)
Type C	3 (6)

[1]The Denis Classification system classifies fractures into four types-compression, burst, flexion-distraction, and fracture-dislocation-and differentiates each of these into five subtypes of fractures: type A (fracture of both endplates without kyphosis), type B (fracture of the superior endplate), type C (fracture of the inferior endplate), type D (burst rotation fracture), and type E (burst lateral flexion fracture) (5)

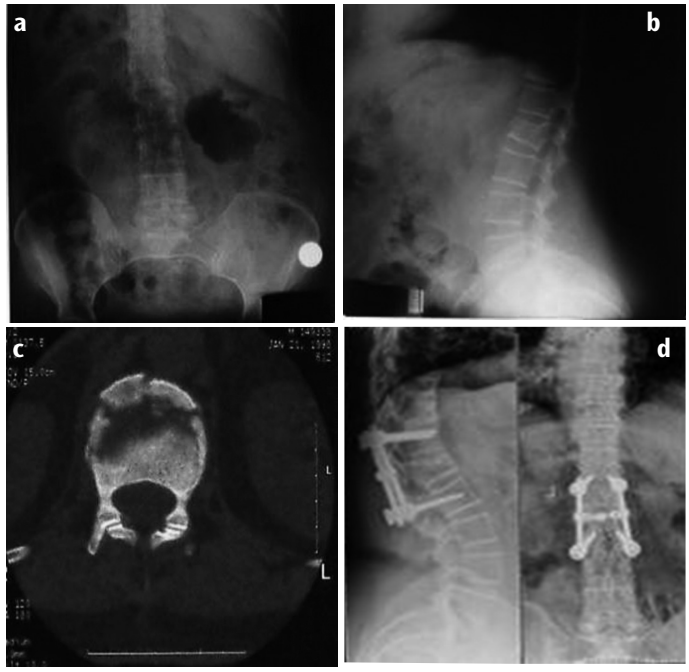

Figure 1. a, b, c, d) A 69-year-old female patient was admitted to the emergency department after falling from a height. On physical examination, there was no neurological deficit detected, but there was sensitivity on palpation of the upper lumbar region. Preoperative (a) AP and (b) lateral X-rays as well as (c) axial computed tomography demonstrated an L1 burst fracture. Posterior instrumentation and fusion were performed between T12 and L2 using pedicle screws, and (d) postoperative lateral and AP x-rays demonstrated improvement. Sagittal index, Local Kyphosis Angle, and anterior corpus height loss were 20.5°, 70°, and 42% preoperatively and 15°, 50°, and 26% postoperatively, respectively

Results

A total of 45 patients with vertebral fractures were admitted directly through our emergency department, whereas the remaining 5 patients were referred to our clinic from an external center. Of these 50 patients, 31 were female and 19 were male. The mean age was 46.5 (range: 16 to 76) years, and the mean follow-up was 96.5 (range: 6 to 183) months. All patients were evaluated and managed according to their trauma etiology and fracture level. The vertebral fractures were classified using both the TLISS system (Table 1) and the Denis classification (Table 2).

Of the 50 patients, 7 (14%) underwent anterior instrumentation and fusion, 41 (82%) underwent posterior instrumentation and fusion, and 2 (4%) underwent combined anterior and posterior instrumentation and fusion in the same session. Representative examples of preoperative and postoperative imaging of a patient receiving posterior instrumentation (Figure 1), postoperative imaging of a patient with a burst fracture (Figure 2), and postoperative imaging of a patient receiving anterior instrumentation (Figure 3) are provided.

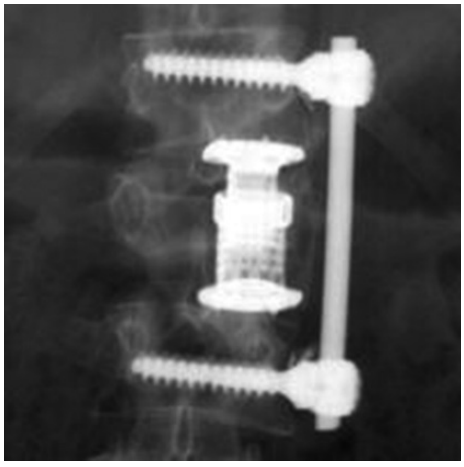

Figure 2. Postoperative AP X-ray after long-segment fixation for T12 burst fracture

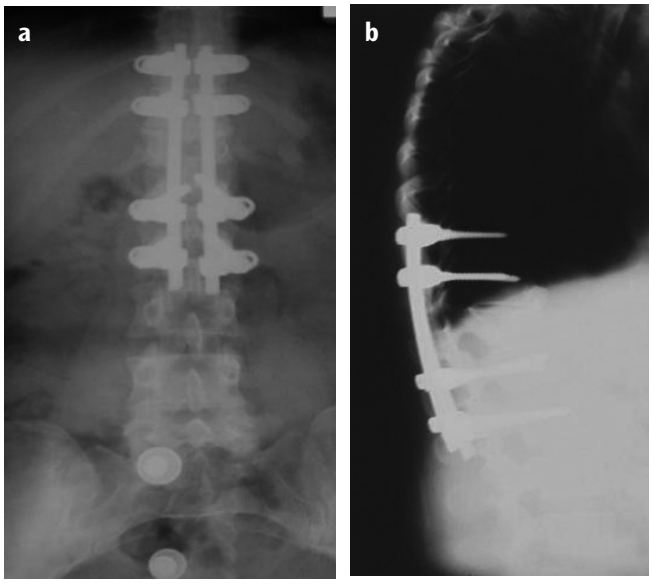

Figure 3. a, b) Postoperative (a) AP and (b) lateral X-ray showing anterior interbody cage after anterior lumbar decompression and interbody fusion

The mean VAS score was 82 mm preoperatively, 60 postoperatively, and 13.5 mm at the final visit, and the mean ODI score was 65% preoperatively, 40% postoperatively, and 15% at the final visit. All of these improvements for both clinical outcome measures (including preoperative to postoperative, preoperative to final visit, and postoperative to final visit) were statistically significant ($p<0.05$). According to the Frankel scale, 42 (84%) patients had non neurological deficit preoperatively, 45 (90%) had no deficit postoperatively, and 46 (92%) had no deficit at final follow-up (Table 3).

Changes in mean SI values, LKA values, and ACHL percentages showed consistent trends from preoperative to postoperative or final visit, and from postoperative to final visit. All three radiological outcome measures demonstrated statistically significant improvements when preoperative values were compared to both postoperative and final visit values (all $p<0.05$) (Table 4). However, unlike clinical outcome measures (which progressively improved with time), all three radiological outcome measures actually demonstrated a loss of correction between the postoperative and final visits. Specifically, mean SI improved

Table 3. Distribution of 50 patients with thoracolumbar vertebral fractures, by preoperative, postoperative, and final visit Frankel scale grades for severity of associated spinal cord injury, Ankara University Faculty of Medicine, Department of Orthopedics, September 2000-December 2011

	Preoperative n (%)	Postoperative n (%)	Final visit n (%)
Grade A (complete)	4 (8)	3 (6)	3 (6)
Grade B (sensory only)	1 (2)	1 (2)	1 (2)
Grade C (motor useless)	0 (0)	0 (0)	0 (0)
Grade D (motor useful)	3 (6)	1 (2)	0 (0)
Grade E (no deficit)	42 (84)	45 (90)	46 (92)

Table 4. Preoperative, postoperative, and final visit sagittal index[1], Local Kyphosis Angle[2], and Anterior Corpus Height Loss[3] in 50 patients with thoracolumbar vertebral fractures, Ankara University Faculty of Medicine, Department of Orthopedics, September 2000-December 2011

	Preoperative	Postoperative	Final visit	Preoperative to postoperative (improvement)	Postoperative to final visit (loss of correction)
Sagittal index, degrees, mean	20	14	15	-4.8	+1.9
Local Kyphosis Angle, degrees, mean	17	9	13	-9.0	+3.4
Anterior corpus height loss, %, mean	45	25	28	-18.0	+4.2

[1]Sagittal index is the angle between the posterior walls of the fractured vertebra and the intact vertebra immediately below it.

[2]Local Kyphosis Angle is the angle formed between a line drawn parallel to the superior endplate of the intact vertebra above the fracture and a line drawn parallel to the inferior endplate of the intact vertebra one level below the fracture.

[3]Anterior Corpus Height Loss is the product of the height of the fractured vertebra divided by the mean height of the intact vertebrae just above and below the fractured vertebra.

from 20° preoperatively to 14° postoperatively, before settling at 15° at the final visit. Mean LKA improved from 17° preoperatively to 9° postoperatively, before stabilizing at 13° at the final visit. Finally, mean ACHL improved from 45% preoperatively to 25% postoperatively, before settling at 28% at the final visit. However, the postoperative to final visit losses of correction for SI, LKA, and ACHL were not statistically significant.

Discussion

We retrospectively assessed the outcomes of thoracolumbar fracture surgery in 50 patients, using a variety of clinical and radiological measures, including VAS, ODI, Frankel scale, SI, LKA, and ACHL. Others have supported this approach by recommending that investigations seeking to quantify outcomes following spine trauma should employ a combination of existing surveys in a complementary fashion, and that these should include determinants of both bodily pain and work-related disability (22). Furthermore, whereas there are numerous radiological variables that can be evaluated following the surgical treatment of thoracolumbar fractures, SI, LKA, and ACHL appear to be used most commonly, and several studies using these parameters have shown varying short-term and long-term results (23-28).

For clinical outcome measures, we found that both the mean VAS and the ODI for all patients improved progressively and significantly from the preoperative visit to the postoperative visit to the final visit. Our results suggest that the severity of back pain was reported by patients to be minimal at the final visit. In addition, using the ODI definitions, patients reported that they had progressed from severely disabled prior to surgery to minimally disabled by their final visit.

For radiological outcome measures, we found that mean SI values, LKA values, and ACHL percentages all showed consistent trends from before surgery, to after surgery, and to the final visit. All three of these radiological outcome measures demonstrated statistically significant improvements when preoperative values were compared to both postoperative and final visit values. However, in contrast to clinical outcomes which continued to improve over time, all three radiological outcomes demonstrated declines, or losses of correction, between postoperative visits and final visits, though none of these changes were statistically significant. Thus, while trends in clinical and radiological outcome measures were similar between preoperative and postoperative visits, the trends in these outcome measures were dissimilar after that.

Others have also described a lack of correlation between radiological and clinical outcome measures. For example, Andress et al. (11) used the Hannover Spine score for the clinical evaluation of long-term results after surgery, and they did not find a significant correlation between improvements in LKA and clinical scores. They did report that clinical complaints were more frequent among patients with an LKA over 30 degrees; however, postoperative improvement of such a severe kyphosis angle is uncommon, which might explain the lack of correlation between improvements in LKA and clinical scores in their study. Similarly, Knop et al. (23) did not find a correlation between improvements in the Hannover Spine scores and any of the radiological outcome variables that they used. As a result, these authors suggested that radiological variables may not be useful for the long-term follow-up of patients with vertebral fractures.

Despite the findings that radiological outcome measures may not always correlate with clinical outcomes, these measures have still been utilized to assess the results in many studies. In 27 patients with short-segment thoracolumbar vertebral fractures, Wang et al. (29) found no significant correlation between the baseline or final severity of kyphosis and their pain scale, although 8 patients with an SI >15° showed a higher incidence of moderate to severe pain compared with the other 19 patients with an SI <15° (29). In another study, Liu et al. (30) undertook surgical treatment and follow-up of 18 patients using monosegmental transpedicular fixation plus posterior fusion. They used mean preoperative, postoperative, and latest follow-up SI values to demonstrate that their technique might provide the same or better fixation with the preservation of more motion segments among patients with thoracolumbar vertebral burst fractures with intact pedicles and facet joints accompanied by a PLC injury.

In their study of 50 patients undergoing short-segment vertebral posterior instrumentation, Andress et al. (11) reported a distinct improvement in SI values by restoring vertebral alignment but also a subsequent loss of correction of LKA during follow-up, reflecting alterations in the intervertebral disc space and the possibility of future degenerative disease. In their long-term study, Knop et al. (23) evaluated 62 patients who had surgery for thoracolumbar burst fractures. They reported a significant improvement in postoperative SI values, with no further alteration in these values during longer follow-up. They also found a mean loss of correction of LKA of 10°, despite also noting a significant improvement in the level of lordosis. Based on their study results, they concluded that LKA values tended to vary most in patients with a high preoperative ACHL percentage. In a related study, Toyone et al. (31) reported that the loss correction of LKA in the long-term was due to an unsupported anterior column. The authors recommended transpedicular intra corporeal hydroxyapatite grafting to address this, and they demonstrated that the loss of correction of LKA in patients in whom this technique was performed was significantly lower.

The literature remains full of studies that have used radiological outcome measures to assess their results, suggesting the need to more definitively determine the value of these measures and to standardize how thoracolumbar fracture treatment results are assessed.

In this study, we were also able to assess the results of two different thoracolumbar fracture classification systems: the Denis classification and the TLISS. According to the Denis classification, the most common thoracolumbar fractures are burst fractures (5). Consistent with these data, 78% of our patients had burst fractures, followed by compression fractures in 16% and fracture-dislocations in 6%. Surgical indications for burst fractures include progressive neurological deficit, conservative treatment failure (new-onset neurological signs, increasing pain, unacceptable deformity), and fracture-dislocations (7). Of import, in patients with mechanically and neurologically unstable burst fractures, pulmonary and venous complications can be prevented, mobility can be maintained, pain can be relieved, spinal deformity can be minimized, decompression of neural components can be achieved, and disease progression can be halted through the use of surgery (7,32,33).

Similarly, based on TLISS fracture morphology characteristics, 78% of our patients had burst fractures, 16% had compression fractures, and 8% had fracture-dislocations. Also, based on TLISS, the vast majority of our patients (84%) had an intact neurologic status. However, in looking at the third component of TLISS, we noted that PLC injury was suspected or confirmed in 94% of our patients. This was important, because several studies have shown that the majority of significant thoracolumbar fractures present with PLC injuries, that MRI is most helpful to confirm the injury, and that surgical fixation is the optimal treatment in these cases (34).

Nevertheless, the optimal treatment for thoracolumbar spine fractures is still being debated. In a meta-analysis that included 275 articles pertaining to thoracolumbar burst fractures, Boerger et al. (35) reported only variable neurological improvement, irrespective of the technique, and they found no correlation between postoperative canal clearance and neurological improvement, suggesting that no surgical technique was superior in this scenario. However, most would agree that surgery is indicated in patients with a neurological deficit and/or fracture instability (6,10-14).

Many authors refer to the three-column concept described by Denis in assessing the stability of a spinal fracture (11,36,37). According to this concept, fractures that demonstrate damaged osteoligamentous (PLC) structures in the middle column on CT or MRI are unstable. Compared to stable fractures, unstable fractures are more often accompanied by a neurological deficit (36,37). The importance of the PLC to vertebral stability has become clearer in recent years, with a greater focus being placed on assessing damage to and stabilization of this structure, particularly in patients with compression fractures (38). Although most of our patients did not have a neurological deficit, nearly all of them had suspected or confirmed PLC injuries, suggesting that vertebral instability was likely and that surgical therapy with fusion was indicated.

With regards to surgical technique, the majority of patients in our study underwent surgery via a posterior approach. Compared to the anterior approach, the posterior approach has some advantages. It offers the ability to do surgery a safe distance away from the lungs and other visceral organs, resulting in lower morbidity and mortality rates (39). In addition, previous studies have shown that use of this approach also takes less time and is associated with a lower risk of bleeding (40). We looked at which approach was performed in the subset of our patients with thoracolumbar fractures who had associated neurologic deficits (according to TLISS) and showed an at least one grade improvement in their Frankel scale postoperatively. Of three patients with preoperative nerve root compression, two demonstrated Frankel scale improvement after surgery; of these, one underwent posterior instrumentation and fusion, while the other underwent anterior instrumentation and fusion. Only one of three patients with total cord compression demonstrated Frankel scale improvement after surgery, and this patient had posterior instrumentation and fusion using the posterior approach alone. The other two patients had combined anterior and posterior approaches.

Study Limitations

The implications of this study are limited by its retrospective design and the relatively small number of patients. In addition, given the divergent directions of clinical outcome and radiological outcome trends between the postoperative visits and final visits, measuring these outcome variables at various points between the postoperative and final visits may have provided additional valuable insights.

Conclusion

Trends in clinical and radiological outcomes after surgery for thoracolumbar vertebral fractures may differ. Although major progress has been made in the treatment of thoracolumbar vertebral fractures, the lack of standardized, verified clinical and radiological outcome measures continues to pose a challenge to the accurate assessment of the results of management.

Ethics

Ethics Committee Approval: Ankara University Faculty of Medicine.

Informed Consent: A written informed surgical consent was obtained from each patient.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: E.A., D.D., Concept: E.A., D.D., Design: E.A., D.D., Data Collection or Processing: E.A., Analysis or Interpretation: E.A., D.D., Literature Search: E.A., Writing: E.A.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Schlegel J, Bayley J, Yuan H, Fredricksen B. Timing of surgical decompression and fixation of acute spinal fractures. J Orthop Trauma. 1996;10:323-30.
2. Singh K, Vaccaro A. Thoracic and lumbar trauma. In: Bono C, Garfin S, eds. Orthopaedic Surgery Essentials: Spine. Philadelphia: Lippincott, Williams& Wilkins; 2004.p.45-57.
3. Weringer P, Schultz A, Hertz H. Conservative management of thoracolumbar and lumbar spine compression and burst fractures: functional and radiographic outcomes in 136 cases treated by closed reduction and casting. Arch Orthop Trauma Surg 2009;129:207-19.
4. Verlaan JJ, Diekerhof CH, Buskens E, van der Tweel I, Verbout AJ, Dhert WJA, et al. Surgical treatment of traumatic fractures of the thoracic and lumbar spine: a systematic review of the literature on techniques, complications, and outcome. Spine 2004;29:803-14.
5. Denis F. The three column spine and its significance in the classification of acute thoracolumbar spinal injuries. In: Banaszkiewicz P, Kader D, eds. Classic Papers in Orthopaedics. London: Springer-Verlag; 2014.p.289-92.
6. Zdeblick TA, Sasso RC, Vaccaro AR, Chapman JR, Harris MB. Surgical treatment of thoracolumbar fractures. Instr Course Lect. 2009;58:639-44.
7. Stambough JL. Posterior instrumentation for thoracolumbar trauma. Clin Orthop Relat Res. 1997;335:73-88.
8. Altay M, Ozkurt B, Aytekin CN, Ozturk AM, Doğan O, Tabak AY. Treatment of unstable thoracolumbar junction burst fractures with short- or long-segment posterior fixation in Magerl type A fractures. Eur Spine J 2007;16:1145-55.
9. Zdeblick TA, Sasso RC, Vaccaro AR, Chapman JR, Harris MB. Surgical treatment of thoracolumbar fractures. Instr Course Lect. 2009;58:639-44.
10. Vaccaro AR, Lehman RA, Hurlbert RJ, Anderson PA, Harris M, Hedlund R, et al. A new classification of thoracolumbar injuries: the importance of injury morphology, the integrity of the posterior ligamentous complex, and neurologic status. Spine. 2005;30:2325-33.
11. Andress H-J, Braun H, Helmberger T, Schürmann M, Hertlein H, Hartl WH. Long-term results after posterior fixation of thoracolumbar burst fractures. Injury. 2002;33:357-65.
12. Accosta FL, Buckley JM, Xu Z, Lotz JC, Ames CP. Biomechanical comparison of three fixation techniques for unstable thoracolumbar burst fractures – laboratory investigation. J Neurosurg Spine. 2008;8:341-6.
13. Disch AC, Knop C, Schaser KD, Blauth M, Schmoetz W. Angular stable anterior plating following thoracolumbar corpectomy reveals superior segmental stability compared to conventional polyaxial plate fixation. Spine. 2008;33:1429-37.
14. Hseih CT, Chen GJ, Wu Cc, Su YH. Complete fracture - dislocation of the thoracolumbar spine without paraplegia. Am J Emerg Med. 2008;26:633.e5-633.e7.
15. Kerwin AJ, Frykberg ER, Schinco MA, Griffen MM, Arce CA, Nguyen TQ, et al. The effect of early surgical treatment of traumatic spine injuries on patient mortality. J Trauma Inj Infect Crit Care. 2007;63:1308-13.
16. Copay AG, Glassman SD, Subach BR, Berven S, Schuler TC, Carreon LY. Minimum clinically important difference in lumbar spine surgery patients: a choice of methods using the Oswestry Disability Index, Medical Outcomes Study questionnaire Short Form 36, and Pain Scales. Spine J. 2008;8:968-74.
17. van Middendorp JJ, Goss B, Urquhart S, Atresh S, Williams RP, Schuetz M. Diagnosis and prognosis of traumatic spinal cord injury. Global Spine J. 2011;1:1-8.
18. Keynan O, Fisher CG, Vaccaro A, Fehlings MG,Öner FC, Dietz J, et al. Radiographic measurement parameters in thoracolumbar fractures: a systematic review and consensus statement of the spine trauma study group. Spine. 2006;31:E156-E165.
19. Bono CM, Vaccaro AR, Hurlbert RJ, Arnold P, Öner, FC, Harrop J, et al. Validating a newly proposed classification system for thoracolumbar spine trauma: looking to the future of the thoracolumbar injury classification and severity score. J Orthop Trauma. 2006;20:567-72.
20. Lee JY, Vaccaro AR, Lim MR, Öner FC, Hulbert RJ, Hedlund R, et al. Thoracolumbar injury classification and severity score: a new paradigm for the treatment of thoracolumbar spine trauma. J Orthop Sci. 2005;10:671-75.
21. Vaccaro AR, Baron EM, Sanfilippo J, Jacoby S, Steuve J, Grossman E, et al. Reliability of a novel classification system for thoracolumbar injuries: the Thoracolumbar Injury Severity Score. Spine. 2006;31(11 Suppl):S62-S69, S104.
22. Schoenfeld A, Bono CM. Measuring spine fracture outcomes: Common scales and checklists. Injury. 2011;42:265-70.
23. Knop C, Fabian HF, Bastian L, Blauth M. Late results of thoracolumbar fractures after posterior instrumentation and transpedicular bone grafting. Spine. 2001;26:88-99.
24. Oner FC, Ramos LMP, Simmermacher RKJ, Kingma P, Diekerhof C, Dhert W, et al. Classification of thoracic and lumbar spine fractures: problems of reproducibility - A study of 53 patients using CT and MRI. Eur Spine J. 2002;11:235-45.
25. He QY, Xu JZ. Short segmental pedicle screw fixation combined with percutaneous vertebroplasty in treatment of nonadjacent thoracolumbar fractures. Chin J Traumatol. 2009;12:138-41.
26. Liao JC, Fan KF, Chen WJ, Chen LH, Chen LH, Kao HK. Transpedicular bone grafting following short-segment posterior instrumentation for acute thoracolumbar burst fracture. Orthop. 2009;32:493.
27. Sasso RC, Renkens K, Hanson D, Reilly T, McGuire RA, Best NM. Unstable thoracolumbar burst fractures: anterior-only versus short-segment posterior fixation. J. Spinal Disord Tech. 2006;19:242-8.
28. Tezeren G, Gumus C, Bulut O, Tukenmez M, Oztemur Z, Sever G. Anterior versus modified combined instrumentation for burst fractures of the thoracolumbar spine: a biomechanical study in calves. J Orthop Surg. 2008;16:281-4.
29. Wang XY, Dai LY, Xu HZ, Chi YL. Kyphosis recurrence after posterior short-segment fixation in thoracolumbar burst fractures. J Neurosurg Spine. 2008;8:246-54.

30. Liu S, Li H, Liang C, Long H, Yu B, Chen B. Monosegmental transpedicular fixation for selected patients with thoracolumbar burst fractures. J Spinal Disord Tech. 2009;22:38-44.

31. Toyone T, Tanaka T, Kato D, Kaneyama R, Otsuka M. The treatment of acute thoracolumbar burst fractures with transpedicular intracorporeal hydroxyapatite grafting following indirect reduction and pedicle screw fixation: a prospective study. Spine. 2006;31:E208-14.

32. Glasser JA, Estes WJ. Distal short segment fixation of thoracolumbar and lumbar injuries. Iowa Orthop J. 1998;18:87-90.

33. Oda T, Panjabi MM. Pedicle screw adjustments affect stability of thoracolumbar burst fracture. Spine. 2001;26:2328-33.

34. Ferguson RL, Allen BJ. A mechanistic classification of thoracolumbar spine fractures. Clin Orthop Relat Res. 1984;189:77-88.

35. Boerger TO, Limb D, Dickson RA. Does 'canal clearance' affect neurological outcome after thoracolumbar burst fractures? Bone Joint J. 2000;82:629-35.

36. Ağuş H, Kayali C, Arslantaş M. Nonoperative treatment of burst-type thoracolumbar vertebral fractures: clinical and radiological results of 29 patients. Eur Spine J. 2005;14:536-40.

37. Dai L, Jia L, Zhao D, Xu Y. [Remodeling of the spinal canal after thoracolumbar burst fractures: significance of nonoperative management]. Zhonghua Wai Ke Za Zhi [Chin J Surg]. 2000;38:610-12.

38. Mikles MR, Stchur RP, Graziano GP. Posterior instrumentation for thoracolumbar fractures. J Am Acad Orthop Surg. 2004;12:424-35.

39. Vaccaro AR, Kim DH, Brodke DS, Harris M, Chapman JR, Schildhauver T. Diagnosis and management of thoracolumbar spine fractures. Instr Course Lect. 2004;53:359-73.

40. Danisa OA, Shaffrey CI, Jane JA, Whitehill R, Wang GJ, Szabu TA, et al. Surgical approaches for the correction of unstable thoracolumbar burst fractures: a retrospective analysis of treatment outcomes. J Neurosurg. 1995;83:977-83.

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Higher Heart-type Fatty Acid Binding Protein Levels are Related to More Severe and Extensive Coronary Atherosclerosis in Patients with Acute Myocardial Infarction

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Abstract

Aim: Heart-type fatty acid binding protein (H-FABP), an early marker of cardiac necrosis, is released rapidly from myocardium as a consequence of ischemic injury. We hypothesized that more severe and extensive coronary atherosclerosis would result in more pronounced myocardial injury and necrosis in patients with acute myocardial infarction (AMI). Therefore, we sought the relationship between serum H-FABP levels and the severity and extent of coronary artery disease (CAD) assessed using the Gensini score.

Materials and Methods: Fifty patients with AMI who underwent invasive coronary angiography were divided into 2 groups according to the angiographic Gensini score, namely the moderate to severe CAD group (group 1) and the mild CAD group (group 2). A point of care test and Cardiodetect Quant device were used to detect whether H-FABP was positive and the quantitative measurements. The data obtained from this study were evaluated using the PASW statistic programme.

Results: Mean serum H-FABP concentration was significantly higher in group 1 when compared to that in group 2. Furthermore, a strongly positive correlation was found between the Gensini score and serum H-FABP levels.

Conclusion: The findings of our study suggest that the quantity of myocardial necrosis demonstrated by serum H-FABP levels is higher in patients with AMI who have more severe and extensive CAD. H-FABP levels are also positively correlated to the Gensini score. We propose that H-FABP, an early marker of myocardial necrosis, may also provide a clue about the severity and extent of CAD, especially in the setting of AMI.

Keywords: Myocardial infarction, coronary artery disease, Gensini score, Heart-type fatty acid binding protein

Introduction

Cardiovascular diseases are increasingly becoming a major cause of mortality and morbidity worldwide (1). Acute coronary syndrome (ACS), usually formed by the rupture of atherosclerotic plaque in the coronary arteries or total occlusion of the coronary artery Subtotal thrombus clinical emergency that occur as a result of table (2-4). Early diagnosis of axillary patients is very important in terms of directing their treatment. Mortality and morbidity will be positively affected by early diagnosis and timely treatment of thrombolytic therapy, and complications that may occur during the follow-up of the disease will be easier to control (5,6). Evidence has been gathered that inflammation plays an important role in the onset and progression of atherosclerosis, and all of these

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suggest that inflammation markers may help predict individual risk for cardiovascular disease (7). The present risk factors may explain only half of all cases of coronary artery disease (CAD) and long-term cardiac death and complications. This inadequacy has sparked an intense interest in the identification of new biomarkers that could contribute to the prediction power of classical risk factors (8). A marker of acute myocardial infarction, acute myocardial infarction (AMI)-induced sarcoidemal injury, cardiac fatty acid binding protein (H-FABP), begin to increase within 1-3. hours, reaching the highest level within 6-8 hours and within 24-36 hours return to normal levels. These plasma kinetics and oscillation properties and various clinical studies have shown H-FABP performance superior to myoglobin, Creatine kinase (CK), creatine kinase heart type (CK-MB) and troponin in early AMI diagnosis (9-11). A number of scoring systems based on coronary angiography images have been developed to determine the severity of CAD. Gensini score is a scoring system that have been developed for this purpose and used to evaluate the severity of coronary artery disease. There are 2 coronary angiography scores: vascular scoring and stenosis scoring. These techniques have been described by Gensini. According to the angiographic degree of stenosis, narrowing between 0-25%, 25-50%, 50-75%, 75-90%, 90-99%, and 100%, stenosis is scored as, 1, 2, 4, 8, 16, and 32 points, respectively (12). CAD is the most common cause of death in the United States and the most common cause of death in the United States. We considered that H-FABP, an early-stage cardiac necrosis marker, may be informative in terms of severity and prevalence by reviewing the literature .In this study, we aimed to investigate the relationship between H-FABP and Gensini scores in patients with high cardiac troponin, CK and CK-MB with cardiac necrosis markers.

Materials and Methods

This study was initiated after obtaining the necessary permission from the local Ethics Committee of Ufuk University Faculty of Medicine. A retrospective study of 735 patients who underwent coronary artery bypass grafting for treatment of coronary artery bypass grafting according to the guidelines of American Society of Cardiology (ACC/AHA) from the Emergency Department of Ufuk University between 05.12.2008 and 24.02.2011 was performed on 735 patients. The patients who had previous cardiopulmonary resuscitation and fibrinolytic treatment, and percutaneous coronary intervention, patients with coronary artery intensive care, those with trauma within 3 days before admission, patients with unstable angina pectoris according to ACC/(USAP), the patients with chronic renal failure and serum creatinine level of 1.5 mg/dL the patients who underwent coronary intensive care unit through PTCA or CABG within 1 month, the patients who had STEMI or NSTEMI within 1 month before admission, the patients with pulmonary thromboembolism, patients with AMI, and patients younger than 18 years were not included in this study (13,14).

According to guidelines of ACC/AHA , the patients with acute coronary syndromes with ST segment elevation and non-ST segment elevation without ST segment elevation were included in the study. All of the patients biochemical parameters, ECG information , the admission of patients until the day they are discharged from the track at highest cardiac necrosis markers (CK-MB, Troponin-T, H-FABP) levels and coronary artery disease with coronary angiography Gensini scores by examining the scores of the seriousness of the form of work have been recorded (13,14). A test based on the rapid chromatographic immunoassay method called CardioDetect Med was used by the manufacturer (Rennesens GmbH Berlin, Germany) for the measurement of H-FABP values. Coronary angiographies were interpreted with the Gensini score assessing CAD severity (15). Patients are considered to have mild coronary atherosclerosis with a score of 1-20, and severe coronary atherosclerosis with a score of 20 according to Gensini scores (16). Patients included in the study were divided into two groups: those with Gensini scores below 20 (group 1), those with 20 and above (group 2).

Statistical Analysis

In comparison; the Kolmogorov-Smirnov test, which is a normal distribution test, was performed, and the normal distribution variables were evaluated by independent sample T test. Mann-Whitney U test was used for the variables without normal distribution, and chi-square test was used for categorical variables. Relationships between Gensini scores of H-FABP, CK-MB and troponin-T values were investigated by Spearman correlation analysis. The data obtained in this study were evaluated with the help of PASW statistical package program. A p value of less than 0.05 was considered statistically significant.

Results

All of the patients, 50 patients, were included diagnosed as AMI according to the AHA (13,14). In our study, the patients the Gensini scores of whom were lower than 20 (group 1), 16 (32%), and the Gensini scoress were higher than 20 (group 2) and 34 (68%) were ill. Of the 50 patients included in the study, 38 (76%) were male and 12 (24%) were female. The average age of the 50 patients included in the study was 64.2±11.498 (minimum: 40-maximum: 87) years. There was no significant difference in the distribution of age and sex between the groups in our study ($p>0.05$). Of the 50 patients included in the study, 36 (72%) were diagnosed as NSTEMI and 14 (28%) were diagnosed as STEMI. Plasma levels of FABP, CK-MB, and Troponin-T for the groups are shown in Table 1.

Table 1. Plasma levels of fatty acid binding protein, CK-MB, Troponin-T according to groups

						Independent samples T test
	Severity of KAH	N	Mean	Minimum	Maximum	Sig. 2 tailed
FABP	Under 20	16	13.0313	7	23	0.000
	20 and over 20	34	55.1471	13	100	
CK-MB	Under 20	16	66.4238	5.21	332.6	0.277
	20 and over 20	34	102.065	6.52	503	
Troponin T	Under 20	16	2.0112	0.04	12.61	0.172
	20 and over 20	34	3.8253	0.11	20.81	

FABP: Fatty acid binding protein

Table 2. The correlation of plasma fatty acid binding protein levels and Gensini scores

	Correlation		Gensini
Spearman's rho	FABP	r	0.926
		p	0.000
		N	50

Table 3. The correlation of plasma CK-MB levels and Gensini scores

	Correlation		Gensini
Spearman's rho	CK-MB	r	0.195
		p	0.174
		N	50

Table 4. The correlation of plasma Troponin-T levels and Gensini scores

	Correlation		Gensini
Spearman's rho	Troponin-T	r	0.142
		p	0.325
		N	50

According to the severity of CAD, there was a statistically significant difference between the FABP levels of the patients in group 2 and the FABP levels of the patients in group 1 ($p<0.05$). As to the Troponin-T values of the patients in group 2 according to the severity of CAD, There was no statistically significant correlation between the levels of Troponin-T of the patients ($p>0.05$). There was no statistically significant correlation between the CK-MB levels of the patients in group 2 and the CK-MB levels of the patients in group 1 ($p>0.05$). Correlation of plasma FABP, CK-MB, Troponin-T levels and Gensini scores of patients is shown in Tables 2, 3, 4. There was a statistically significant positive correlation between the FABP levels of all patients with ACS who were included in the study and the Gensini scores calculated after coronary angiography ($p<0.005$). Correlation Graph of plasma FABP levels and Gensini scores of patients is shown in Figure 1. Correlation Graph of plasma CK-MB levels and Gensini scores of patients is shown in Figure 2. Correlation Graph of plasma Troponin-T levels and Gensini scores of patients is shown in Figure 3.

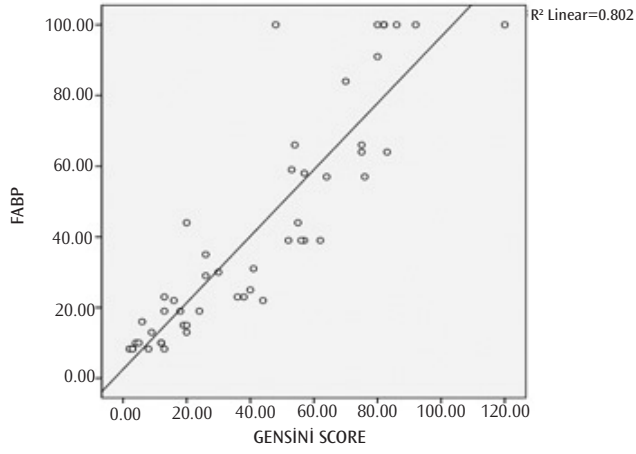

Figure 1. Correlation graph of plasma fatty acid binding protein levels and Gensini scores of patients

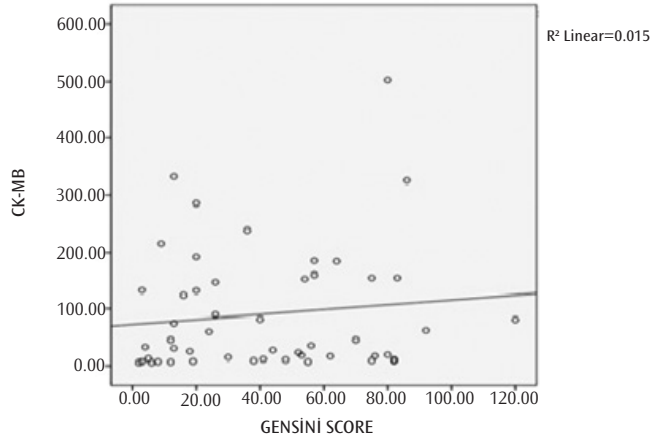

Figure 2. Correlation graph of plasma CK-MB levels and Gensini scores of patients

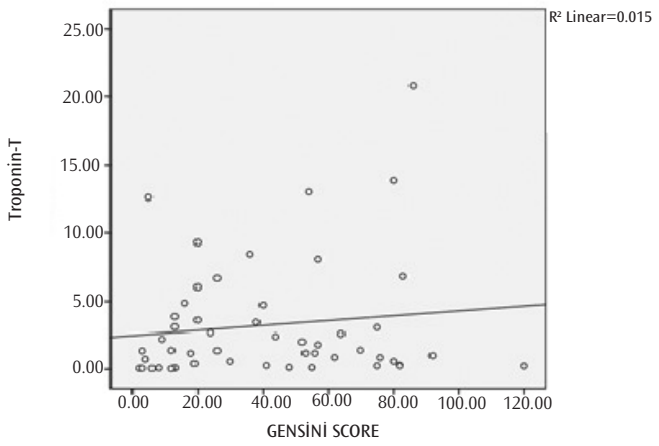

Figure 3. Correlation graph of plasma Troponin-T levels and Gensini scores of patients

Discussion

H-FABP, an indicator of AMI-associated sarcolemmal injury, increases in 1-3rd. hours of AMI, reaches the highest level within 6-8 hours, and returns to normal levels within 24-36 hours (9).

The relationship between plasma H-FABP and the severity of coronary artery disease is not fully known, though it is known that H-FABP is an important cardiac marker for ACS with plasma kinetics and with its release characteristics. Up to date, no study in the literature has shown a relationship between the severity of CAD and the serum levels of H-FABP, CK-MB, and Troponin-T in patients with ACS, whose cardiac necrosis markers are positive. However, there are studies investigating the relationship between serum H-FABP values and prognosis of patients with ACS (17-21). In addition, there was no study in the literature regarding the correlation between serum H-FABP, CK-MB, Troponin-T levels and Gensini scores in patients with ACS in which cardiac necrosis markers were positive.

In a study conducted by O'Donoghue et al. (18) the patients diagnosed with ACS were those with a serum H-FABP value of 8 ng/dL and above (n=332) and those with serum H-FABP <8 ng/dL (n=1955) were separated into two groups and monitored for 10 months. There was a statistically significant difference between these two groups in terms of developing cardiac death, MI, and CHF development within 10 months (p<0.001) (18).

In the same study conducted by O'Donoghue et al. (18) the patients diagnosed with ACS were those with serum H-FABP >16 ng/dL (n=166), those with serum H-FABP values between 8 and 16 (n=166) <8 ng/dL (n=1955) were separated and monitored for 10 months. There was a statistically significant difference (p<0.001) in the group with serum H-FABP >16 ng/dL in terms of developing cardiac-induced death, subsequent MI transmission and CHF development within 10 months compared to the other groups (18).

According to the retrospective study performed by Suzuki et al. (19) 90 patients with ACS were qualitatively divided into two groups as H-FABP positive (n=56) and negative (n=34) and a statistically significant difference was found by the Cox Proportional Risk Method for developing MI and decompensated CHF and subsequent MI (p<0.005).

According to the prospective study performed by McCann et al., (20) the patients admitted to the coronary intensive care unit with ischemic chest pain (n=664) were followed up for 1 year. They were into separated 2 groups, as experienced 1 cardiac event and as 1 experienced no cardiac event. There was a statistically significant difference between H-FABP and Troponin-T values (p<0.001, p<0.001).

According to a prospective study conducted by Viswanathan et al. (21), 955 patients with suspected ACS, who were referred to emergency services, were followed for 48 weeks. Patients were divided into 4 groups according to serum H-FABP values. Serum H-FABP <3.27 ng/dL group-1, H-FABP 3.27-6.48 ng/dL group 2, H-FABP 6.49-12.77 ng/-FABP> 12.77 group 4. There was a statistically significant difference between group 3 and group 4 and group 1 according to the number of patients who had cardiac death and MI after 48 weeks (p<0.0001, p<0.0001). There was also a statistically significant difference between group 4 and the other groups according to whether patients had a history of CAD (p<0.001) (21). This shows us that the CAD story of the patients is a significant risk factor for evaluating the prognosis of the CAD as it is in our study.

In the same study of Viswanathan et al. (21) patients with positive troponin-T values were excluded and the remaining 756 patients were re-divided into 4 groups according to serum H-FABP values. There was a statistically significant difference between group-3 and group-4 and group-1 according to the number of patients who had cardiac death and MI at 48 weeks (p<0.0001, p<0.0001) (21). In the same study of Viswanathan et al. (21) 955 patients with suspected ACS, who were admitted to emergency services, were followed up for 48 weeks. Patients were divided into 4 groups according to serum troponin-T values. Serum troponin-T group-1 between 0.00-0.02 µg/L, group-2 between troponin-T 0.03-0.08 ug/L, group-2 between troponin-T 0.09-3.04 group-3 and troponin-T>3.04 µg/L group-4. There was a statistically significant difference between group-3 and group-4 and group-1 according to the number of patients who had cardiac death and MI at 48 weeks (p<0.0001, p<0.0001) (21). These studies carried out by Viswanathan et al. (21) indicate that H-FABP is a prognostic serum biomarker, independent of troponin-T, while emphasizing

that serum H-FABP values and troponin-T values are important for assessing long-term mortality in CAD.

Ishii et al. (22) reported that patients who were admitted to the hospital with ACS diagnosis (n=328) were divided into two groups: group-1 at 9.8 ug/L and group-2 at 9.8 ug/L. They separated the group and followed the patients for 6 months. At 6 months, there was a statistically significant difference between the group with cardiac mortality H-FABP value above 9.8 µg/L and the other group ($p<0.0001$) (22). In the same study conducted by Ishii et al., (22) it was determined that there was a statistically significant difference in cardiac-induced mortality after 6 months ($p<0.0001$) between patients with elevated troponin-T and H-FABP and patients with elevated troponin-T alone) (22).

In our study, there was a numerical difference between the mean troponin-T values of the patient group with a high CAD severity (group 2) and the mean troponin-T values of the patient group with low CAD severity (group 1) (group 1=2.011 ng/mL group 2=3.825 ng/mL). However, there was no statistically significant difference between the two groups in our study ($p>0.005$). The knowledge in the literature that the troponin-T can assess long-term mortality in CAD suggests that this study is related to the low number of patients in group 1 in our study, although it is statistically incompatible with our study in terms of statistically.

H-FABP, a marker of AMI-associated sarcolemmal injury, increases in 1-3rd. hours of AMI, reaches the highest level within 6-8 hours, and returns to normal levels within 24-36 hours (9). Although H-FABP is an important cardiac marker for ACS with this plasma kinetics and oscillation feature, it is also a new cardiac marker in evaluating the long-term mortality and prognosis of patients with ACS in light of our study and these studies in the literature. There is a relationship between H-FABP and CAD severity in the data obtained from our studies and from literature studies.

Study Limitations

The most significant limitation of our study is our small sample size. It is necessary to support our findings with larger scale, prospective and multicenter studies.

Conclusion

There is a need for a non-invasive, easily reproducible technique that meets the clinical need to determine the severity of CAD and its prognosis early. In our study, serum H-FABP levels were significantly higher in patients with high CAD severity (group 2) and patients with low CAD severity (group 1). It was also determined that there was a significant positive correlation between Gensini score and serum H-FABP values in all patients with positive cardiac necrosis markers. There is a relationship between H-FABP and CAD severity, suggesting that H-FABP can provide information about the prevalence and severity of CAD even in the early period of cardiac damage. In conclusion, the relevant studies that use serum H-FABP levels as a predictor of cardiovascular risk require more extensive, prospective studies to diagnose ACS patients, to determine the need for intervention, and to predict the severity of coronary artery disease.

Ethics

Ethics Committee Approval: Ufuk University, Faculty of Medicine, approval number: 15062012-5.

Informed Consent: Informed consent did not obtained from the participants due to retrospective nature of the study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: T.E., A.F.E., Concept: B.E., S.D., Design: Ş.K., A.K., Data Collection or Processing: E.K.K., Analysis or Interpretation: B.K., Literature Search: B.E., A.K., Writing: T.E., E.K.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Hennekens CH. Increasing burden of cardiovascular disease. Current knowledge and future firections for research on risc factors. Circulation. 1998;97:1095-102.
2. Falk E, Shah PK, Fuster V. Coronary plaque distruption. Circulation. 1995;92:657-71.
3. Mann JM, Davies MJ. Vulnerable plaque. Relation of characteristics to degree of stenosis in human coronary arteries. Circulation. 1996;94:928-31.
4. Fuster V, Badimon L, Badimon JJ, Chesebro JH. The pathogenesis of coronary artery disease and acute coronary syndromes. N Engl J Med. 1992;326:242-50.
5. Solinas L, Raucci R, Terrazzino S, Moscariello F, Pertoldi F, Vajto S, et al. Prevalence, clinical characteristics,resource utilization and outcome of patients with acute chest pain in theemergency department. A multicenter, prospective, observational study innorth-eastern Italy. Ital Heart J. 2003;4:318–24.
6. Karlson BW, Wiklund I, Bengston A, Herlitz J. Prognosis and symptoms one year after discharge from the emergency department in patients with acute chestpain. Chest. 1994;105:1442–7.
7. Kelly AE, Gensini GG. Coronary arteriography and left-heart studies. Heart Lung. 1975;4:85-98.
8. de Korte CL, van der Steen AF, Cepedes EI, Pasterkamp G, Carlier SG, Mastik F, et al. Characterization of plaque components and vulnerability with intravascular ultrasound elastography. Phys Med Biol. 2000;45:1465-75.
9. Early Diagnostic Performance of Heart-Type Fatty Acid Binding Protein in Suspected AcuteMyocardial Infarction: Evidence From a Meta-Analysis of Contemporary Studies. Xu LQ, Yang YM, Tong H, Xu CF. Heart Lung Circ. 2018;27:503-12.

10. Mad P, Domanovits H, Fazelnia C, Stiassny K. Human heart-type fatty-acid-binding protein as a point-of-care test in the early diagnosis of acute myocardial infarction. QJM. 2007;100:203-10.

11. Bruins Slot MH, van der Heijden GJ, Rutten FH. Heart-type Fatty acid-binding protein in Acute Myocardial infarction Evaluation (FAME): background and design of a diagnostic study in primary care. BMC Cardiovasc Disord. 2008;8:8.

12. Içli A, Gök H, Altunkeser BB, Ozdemir K, Gürbilek M, Gederet YT, Sökmen G. Evaluation of "admission index of insulin resistance (AIRI)" as an early stage risk predictor in nondiabetic acute coronary syndromes. Anadolu Kardiyol Derg. 2002;2:194–201.

13. Levine GN, Bates ER, Blankenship JC, Bailey SR, Bittl JA, Cercek B, et al. 2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction: An Update of the 2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention and the 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. Circulation. 2016;133:1135-47

14. Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H,et al. 2017 ESC Guidelines for the Management of Acute Myocardial Infarction in Patients Presenting With ST-Segment Elevation: The Task Force for the Management of Acute Myocardial Infarction in Patients Presenting With ST-Segment Elevation of the European Society of Cardiology (ESC). Eur Heart J. 2018;39:119-77.

15. Gensini GG. A more meaningful scoring system for determining the severity of coronary heart disease. Am J Cardiol. 1983:51:606.

16. Amsterdam EA, Wenger NK, Brindis RG, Casey DE Jr, Ganiats TG, Holmes DR Jr, et al. 2014 AHA/ACC Guideline for the Management of Patients with Non-ST-Elevation Acute Coronary Syndromes: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2014;64:e139-e228.

17. Oishi Y, Wakatsuki T, Nishikado A, Oki T, Ito S. Circulating adhesion molecules and severity of coronary atherosclerosis. Coron Artery Dis. 2000;11:77-81.

18. O'Donoghue M, de Lemos JA, Morrow DA, Murphy SA, Buros JL, Cannon CP, et al. Prognostic Utility of Heart- Type Fatty Acid Binding Protein in Patients With Acute Coronary Syndromes. Circulation. 2006;114:550-7.

19. Suzuki M, Hori S, Noma S, Kobayashi K. Prognostic Value of a Qualitative Test for Heart-Type Fatty Acid-Binding Protein in Patients With Acute Coronary Syndrome. Int Heart J. 2005;46:601-6.

20. McCann CJ, Glover BM, Menown IB, Moore MJ, McEneny J, Owens CG, et al. Prognostic value ofa multimarker approach for patients presenting to hospital with acute chest pain. Am J Cardiol. 2009;103:22-8.

21. Viswanathan K, Kilcullen N, Morell C, Thistlethwaite SJ, Sivananthan MU, Hassan TB, et al. Heart-Type Fatty Acid-Binding Protein Predict Long-Term Mortality and Re-Infarction in Consecutive Patients With Suspected Acute Coronary Syndrome Who Are Troponin-Negative. J Am Coll Cardiol. 2010;55:2590-8.

22. Ishii J, Ozaki Y, Lu J, Kitagawa F, Kuno T, Nakano T, et al. Prognostic Value of Serum Concentration of Heart-Type Fatty Acid–Binding Protein Relative to Cardiac Troponin T on Admission in the Early Hours of Acute Coronary Syndrome. Clin Chem. 2005;51:1397-404.

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Moral Distress and Related Factors Among Emergency Department Nurses

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Abstract

Aim: The study determines moral distress and related factors among emergency nurses. Moral distress is one of the recurring issues in the nursing profession that has gained importance by creating changes in the health care system.

Materials and Methods: An analytic-descriptive study was conducted, in which all 180 nurses working in emergency education and health centers in were included. Moral distress was measured by questionnaire. Data were analyzed using SPSS 17.

Results: The findings showed that moral distress in emergency nurses (4.93±1.08) was high. Most moral distress was in the area of professional-functional competence (5.21±1.17) in the item of "unsafe conditions" (5.55±1.45). No statistically significant correlation was found between age and experience with moral distress among nurses in the emergency department. From the perspective of nurses in the study, organizational factors including barriers to education were the strongest factor influencing moral distress.

Conclusion: Given that moral distress in nurses participating in the study was very high, it seems that planning to promote professional-functional competency of nursing practice are essential.

Keywords: Moral distress, nursing ethics, emergency department services, emergency de details

Introduction

Any profession that is linked directly with clients' needs morality; although ethics is essential in all jobs, it is an inseparable part of the nursing profession, because moral behavior and responsibility in nurses with patients has a significant role in improving their health (1-3).

In the nursing profession, because of long communication with the client and direct responsibility for patients, nurses are faced daily with ethical decisions that usually raise the following questions: Have you ever decided to do the best thing for the patient but felt that you cannot do it? Have you ever wanted not to implement the law because of policies and procedures that prevent the best thing for the patient? If you have had any of these feelings, you have experienced moral distress (1,3).

Moral distress was first described by Jameton as when the nurse knows what the right action is, but organizational politics and conflict with colleagues prevent him/her from doing the right thing. In a study by de Veer et al., (2) moral distress was distinguished from emotional distress. A nurse may experience emotional distress while restrict the patient, but if the nurse believes that restriction of patient is not morally correct then he/she experiences moral distress. Moral distress is a concern for nurses around the world (4). Statistics indicate that one out of every three nurses experiences moral distress. Additionally, at least one out of ten people will leave the profession because of moral distress. A considerable number of nurses face ethical challenges in their everyday practice (5,6).

Moral distress can derive from a variety of sources, including limited resources, organizational policies, direct communication with patients, providing unnecessary medical care, hospital

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procedures, more social demand, an affront to the independence of patients, relations between doctors and nurses, conflicts with the wishes of the family, decisions on the release of patient's information, and the inability to prevent the patient's death (7,8).

In this regard, Kazemi et al. (9) study indicated that the existence of conflicts and differences of opinion between medical staff and patients' relatives about treatments that are useless or less useful in the medical staff's opinion, but which the patient or those around him want to apply, and on the other hand, medical advice and treatments that the medical staff know to be useful but which the patient or his relatives would not accept as medical expenses, cause moral distress to manifest in nurses.

As a result of these factors, nurses experiencing moral distress react in different ways. Some go along with other treatment team members and avoid unnecessary treatments, while others remain silent. Some will experience physical and psychological symptoms. Physical symptoms due to moral distress have been reported as palpitations, headaches, sleep disturbances, and changes in bodily functions. Psychological consequences are seen in the form of feelings of imbalance, low self-esteem, guilt, regret, anxiety, hopelessness, lack of energy, emotional exhaustion, withdrawal from family and friends, and deep sorrow (10,11).

Corel's theory proposes a model of moral distress in which, if a person has the moral courage to do the right thing, he/she will experience moral discomfort. Moral distress has different effects on nurses, patients, and health systems, and its consequences are important: in nurses, it causes them to leave the profession, and to experience isolation and burnout; when patients are faced with loss of quality of care and lack of patient protection, their irritation and discomfort will increase. Finally, organizations also suffer from the effects of this problem and are faced with heavy costs because of the loss of staff and difficulty recruiting new staff, which leads to decreases in quality of care and lack of patient satisfaction, which can endanger their professional reputation (12,13). The results of Fernandez-Parsons et al.' (14) study at emergency sectors of hospitals in California, America demonstrated low intensity of moral distress (14), while Ohnishi et al. (15) study in Japan's public hospitals showed high levels of moral distress. In the nursing community of [Country name], like other communities, moral distress is alarmingly high, and among the special sectors, emergency and ICU have a high degree of distress (16). In these sectors, moral distress in nurses occurs because of the special conditions of patients and the emergency status of medical operations (Diagnosis-Treatment), and nurses are exposed to moral distress more than in other sectors. Studies suggest that nurses experience different levels of moral distress (17). Beikmoradi et al. (18) in a cross sectional study conducted on 163 nurses working in intensive care units and medical training centers, reported a high level of moral distress. Ebrahimi and colleagues, in a descriptive-analytic study on 418 nurses working in teaching and medical hospitals, reported a moderate to high level of moral distress, and concluded that among personal features, job status and educational level were significantly associated with moral distress (19). Ameri et al. (5) reported high levels of moral distress and reported significant correlations between nurses' age, experience, and type of employment, and the intensity of moral distress.

The study of moral distress in emergency nurses is important, because the emergency room is where transfer of ill patients from pre-hospital emergency medical centers occurs, while on the other hand, nurses bear the task of stabilizing the vital signs of patients entering the clinical, special, and operation departments of the hospital and other hospitals. In addition, the sector is faced with a host of outpatients who for various reasons, have chosen emergency treatment and who expect to receive timely and high-quality services (20,21). Although in recent years, moral distress experienced by nurses in different parts has received attention, no study on this issue in relation to moral distress has been conducted in. Therefore, this study has been designed and implemented to investigate moral distress and related factors in the emergency departments and medical educational centers in.

Materials and Methods

This is a cross-sectional study (with a descriptive-analytic approach) that was conducted with 192 nurses working in emergency departments and training centers in. Hundred and eighty nurses were enrolled after providing informed consent via the census method. A total of 12 participants were excluded because of the exclusion criteria, no-filling, sickness, and maternity leave. The researcher referred to units in the morning, afternoon and evening shifts and data were collected at the beginning, about work purposes, confidential boxes, inclusion and exclusion criteria (experience of less than one year, maternity leave, sickness more than a month, and students), and then by identifying target nursing staff, explanation about the purpose of the work (defined subject and scoring), and data safe boxes (reason: the secrecy and lack of accountability of colleagues in questionnaires), and if these people agreed to complete the informed consent form.

Data collection tools included a two-part questionnaire, which consisted of a standardized questionnaire to measure moral distress scale and its related factors. The scale showed acceptable validity and reliability according to Razzaghi Kashani et al. (16).

The related factors questionnaire comprised three areas of demographic, occupational-social, and organizational factors, and included 18 questions about the subjects (age, gender, marital status, level of education, experience, position, income, employment status, interaction between physicians and nurses, the interaction between nurses, supporting one's parents and wife or not, hospital management support, job promotion opportunities, Job security, arrangements for continuing education, further education barriers, and stress and tension).

The Jamitoon moral distress scale is the first scale assessing moral distress in the community of nurses. This questionnaire consists of 30 questions in three areas, including ignoring the patient (Cronbach's alpha of 0.92) with 16 questions, patient's decision-making power (Cronbach's alpha 0.86) with 8 questions, and professional and functional competence (Cronbach's alpha of 0.79) with 6 questions. The scale measures the amount of moral distress that nurses experience in specific locations and conditions. The scoring of this tool uses a 7-point Likert format ranging from very low levels of moral distress to very high. In the questionnaire, it was stated that, if a respondent had not had any experience of a specific ethical problem, they should leave that item blank, and if they had faced an ethical problem, to rate it on a scale ranging from the lowest (1) to the highest (7). The range of the score of each area is from 1 to 7, and the total score of the questionnaire is also between 1 and 7; a total average score closer to 7 indicates higher moral distress, while a total average score closer to 1 indicates lower moral distress. The response variable used in this study was that a score less than the average was considered to indicate low moral distress and a score above average was considered to indicate high moral distress (m=4.93). The scientific validity and reliability of the moral distress measurement tool was measured by Dr. Razzaghi Kashani et al. (16) in 2008, who determined this using Cronbach's alpha of 86% and a re-test.

Guilan University of Medical Sciences Institutional Review Board approved this study, in accordance to Helsinki Declaration (approval number: IRBGUMS29308264).

Statistical Analysis

Data were analyzed using SPSS 17 software; descriptive statistics (percent) and means (standard deviation) were calculated, and the relationships between specific factors and moral distress ratings were examined using inferential statistical tests (t-test and ANOVA) considering $p<0.05$.

Results

In this study, 180 of 192 nurses completed the questionnaires; 93.9% (169 people) of respondents were female, and 5% (9 people) were male. The mean age and standard deviation of the subjects were 30.93±6.20 and average and SD of work experience was 6.60±5.05. Regarding marital status, 4.44% (80 cases) of nurses were single and 35.3% (96 cases) were married. Thirty percent of respondents were employed in Poursina Hospital, 20% in Razi, 1.16% in Heshmat, 7.8% in Velaayat, 1.1% in Alzahra, 6.7% in Amir-Al-Momenin, 8.9% in Shafa, and 9.4% in Hefdah-e-Shahrivar. In terms of education, 1.1% of those surveyed were technicians, 96.7% were experts, and 2.2% had an MSc in nursing. In terms of employment status, 26.7% were in formal employment, 23.9% were in treaty employment, and 27.8% were employed on a contract basis for a plan. In terms of position, 5% were head nurses, 94.4% were nurses, and 0.6% gave no response. Among those surveyed in October or November, 3 people had maternity leave, 2 had exclusions, 4 people were employed less than 1 year, and 3 people were uncooperative.

According to the study, the average moral distress in nurses was 4.93±1.08. Thus, high moral distress was reported. Heshmat hospital emergency department indicated the highest level of moral distress with a mean (standard deviation) of 5.20±1.30 and emergency department of Hefdah-Shahrivar Hospital indicated

Table 1. Distribution of demographic and occupational - social characteristics of participants

Characteristics (n=180)		n	%
Age (years)	22-28	78	43.3
	29-35	54	30
	>35	48	26.7
Marital status	Single	80	44.4
	Married	96	53.3
Educational status	Associate degree	2	1.1
	Bachelor	174	96.7
	Master	4	2.2
Type of employment	Employed	48	26.7
	Long term contract	43	23.9
	Short term contract	38	20.6
	Formal obligation	50	27.8
Work experience (years)	1-7	95	52.8
	8-14	37	20.5
	>14	48	26.7
Clinical position	Head nurse	9	5
	Clinical nurse	170	94.4

Table 2. Estimated regression coefficients of effective factors (organizational factors) and rating of moral distress according to logistic model of listening-reading method

Variable	β	SE	p value	Odds ratio	CI	
					LL	UL
Education obstacle	0.367	0.171	0.032	1.443	1.032	2.018

CI: Confidence interval

the lowest with a mean (standard deviation) of 4.57±1.27. Among the areas of moral distress, professional and functional competence was assigned the highest rating with an average of 5.21±1.17. In this context, according to the nurses, the item "During care and treatment in unsafe conditions" with a rating of 5.55 and the item "Working in conditions in which, due to lack of nurses, insufficient care for the patient is done" with a rating of 5.49 showed the highest moral distress scores. For ignoring the patient, the item "providing better care for rich patients" with a rating of 4.28, while for patient's decision-making power, the item "avoids taking oral medication" with a rating of 4.37 showed the lowest moral distress scores in nurses.

Among the relevant factors, organizational factors such as barriers to further education (p=0.04) and stress (p=0.49) had significant relationships with nurses' moral distress. Nurses who applied effective stress combating strategies, had less distress than others. The regression coefficient of factors related to moral distress based on logistic regression model using imported Beck shows that among the factors related to moral distress with a significance level of p=0.25, only education barriers remained significant in the final model, so that by increasing education barriers, the chances of creating moral distress were almost 1.5 times higher. Additionally, personal factors with variables of age, gender, etc., and occupational-social factors with variables of scientific interaction between nurses, family support, etc., had no significant statistical relationships with intensity of moral distress.

The results showed that the education barriers variable (p=0.032) significantly predicted nurses' moral distress. The direction of this impact is positive, and the results show that nurses' moral distress increases with increasing education barriers and the chance of creating moral distress in nurses increases almost 1.5 times (odds ratio=1.443).

Discussion

The results of this study show that nurses experience high average rates of moral distress. The results of this part of the study are comparable with other studies in this area. Abbaszadeh et al. (7) conducted a study in 2012 and reported high rates of moral distress (5.041) in nurses working in educational and health centers of. A study conducted in 2013 by Ameri et al. (22) reported high moral distress levels in nurses working in the oncology sector (2.13 of 4), which is consistent with the results of this study. However, a study by Fernandez-Parsons et al. (14) conducted in 2013 reported low levels of moral distress in the emergency department that does not match with the results of this study. This contradiction could be due to differences in the tools used, that is, differences in the type of wording and scoring method of each tool. Furthermore, nurses are faced daily with critical decisions about patients, and considering the definition of moral distress, which is an inner experience and its causes, relates to some inner individual features, and these characteristics are the basis of ones' willingness or unwillingness to solve ethical problems (23). Therefore, it seems that unique individual characteristics (personality, experience, and skills) of each sample may have caused contradictions in the moral distress for research units.

In the realm of moral distress, professional and functional competence of patients was associated with high moral distress. In this context, the items "Working in unsafe conditions because of lack of nurses" and "Working in a situation where due to the lack of nurses, there is inadequate care for the patients" had the highest ratings. The results of this study were consistent with the findings of Abbaszadeh et al (7) and co-workers about moral distress in nurses working in teaching hospitals in, while they were inconsistent with the study of Ameri et al. (22) and Allari et al. (24) concerning moral distress among nurses in Jordan and its relation to moral atmosphere. Perhaps considering the fact that half of the research units working in the emergency department are in a plan and contractual, it seems that employing nurses with low skills and experience caused the highest moral distress in nurses. Therefore, the lower the functional-professional competence, the higher the moral distress in nurses.

In this study, social-occupational and individual factors were not significantly associated with the intensity of moral distress. The results were different from those of Beikmoradi et al. (18) results that used MDS tools revised by Haamrik (18). This could be because of differences in study tools, and also because of differences in the environment investigated.

In logistic regression analysis, the only significant variable was education barriers, so it can be argued that education barriers are the most powerful predictor of moral distress in nurses, which means that increased education barriers cause nurses more moral distress. de Veer et al. (25) showed there are no predictor factors for moral distress in the daily performance in nurses. Evaluation with different tools may cause different results. Furthermore, given that there are more young people and novice nurses in the emergency department and they are interested in continuing their education, that they find education barriers stressful should be considered by corporate executives.

Conclusion

Intensity of moral distress in the emergency department nurses was evaluated to occur at a high level. Considering the outcome and impact of moral distress on nurses and hospital attendants

and of subsequently dealing with it, creating areas of reduced moral distress should be considered for patients, special distress workshops for nurses should be held, and special courses taught to reduce moral distress in the nursing community. Given that moral distress was not significantly associated with individual factors, a plan of in-service distress measurement may be helpful. In the present study, nurses who must endure stress and tension in the workplace had high distress, which could indicate a lack of awareness of methods of controlling moral distress. Therefore, teaching strategies for dealing with moral distress can be very helpful. Given that the highest moral distress was expressed in the condition of shortages of nurses for patient care, planning to increase the number of nurses in hospital wards is required. The amount of moral distress in the professional-functional competence area is high. Therefore, planning to create professional-functional competency of nurses appears necessary. Considering that education barriers were one of the strong factors in creating moral distress, creating a learning environment in hospitals should be considered.

Ethics

Ethics Committee Approval: Guilan University of Medical Sciences, approval number: IRBGUMS29308264.

Informed Consent: It was taken.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: R.T.K., F.A., M.S.S., Concept: K.J., R.T.K., Design: R.T.K., E.K., Data Collection or Processing: K.J., E.K., Analysis or Interpretation: M.S.S., E.K., Literature Search: R.T.K., F.A., M.S.S., Writing: K.J., R.T.K., F.A.

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References

1. Burston AS, Tuckett AG. Moral distress in nursing: contributing factors, outcomes and interventions. Nursing Ethics. 2013;20:312-24.
2. de Veer AJ, Francke AL, Struijs A, Willems DL. Determinants of moral distress in daily nursing practice: a cross sectional correlational questionnaire survey. Int J Nurs Stud. 2013;50:100-8.
3. Karagozoglu S, Yildirim G, Ozden D, Çınar Z. Moral distress in Turkish intensive care nurses. Nursing Ethics. 2017;24:209-24.
4. Ulrich CM, Hamric AB, Grady C. Moral distress: a growing problem in the health professions? The Hastings Cent Rep. 2010;40:20-2.
5. Ameri M, Safavi Bayat Z, Ashktorab T, Kavoosi A, Vaezi A. Moral distress: evaluating nurses' experiences. J Med Ethics Hist Med. 2013;6:64-73.
6. Ulrich CM, Taylor C, Soeken K, O'Donnell P, Farrar A, Danis M, et al. Everyday Ethics: Ethical Issues and Stress in Nursing Practice. J Adv Nurs. 2010;66:2510-9.
7. Abbaszadeh AB, Borhani F, Kalantary S. The moral distress of nurses in health centers in the city of Bam in 1390. Iranian Journal of Medical Ethics. 2011;6.
8. Afshar MH , Jooybari L, Sanagou A, Kalantari S. Study Of Factors Affecting Moral Distress Among Nurses: A Review of Previous Studies. J Educ Ethics Nurs. 2012;1(1).
9. Kazemi AK, Kazemi M, Abbasi M, Kiyani M, Feyzollahi N, Atoloo S, et al. Assessing end of life support. Medical Ethics and History of Medicine. 2012;5:45-57.
10. Maluwa VM, Andre J, Ndebele P, Chilemba E. Moral distress in nursing practice in Malawi. Nurs Ethics. 2012;19:196-207.
11. Corley MC, Minick P, Elswick R, Jacobs M. Nurse moral distress and ethical work environment. Nursing Ethics. 2005;12:381-90.
12. Lamiani G, Borghi L, Argentero P. When healthcare professionals cannot do the right thing: A systematic review of moral distress and its correlates. J Health Psychol. 2017;22:51-67.
13. Morley G, Ives J, Bradbury-Jones C, Irvine F. What is 'moral distress'? A narrative synthesis of the literature. Nursing Ethics. 2017.
14. Fernandez-Parsons R, Rodriguez L, Goyal D. Moral Distress In Emergency Nurses. J Emerg Nurs. 2013;39:547-52.
15. Ohnishi K, Ohgushi Y, Nakano M, Fujii H, Tanaka H, Kitaoka K, et al. Moral distress experienced by psychiatric nurses in japan. Nursing Ethics. 2010;17:726-40.
16. Razzaghi Kashani OM, Motevallian SA, Alizadegan S, Vaziri M Hossein, Merghati Khoiee E, Goushegir SA, et al. Developing the Moral Distress Scale in the Population of Iranian Nurses. Iranian Journal of Psychiatry. 2008;55:46-55.
17. Nadere RNG, Hasemi E, Farahani AHM, Borhani F. Evaluation of nurses' moral distress in educational institutions -Darmany Shaheed Beheshti University in 1392. Medical Ethics. 2013;8:121-43.
18. Beikmoradi A, Rabiee S, Khatiban M, Cheraghi MA. Nurses distress in intensive care unit: a survey in teaching hospitals. J Med Ethics Hist Med. 2012;5:58-69.
19. Ebrahimi H, Kazemi A, Jafarabadi MA, Azarm A.Moral distress in nurses working in educational hospitals of Northwest Medical Universities of Iran. J Med Ethics Hist Med. 2013;6:80-8.
20. Masomi GJ, M. Siahtir M. et. al. The measures of Emergency Department in hospitals. Iranian Ministry of Health. Health Policy Breauea.
21. Noorossana R, Rezaeian S, Saghaei A, Karimzadeh Y, Moradi S. Measuring Service Quality in Emergency department Based on patient rights: a cross-sectional study from Iran. Med Ethics. 2013;7:161-84.
22. Ameri M, Mirhashemi B, Hosseini SS.Moral distress and the contributing factors among nurses in different work environments. JNMS. 2015:2:44-9.
23. Borhani F, Abbaszadeh A, Mohamadi E, Ghasemi E, Hoseinabad-Farahani MJ. Moral sensitivity and moral distress in Iranian critical care nurses. Nursing Ethics. 2017;24:474-82.
24. Allari R, Abu-Moghli F. Moral Distress among Jordanian Critical Care Nurse and their Perception of Hospital Ethical Climate. Journal of Natural Sciences Research. 2013;3:144-53.
25. de Veer AJ, Francke AL, Struijs A, Willems DL. Determinants of Moral Distress In Daily Nursing Practice: A Cross Sectional Correlational Questionnaire Survey. Int J Nurs Stud. 2013;50:100-8.

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Mushroom Poisoning Cases from an Emergency Department in Central Anatolia: Comparison and Evaluation of Wild and Cultivated Mushroom Poisoning

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Abstract

Aim: To evaluate differences between cultivated and wild mushroom poisoning in terms of clinical characteristics, laboratory findings, and complications. We also aimed to determine the differences among patients in regard to presence of complications.

Materials and Methods: We evaluated adults who were diagnosed with mushroom poisoning at Konya Training and Research Hospital in a 4-year period between January 2014 and December 2017. The following characteristics of patients were recorded: Age, sex, complaints, time until hospital admittance, time until symptom onset, mushroom source, any interventions until patient arrived to the hospital, laboratory findings, complications like acute renal failure, neurotoxicity, rhabdomyolysis, cardiotoxicity and mortality, length of stay (LoS) at hospital, and patient discharge status. All analyses were performed on SPSS v21. Kolmogorov-Smirnov test was used to determine normality of distribution. Continuous variables were analyzed with the Mann-Whitney U test and described as median (minimum-maximum). Categorical variables were analyzed with chi-square test and described as frequency (percentage). The relationships between continuous variables were determined by calculating Spearman correlation coefficients.

Results: We included 168 patients (79 males and 89 females) in our study. The mean age was 46.66±18.66 years. The cause of poisoning was cultivated mushrooms for 57 (33.9%) patients and wild mushrooms for 111 (66.1%) patients. It was found that patients in the wild mushroom group were older than the patients in the cultivated mushroom group (p=0.006). Cultivated mushrooms were largely consumed by patients who live in metropolitan areas (p<0.001). Patients who consumed wild mushrooms had higher troponin levels (p=0.017), lower base excess values (0.032) and longer LoS at hospital (p=0.029). Although the sociodemographic studies of mushroom poisoning have been made numerously, this is the first study to draw attention to fact that it may also occur with cultured fungi.

Conclusion: Due to the climatic conditions in the area where our study has been conducted, frequent referrals to our institution occur with mushroom poisoning particularly in spring season. However, even in cultivated mushrooms, which are thought to be harmless, poisoning cases may also be observed that are usually seen with the wild fungi. Even in cases of cultured mushroom poisoning, symptoms may develop early and more serious complications may arise.

Keywords: Cultivated mushroom poisoning, wild mushroom poisoning, laboratory findings, clinical characteristics, complication

Introduction

Mushroom poisoning (MP) is an important cause of poisoning worldwide. Around 100 mushroom species are known to be poisonous to humans while 20 species contain lethal toxins (1,2). Most deadly poisonings are caused by the amanita phalloides species, also known as the death cap; which is followed by the gyromitra (now grouped in the Discinaceae family) group (3). The severity of MP ranges from mild food-poisoning symptoms to serious life-threatening cases (4). Due to the number of unreported cases, the symptomatic similarity with other food poisonings, and the relatively low number of serious cases that

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require medical attention; determining the overall incidence of MP is difficult and usually requires a patient history indicating the consumption of mushrooms. As such, the incidence of MP is also unclear in Turkey (3). Another important point is that, although MP due to the foraging of mushrooms is much more frequent, commercially obtained mushrooms have been shown to cause poisonings in up to 5-7% of cases (5-7).

The clinical manifestation of MP may range from simple gastroenteritis to serious psychological effects, fatal liver and kidney failure (8). There are many factors that determine the severity of MP. Season, ingested amount, mushroom type, and preparation of the mushroom are some of these factors. As previously stated, patient history is very important in the diagnosis and care of MP. Identifying the type of mushroom is also important in some regions in which mushrooms that contain lethal toxins are endemic (9).

MP is categorized according to the time of symptom onset: Early onset (<6 hours), late onset (6-24 hours) and delayed onset (>24 hours). Early onset poisoning usually presents with GI and allergic symptoms and less commonly neurotoxic symptoms. Late onset poisoning presents with hepatotoxic and nephrotoxic symptoms and erythromelalgia syndrome. Delayed onset presents with hepatotoxic, nephrotoxic, delayed neurotoxic and rhabdomyolytic symptoms (10). The diagnosis and treatment of MP cases are based on patient history, clinical manifestation (including category), laboratory findings and identification of the responsible mushroom.

Early diagnosis and treatment are the most important factors that affect morbidity and mortality in MP. Although specific approaches in regard to mushroom type exist; treatment of MP is largely supportive even if the mushroom is identified. Treatment options include; activated charcoal, hemodialysis, hemoperfusion, hemofiltration, supplementation of fluid-electrolytes, symptomatic treatment, antiemetics, silibinin, N-acetylcysteine, pyridoxine, benzodiazepines, aspirin, nicotinic acid, and high dose penicillin (6,10-18). The use of penicillin in most MP cases is currently being disputed (19); however, it is still a popular treatment option.

Our aim was to evaluate the clinical characteristics, laboratory findings and complications of wild and cultivated mushroom poisonings. In cultured mushroom poisoning, symptoms were developing earlier than wild fungi poisoning. We also observed that the incidence of serious complications such as acute renal failure and cardiotoxicity was higher in cultured mushroom poisoning. Acute renal failure developed in 22 and (37.2%), cardiotoxicity in 3 of 59 patients (5.08%) who were poisoned by cultured mushroom.

Materials and Methods

The study was a retrospective evaluation of patients, admitted to Konya Training and Research Hospital between 01 January 2014 and 31 December-2017 who were diagnosed with MP. Patient inclusion criteria were: (1) Being older than 18 years of age, (2) accepting treatment from our clinic, (3) remaining at our clinic until their results were obtained or the end of treatment. Twenty-one patients were excluded from the study; 8 due to being younger than 18, 7 due to refusal of treatment, and 6 due to leaving the hospital while primary care/treatment was continuing (these 6 patients did not inform that they were leaving and did not fill an AMA form; thus they were not included in the study. Whereas patients who had sufficient data and later had filled an AMA form were included in the final evaluation). A final total of 168 patients were included in the study.

Local ethics committee approval was obtained at 28 March 2017/985 from University of Necmettin Erbakan and the Helsinki declaration and good clinical practice guidelines were followed for the entirety of the study.

The following characteristics of patients were recorded: Age, sex, complaints, time until hospital admittance, time until symptom onset, mushroom source, any interventions until patient arrived to the hospital, laboratory findings, complications, length of stay (LoS) at hospital, and patient discharge status. The following conditions were accepted as complications: Acute renal failure, neurotoxicity, cardiotoxicity, rhabdomyolysis. The patients were asked about the features of mushroom. Data from the patients who have information about the mushroom species were recorded. If the patient didn't have information about the mushroom species, they were asked about the shape and the source of mushrooms. The mushrooms with a pale cap and stalk are accepted as cultivated mushroom.

Statistical Analysis

All analyses were performed on SPSS v21. Kolmogorov-Smirnov test was used to determine normality of distribution. Continuous variables were analyzed with the Mann-Whitney U test and described as median (minimum-maximum). Categorical variables were analyzed with chi-square test and described as frequency (percentage). The relationships between continuous variables were determined by calculating Spearman correlation coefficients.

Results

We included 168 patients (79 males and 89 females) in our study. The mean age was 46.66±18.66 years. The cause of poisoning was cultivated mushrooms for 57 (33.9%) patients and wild

Table 1. Patients' Demographics and characteristics regarding source of consumed mushroom

	Wild mushroom (n=111)	Cultivated mushroom (n=57)	p
Age	47 (17-88)	33 (18-79)	0.006*
Gender			
Female	60 (54.1%)	29 (50.9%)	0.820
Male	51 (45.9%)	28 (49.1%)	
Location			
Rural	37 (33.3%)	4 (7.0%)	<0.001**
Urban	74 (67.7%)	53 (93.0%)	
Educational status			
Primary school and below	53 (47.7%)	18 (31.6%)	0.132
Secondary school	11 (9.9%)	7 (12.3%)	
High school and above	47 (42.3%)	32 (56.1%)	
Complications	55 (49.5%)	29 (50.9%)	1.000
Discharge			
After full recovery	102 (91.9%)	52 (91.2%)	1.000
Patient request (AMA)	9 (8.1%)	5 (8.8%)	
Time of symptom onset (hours)	4 (0-96)	4 (0-24)	0.675
Systolic blood pressure	120 (100-170)	120 (100-145)	0.370
Diastolic blood pressure	70 (45-100)	70 (64-90)	0.699
Pulse (BPM)	78 (65-115)	79 (65-92)	0.168
Urea	29 (12-63)	27 (10-59)	0.083
Creatinine	0.77 (0.50-1.24)	0.80 (0.44-1.48)	0.283
AST	22 (7-718)	23 (12-88)	0.377
ALT	17 (9-860)	19 (7-79)	0.303
Direct bilirubin	0.10 (0.01-0.40)	0.10 (0.03-0.40)	0.401
Indirect bilirubin	0.4 (0.1-1.6)	0.4 (0.1-2.9)	0.458
INR	0.9 (0.8-1.9)	1 (0.8-1.5)	0.071
Troponin	0.04 (0-0.73)	0.04 (0-0.09)	0.017*
CK	93 (12-2166)	89.5 (1-725)	0.734
CK-MB	1.8 (0-91)	1 (0 - 54)	0.066
pH	7.39 (7.28-7.52)	7.39 (7.32-7.47)	0.792
HCO_3	23.05 (16.0-32.0)	23.8 (14.3-28.3)	0.098
Lactate	1.2 (0.13-12.70)	1.5 (0.6-10.7)	0.201
Base excess	-0.7 (-10-6.6)	-0.05 (-12.2-3)	0.032*
LoS at hospital (days)	2 (0-13)	1 (0-6)	0.029*

Data given as median (minimum - maximum) or frequency (percentage)
LoS: Length of stay

mushrooms for 111 cases (66.1%). It was found that patients in the wild mushroom group were older than the patients in the cultivated mushroom group (p=0.006). Cultivated mushrooms were largely consumed by patients who live in metropolitan areas (p<0.001). Patients who consumed wild mushrooms had higher troponin levels (p=0.017), lower base excess values (0.032) and longer LoS at hospital (p=0.029) (Table 1). Fifty-five (49.5%) patients in the wild mushroom group, and 29 (50.9%) patients in the cultivated mushroom group developed complications. Complications were more frequent in patients who lived in urban and metropolitan areas than those who lived in rural areas (p<0.001), and in patients with higher educational status (p=0.002). Symptoms were seen earlier in patients who had complications than those who had not (p=0.001). Patients with

Table 2. Patients' demographics and characteristics regarding complications

	Complications		
	Absent (n=84)	Present (n=84)	p
Age	41.5 (17-88)	38.5 (18-81)	0.105
Gender			
Female	41 (48.8%)	48 (57.1%)	0.354
Male	43 (51.2%)	36 (42.9%)	
Location			
Rural	34 (40.5%)	7 (8.3%)	<0.001**
Urban	50 (59.5%)	77 (91.7%)	
Educational status			
Primary school and below	44 (52.4%)	27 (32.1%)	0.002*
Secondary school	3 (3.6%)	15 (17.9%)	
High school and above	37 (44.0%)	42 (50.0%)	
Discharge			
After full recovery	79 (94.0%)	75 (89.3%)	0.402
Patient request (AMA)	5 (6.0%)	9 (10.7%)	
Time of symptom onset (hours)	4.5 (0.5-72)	3 (0-96)	0.001**
Systolic blood pressure	116.5 (105-170)	120 (100-170)	0.702
Diastolic blood pressure	70 (45-100)	70 (60-100)	0.181
Pulse (BPM)	75 (65-95)	79.5 (65-115)	0.008
Urea	29.5 (10-63)	28 (10-62)	0.044*
Creatinine	0.8 (0.50-1.48)	0.79 (0.44-1.48)	0.762
AST	22 (7-76)	23.5 (7-718)	0.083
ALT	16.5 (7-92)	18.5 (9-860)	0.020*
Direct bilirubin	0.10 (0.01-0.40)	0.10 (0.03-0.40)	0.025*
Indirect bilirubin	0.4 (0.1-2.9)	0.4 (0.1-1.4)	0.914
INR	1 (0.8-1.5)	1 (0.8-1.9)	0.916
Troponin	0.04 (0-0.4)	0.04 (0-0.73)	0.816
CK	97 (1-725)	87.5 (33-2166)	0.744
CK-MB	10 (0-91)	1 (0-27)	<0.001**
pH	7.38 (7.28-7.52)	7.39 (7.3-7.48)	0.443
HCO_3	23.7 (14.3-29.4)	23 (17-32)	0.106
Lactate	1.4 (0.13-12.7)	1.2 (0.6-12)	0.267
Base excess	-0.5 (-12.2-3.6)	-0.3 (-9-6.6)	0.826
LoS at hospital (days)	2 (0-4)	0 (0-13)	<0.001**

Data given as median (minimum - maximum) or frequency (percentage)

LoS: Length of stay, INR: International normalized ratio, ALT: Alanine transaminase, AST: Aspartate aminotransferase

complications had lower urea (p=0.044) and CK-MB (p<0.001) values while they had higher ALT (p=0.020) and direct bilirubin (p=0.025) values. Hospitalization time (LoS) were longer for patients without complications (p<0.001) (Table 2). There was a positive moderate correlation between the time interval until symptom onset and hospitalization (LoS) time (r=0.416; p<0.001) and also a positive weak correlation between age and hospitalization (LoS) time (r=0.239; p=0.003).

Discussion

Although determining the incidence of MP through retrospective studies has various limitations, we believe that overall MP

incidence is lower in our area than other parts of our country. There was no death due to MP in our study. We found that cultivated mushrooms were mostly consumed by patients in the metropolitan area. Patients who consumed wild mushrooms had higher troponin levels, lower base excess values, and longer LoS at hospital. Furthermore, patients who had complications had higher ALT and bilirubin levels while they were surprisingly found to have lower urea and CK-MB values, earlier symptom onset, and shorter LoS at hospital. We also identified various results of which some could be compared with available literature and some that could not.

Due to the regional differences of fungi population and poisonousness, we aimed to assess domestic reports to evaluate MP incidence in Turkey and found that, in 2008 a total of 1210 MP cases were reported to the national poisoning center, which represented 43.54% of all poisonings from food sources (20). However, epidemiologic and clinical studies of MP in Turkey are limited to single-center studies which only represent local poisoning cases. Five major single-center Turkish studies cumulatively including a total of 1411 patients reported a total of 26 deaths (1.8%) due to MP (3,6,7,21,22) which is comparable to various studies (18) but lower than studies which include patients poisoned with amanita phalloides (23,24). Reports from other countries and regions such as the United States and Europe estimate that there are around 100-200 yearly fatalities due to MP (25,26). A study by Yamaura (27), reported a total of 1920 cases and 10 deaths between 2001-2010 in Japan. In our study we did not observe any death due to MP, which may be explained by the relatively low rate of wild MP cases, fast arrival at hospital, prompt treatment, and low rate of serious complications.

Various domestic studies (6,7) and a report from the Food and Agriculture Organization (FAO) of the United Nations (5) show that cultivated mushrooms represent 5-7% of MP cases; which is an important finding when cultivated mushrooms are accepted as 'safe' by the general population. We report a very high rate (n=57, 33.9%) of cultivated MP in our study. This rate may be explained by the unfavorable climate for mushrooms and the unpopularity of mushroom foraging in our region, which may have increased the proportion of cultivated MP cases. Some studies from Turkey report rates of MP due to foraging close to 100%, while others report poisonings from commercial mushrooms in up to 12% of their cases (21). Analysis of cases based on the source of mushrooms (wild or cultivated) showed that cultivated mushrooms were the main source of poisoning in patients from the metropolitan area. We also found that troponin levels, base excess and LoS at hospital were lower in the cultivated mushroom group. To our knowledge, our rate is the highest reported rate of MP due to cultivated mushrooms in Turkey. This limits the feasibility of comparing findings with other studies in this matter.

The clinical course of MP is usually based on the type of mushroom, which is directly related to the onset time of symptoms. Early onset shows better prognosis while patients with late and delayed onset show poor prognosis (6,7,28,29). In our study, when patients were grouped in regard to development of complications, we found that complications were more frequent in patients who lived in urban and metropolitan areas compared to rural areas. Patients with complications had higher ALT and direct bilirubin levels as expected. However, we also found that patients with complications had earlier onset, shorter LoS at hospital, lower urea and CK-MB values in comparison to patients without complications. This is a surprising finding which is contrary to the literature (1,3,9,21) may simply be explained by incorrect patient history. However, another explanation may lie in our definition of complication; which included mild conditions, thus our statistics may have been affected. In the light of these findings, we believe that complications are not rare in cultivated MP and also, it may be plausible to suggest that mild complications do not affect prognosis in MP. Our findings and our conclusion requires further studies and explanations which may be obtained by analysis of complications separately.

There are several strengths of our study. Firstly, we have a large group of patients due to our center being a major hospital in area; secondly, our study evaluated patients based on the source of mushroom and the presence of complications, rather than the more common "demographic-descriptive" assessment. Finally, our study showed that the laboratory findings of these clinically indistinguishable conditions were also similar. There are also limitations to our study. Firstly, we did not identify mushroom species; however, although identification of mushroom is helpful in treatment, it is not an absolute requirement for the effective management of MP (8). We did not evaluate the effect of season on MP which has been shown to be an important factor in various studies (6,30); however, we were interested in identifying the differences in terms of mushroom source and complications; thus evaluating seasonal effects were not necessary. Secondly, we did not separate mild and severe complications which may explain our results that were in contrast with the literature. Finally, the retrospective nature of the study is also a limitation.

Conclusion

In conclusion, we suggest that educational measures should be taken to instruct the general public -not only about the risks of mushroom foraging- but also about precautions that should be taken in the preparation and consumption of cultivated mushrooms. We also want to remind clinicians that the most

important step in the approach to MP is identifying mushroom ingestion from the patient history and promptly beginning supportive treatment even if the source is cultivated mushrooms. We believe our findings provide a new approach to complications in MP and shed light on the differences (and similarities) between cultivated and wild MP. Some of our findings are in contrast with the literature; however, we believe this is largely due to the perception and definition of mild and severe complications. These results may be explained by future studies that separate complications by severity.

Ethics

Ethics Committee Approval: Local ethics committee approval was obtained at 28 March 2017/985 from University of Necmettin Erbakan and the Helsinki declaration and good clinical practice guidelines were followed for the entirety of the study.

Informed Consent: It was taken.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: D.A., E.F.V., Concept: D.A., E.F.V., Design: D.A., Data Collection or Processing: M.P., Analysis or Interpretation: D.A., E.F.V., Literature Search: E.N.Ö., M.G., Writing: D.A., E.F.V.

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References

1. Erguven M, Yilmaz O, Deveci M, Aksu N, Dursun F, Pelit M, et al. Mushroom poisoning. Indian J Pediatr. 2007;74:847-52.
2. Berger KJ, Guss DA. Mycotoxins revisited: part I. J Emerg Med. 2005;28:53-62.
3. Colak S, Kandis H, Afacan MA, Erdogan MO, Gunes H, Kaya E, et al. Assessment of patients who presented to the emergency department with mushroom poisoning. Hum Exp Toxicol. 2015;34:725-31.
4. Unverir P, Soner BC, Dedeoglu E, Karcioglu O, Boztok K, Tuncok Y. Renal and hepatic injury with elevated cardiac enzymes in Amanita phalloides poisoning: a case report. Hum Exp Toxicol. 2007;26:757-61.
5. GECAN JS, Cıchowıcz SM. Toxic Mushroom Contamination of Wild Mushrooms in Commercial Distribution. J Food Prot. 1993;56:730-4.
6. Eren SH, Demirel Y, Ugurlu S, Korkmaz I, Aktas C, Güven FM. Mushroom poisoning: retrospective analysis of 294 cases. Clinics (Sao Paulo). 2010;65:491-6.
7. Unluoglu I, Tayfur M. Mushroom poisoning: an analysis of the data between 1996 and 2000. Eur J Emerg Med. 2003;10:23-6.
8. Pajoumand A, Shadnia S, Efricheh H, Mandegary A, Hassanian-Moghadam H, Abdollahi M. A retrospective study of mushroom poisoning in Iran. Hum Exp Toxicol. 2005;24:609-13.
9. Brayer AF, Schneider S, Cevik A. Mushroom poisoning. Emergency medicine: A comprehensive study guide. McGraw-Hill. 2004.
10. Diaz JH. Syndromic diagnosis and management of confirmed mushroom poisonings. Crit Care Med. 2005;33:427-36.
11. Bedry R, Baudrimont I, Deffieux G, Creppy EE, Pomies JP, Ragnaud JM, et al. Wild-mushroom intoxication as a cause of rhabdomyolysis. N Engl J Med. 2001;345:798-802.
12. Nakajima N, Ueda M, Higashi N, Katayama Y. Erythromelalgia associated with Clitocybe acromelalga intoxication. Clin Toxicol (Phila). 2013;51:451-4.
13. Michelot D, Toth B. Poisoning by Gyromitra esculenta--a review. J Appl Toxicol. 1991;11:235-43.
14. Diaz JH. Evolving global epidemiology, syndromic classification, general management, and prevention of unknown mushroom poisonings. Crit Care Med. 2005;33:419-26.
15. Beuhler MC, Sasser HC, Watson WA. The outcome of North American pediatric unintentional mushroom ingestions with various decontamination treatments: an analysis of 14 years of TESS data. Toxicon. 2009;53:437-43.
16. Ergin N. Mantar zehirlenmeleri ve tedavide genel yaklaşım. Türk Hij Den Biyol Derg. 2000;57:109-18.
17. Santi L, Maggioli C, Mastroroberto M, Tufoni M, Napoli L, Caraceni P. Acute Liver Failure Caused by Amanita phalloides Poisoning. Int J Hepatol. 2012;2012:487480.
18. Altıntop L. OMÜ Tıp Fakültesi Acil Servise Başvuran mantar İntoksikasyonlarının Bir Yıllık Değerlendirilmesi. Akademik Acil Tıp Derg. 2004;2:23-7.
19. Karlson-Stiber C, Persson H. Cytotoxic fungi-an overview. Toxicon. 2003;42:339-49.
20. Özcan N, İkincioğulları D. Ulusal Zehir Danışma Merkezi 2008 Yılı Çalışma Raporu Özeti. Turk Hij Den Biyol Derg. 2009;66:29-58.
21. Cevik AA, Unluoglu I. Factors Affecting Mortality and Complications in Mushroom Poisonings Over a 20 Year Period: A Report from Central Anatolia. Turk J Emerg Med. 2016;14:104-10.
22. Yardan T, Baydin A, Eden AO, Akdemir HU, Aygun D, Acar E, et al. Wild mushroom poisonings in the Middle Black Sea region in Turkey: analyses of 6 years. Hum Exp Toxicol. 2010;29:767-71.
23. Enjalbert F, Rapior S, Nouguier-Soulé J, Guillon S, Amouroux N, Cabot C. Treatment of amatoxin poisoning: 20-year retrospective analysis. J Toxicol Clin Toxicol. 2002;40:715-57.
24. Jander S, Bischoff J. Treatment of Amanita phalloides poisoning: I. Retrospective evaluation of plasmapheresis in 21 patients. Ther Apher. 2000;4:303-7.
25. Ellenhorn MJ, Seth S, Ordog G, Wasserberger J. Ellenhorn's medical toxicology: diagnosis and treatment of human poisoning. 1997: Williams & Wilkins.
26. Mengs U, Pohl RT, Mitchell T. Legalon® SIL: the antidote of choice in patients with acute hepatotoxicity from amatoxin poisoning. Curr Pharm Biotechnol. 2012;13:1964-70.
27. Yamaura Y. Recent trends of mushroom poisoning in Japan. Chudoku Kenkyu. 2013;26:39-43.
28. Schenk-Jaeger KM, Rauber-Lüthy C, Bodmer M, Kupferschmidt H, Kullak-Ublick GA, Ceschi A. Mushroom poisoning: a study on circumstances of exposure and patterns of toxicity. Eur J Intern Med. 2012;23:85-91.
29. Yelken, B., Erkan A. Mantar zehirlenmeleri: 104 olgunun değerlendirmesi. Journal of the Turkish Society of Intensive Care, 2009.7:12-6.
30. Nordt SP, Manoguerra A, Clark RF. 5-Year analysis of mushroom exposures in California. West J Med. 2000;173:314-7.

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Role of Bedside Sonography in Detecting Rib Fractures and Related Injuries

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Abstract

Aim: About 40% of patients with trauma, experience chest related injuries. Rib fracture remains the most frequent finding in chest trauma. Some literatures have suggested chest wall ultrasonography as a potential replacement for chest X-ray (CXR) in detecting rib fractures. The aim of this study is to assess sensitivity and specificity of bedside ultrasonography in detecting rib fractures and related injuries.

Materials and Methods: Patients between April 2012 and April 2014 were enrolled in our prospective cross-sectional study. Then emergency medicine specialists performed a bedside ultrasonography to detect any probable fracture and suspected injuries. We took CXRs and an expert radiologist looked for fracture and related injuries. A chest computerized tomography scan was taken and compared with findings of CXR and ultrasonography.

Results: Out of 360 patients, 238 met our inclusion criteria and enrolled in the study; where 222 (93.3%) were male and 16 (6.7%) were female with the average age of 33.78±11.62 (± standard deviation). The sensitivity and specificity of two modalities in detecting fracture, pneumothorax, hemothorax and contusion were analyzed.

Conclusion: Our study showed that bedside ultrasonography could substitute CXR in detecting not only rib fractures but also related comorbidities especially in minor trauma.

Keywords: Rib fracture, bedside ultrasonography, injuries, emergency physician, sensitivity, chest X-ray

Introduction

About 40% of patients with trauma experience chest related injuries. External forces including motor vehicle collisions and falling from height, considered as the most common causes of the blunt trauma (1,2). Rib fracture remains the most frequent finding in chest trauma and occurs because of the blunt trauma in almost half of the cases (3). Rib fractures happen while direct force applied to the sternum caused by a motor vehicle. Aging increases likelihood of rib fractures. Higher thoracic flexibility of children reduces the risk of fracture (1-3).

Due to semi-protected position of the upper ribs (1st to 3rd) and limited range of motion of the lower ribs (9th to 12th), these ribs are less vulnerable to the trauma. Therefore, 4th to 9th ribs fracture more frequently. However, upper rib fractures, accompany higher mortality rate due to comorbid subclavian artery or vein injuries; and lower rib fractures can increase three and four times the rupture probability of the liver and spleen, respectively (4-7). The more the ribs fracture, the higher the comorbidities occur. Patients with three or more fractured ribs require hospitalization for pain alleviation and further investigations (8,9).

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Chest X-ray (CXR) remains a beneficial and sensitive tool in detecting rib fractures.

Bony construction and oblique view of ribs in a CXR make it easy to detect fractures (10-13).

Some literatures have suggested chest wall ultrasonography as a potential replacement for CXR in detecting rib fractures especially in trauma related ones. Moreover, chest wall ultrasonography can differentiate traumatic fractures from pathologic ones (14-21).

A few studies have evaluated the role of ultrasonography in finding fracture of the ribs; however, in none of them emergency physicians have used bedside ultrasonography at emergency departments (22-25). Moreover, small sample size in previous studies made it crucial to perform a study with a larger sample size.

The aim of this study is to assess sensitivity and specificity of bedside ultrasonography in detecting rib fractures and related injuries including pneumothorax, hemothorax and pulmonary contusion.

Materials and Methods

Study Design

Patients who were referred to our tertiary emergency department between April 2012 and April 2014 were enrolled in our prospective cross-sectional study. We included all stable patients with chest trauma who were older than 10 years (being cooperative in localizing pain), fully conscious (Glasgow coma scale=15) and without distracting pain (difficulty in pain localization). After approval of ethics committee, we took written consent form from all patients who were enrolled in the study.

We excluded patients if either they face life-threatening condition or experience decrease in GCS. We also excluded patients without rib fractures, patients who have more than 3 fractures and patients with massive emphysema.

The patients were asked to localize the most excruciating area. Then emergency medicine specialists performed a bedside ultrasonography, using a Medison-X (South Korea) with a linear 7.5-10 mHz probe, for the localized area and surroundings in a sitting position. This was used to detect any probable fracture and suspected injuries such as: Pneumothorax, hemothorax and soft tissue contusion. We used following criteria in detecting probable fracture: Cortical discontinuity, acoustic shadow following fracture, reverberation artifact, and local hematoma.

We took anteroposterior (AP) and lateral CXRs after stabilization of patients. An expert radiologist who was unaware of the study looked for the fracture and related injuries. A chest computerized tomography (CT) scan (64-multislice), as the gold standard, was taken and compared with findings of CXR and ultrasonography.

Data Analysis

We used SPSS-15.0 to calculated sensitivity and specificity of CXR and ultrasonography for detection of fracture, hemothorax, pneumothorax, and contusion.

Ethical Considerations

Ethics Committee of Iran University of Medical Sciences approved the study before patients' enrollment (approval number: 91/D/131/965).

Results

Out of 360 patients, 238 met our inclusion criteria and enrolled in the study; where 222 (93.3%) were male and 16 (6.7%) were female with the average age of 33.78±11.62 (± standard deviation).

Motor vehicle collisions were the most frequent cause of trauma in 171 (71.8%) patients.

Figure 1 shows the incidence of fractures detected by CXR, ultrasonography and CT. Incidence of pneumothorax, hemothorax and contusion based on diagnostic modality is shown in Table 1.

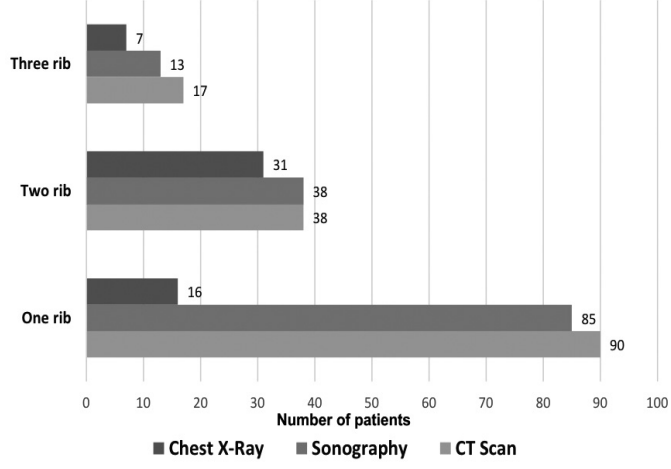

Figure 1. Incidence of fractures detected by chest X-ray, ultrasonography and computerized tomography

CT: Computerized tomography

Table 1. Incidence of injuries based on diagnostic modality

	Modality		
	CXR	Ultrasonography	CT
Hemothorax (n)	0	17	28
Pneumothorax (n)	7	54	58
Contusion (n)	0	3	18

CXR: Chest X-ray, CT: Computerized tomography

Table 2. Sensitivity and specificity of injuries detected on chest X-ray and ultrasonography

	Findings	Sensitivity %	Specificity %
CXR (n=238)	Fracture	37.2	100
	Hemothorax	0	100
	Pneumothorax	12.1	100
	Contusion	0	100
Ultrasonography (n=238)	Fracture	93.8	100
	Hemothorax	60.7	100
	Pneumothorax	93.1	100
	Contusion	16.7	100

CXR: Chest X-ray

In addition, the sensitivity and specificity of two modalities in detecting fracture, pneumothorax, hemothorax and contusion were depicted in Table 2.

Discussion

In the case of thoracic injuries, when physicians suspect fracture or related injuries, they use various imaging modalities such as: AP and lateral CXR, chest ultrasonography and chest CT scan.

Majority of patients in our study were young male people who were referred due to a motor vehicle collision. Most of the detected fractures with CXR were fracture of two ribs, however one rib fractures were the mostly detected ones using CT scan and bedside ultrasonography. This indicates more diagnostic value of CXR in more severe trauma. On the other hand, in less severe trauma usage of ultrasonography or CT is more diagnostic. Higher sensitivity rate of ultrasonography in comparison with CXR (93.8% to 37.2%) in detecting fractures denotes superiority of ultrasonography usage.

Moreover, better results in detecting injuries suggest advantage of ultrasonography comparing with CXR. Nonetheless, low sensitivity rates for detection of contusion (16.7%) and hemothorax (60.7%) make the usage of CT scan inevitable in suspected patients.

Turk et al. (22) studied 20 patients with normal CXR. They performed ultrasonography and found rib fractures in 18 of 20 patients. Kara et al. (24) evaluated 36 patients with chest trauma who had no fracture in their CXRs. Surprisingly, 15 of the patients had rib fractures.

If we consider minor trauma as a cause of these biases, ultrasonography can significantly detect less severe trauma.

Griffith et al. (26) assessed 50 patients with both CXR and ultrasonography. The findings are as follows: 8 fractures in 6 patients detected by CXR in comparison with 83 fractures in 39 patients detected by ultrasonography, where 4 of 83 fractures were in costochondral junction and 5 of them were costal fractures in cartilages.

Study Limitations

Different level of experience in performing ultrasonography was one of our study's limitations, which several one-day workshops were held to minimize the dissimilarity.

Low injury severity was another limitation of our study. It is unclear what impact, if any, multiple fractures on the same rib or adjacent ribs would have on the sensitivity of this mode. We also excluded patients with emphysema. Subcutaneous emphysema can lead to a poor sonographic view.

Conclusion

Our study showed that bedside ultrasonography could substitute CXR in detecting not only rib fractures but also related comorbidities. Moreover, higher sensitivity in fractures with less severe trauma makes ultrasonography a valuable screening method in survey of patients injured with minor trauma.

Ethics

Ethics Committee Approval: Iran University of Medical Sceinces, (approval number: 91/D/131/965).

Informed Consent: After approval of ethics committee, we took written consent form from all patients who were enrolled in the study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.G., N.G., Concept: H.A., T.R, S.S.V., Design: H.A., N.G., S.S.V., Data Collection or Processing: A.G., T.R., Analysis or Interpretation: A.G., Literature Search: A.G., M.J.B., Writing: M.J.B.

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References

1. Khandhar SJ, Johnson SB, Calhoon JH. Overview of thoracic trauma in the United States. Thorac Surg Clin. 2007;17:1-9.
2. Eckstein, M, Henderson S. Thoracic Tr. In: Rosen's Emergency Medicine: Concepts and Clinical Practice, 6th edition, Marx, JA, Hockberger, RS, Walls, RM (Eds), Mosby Elsevier, Philadelphia 2006.
3. Love JC, Symes SA. Understanding rib fracture patterns: incomplete and buckle fractures. J Forensic Sci. 2004;49:1153.

4. Shweiki E, Klena J, Wood GC, Indeck M. Assessing the true risk of abdominal solid organ injury in hospitalized rib fracture patients. J Trauma. 2001;48:684.
5. Bergeron E, Lavoie A, Clas D, Moore L, Ratte S, Tetreault S, et al. Elderly trauma patients with rib fractures are at greater risk of death and pneumonia. J Trauma. 2003;54:478.
6. Holcomb JB, McMullin NR, Kozar RA, Lygas MH, Moore FA. Morbidity from rib fractures increases after age 45. J Am Coll Surg. 2003;196:549-55.
7. Brasel KJ, Guse CE, Layde P, Weigelt JA. Rib fractures: Relationship with pneumonia and mortality. Crit Care Med. 2006;34:1642-6.
8. Traub M, Stevenson M, McEvoy S, Briggs G, Lo SK, Leibman S, et al. The use of chest computed tomography versus chest x-ray in patients with major blunt trauma. Injury. 2007;38:43-7.
9. Sirmali M, Turut H, Topcu S, Gülhan E, Yazici U, Kaya S, et al. A comprehensive analysis of traumatic rib fractures: Morbidity, mortality and management. Eur J Cardiothorac Surg. 2003;24:133-8.
10. Bergeron E, Lavoie A, Clas D, Moore L, Ratte S, Tetreault S, et al. Elderly trauma patients with rib fractures are at greater risk of death and pneumonia. J Trauma 2003;54:478-85.
11. Holcomb JB, McMullin NR, Kozar RA, Lygas MH, Moore FA. Morbidity from rib fractures increases after age 45. J Am Coll Surg. 2003;196:549-55.
12. Livingston DH, Shogan B, John P, Lavery RF. CT diagnosis of Rib fractures and the prediction of acute respiratory failure. J Trauma 2008;64:905-11.
13. Holmes JF, Ngyuen H, Jacoby RC, McGahan JP, Bozorgchami H, Wisner DH. Do all patients with left costal margin injuries require radiographic evaluation for intra abdominal injury? Ann Emerg Med. 2005;46:232-6.
14. Hurley ME, Keye GD, Hamilton S. Is ultrasound really helpful in the detection of rib fractures? Injury. 2004;35:562-6.
15. Kara M, Dikmen E, Erdal HH, Simsir I, Kara SA. Disclosure of unnoticed rib fractures with the use of ultraultrasonography in minor blunt chest trauma. Eur J Cardiothorac Surg. 2003;24:608-13.
16. Rainer TH, Griffith JF, Lam E, Lam PK, Metreweli C. Comparison of thoracic ultrasound, clinical acumen, and radiography in patients with minor chest injury. J Trauma. 2004;56:1211-3.
17. Chan SS. Emergency bedside ultrasound for the diagnosis of rib fractures. Am J Emerg. 2009;27:617-20.
18. Reissig A, Copetti R, Kroegel C. Current role of emergency ultrasound of the chest. Crit Care Med. 2011;39:839-45.
19. Paik SH, Chung MJ, Park JS, Goo JM, Im JG. High-resolution ultrasonography of the rib: can fracture and metastasis be differentiated? AJR Am J Roentgenol. 2005;184:969-74.
20. Gupta A, Jamshidi M, Rubin JR. Traumatic first rib fracture: is angiography necessary? A review of 730 cases. Cardiovasc Surg. 1997;5:48-53.
21. Koh DM, Burke S, Davies N, Padley SP. Transthoracic US of the chest: clinical uses and applications. Radiographics. 2002;22:e1.
22. Turk F, Kurt AB, Salgam S. Evaluation by ultrasond of traumatic rib fractures missed by radiography. Emerg Radiol. 2010;17:473-7.
23. Hurley ME, Keye GD, Hamilton S. Is ultrasound realy helpful in the detection of rib fractures?. Int J Care Injured. 2004;35:562-6.
24. Kara M, Dikmen E, Erdal HH, Simsir I, Kara SA. Disclosure of unnoticed rib fracture with the use of ultraultrasonography in minor blunt chest trauma. Eur J Cardiothorac Surg. 2003;24:608-13.
25. Malghem J, Vande Berg BC, Lecouvet FE, Maldague BE. Costal cartilage fracture as revealed on CT and ultrasonography. Ame J of Radilogy. 2001;176:429-32.
26. Griffith JF, Rainer TH, Ching ASC, Law KL, Cocks RA, Metreweli C. Ultrasonography compared with radiography in revealing acute rib fracture. AJR Am J Roentgenol. 1999;173:1603-9.

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The Relationship Between Platelet, Mean Platelet Volume, C-Reactive Protein and Mortality in Ischemic Stroke Patients

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Abstract

Aim: This study aimed to analyze the relationship between platelet, mean platelet volume, C-reactive protein and mortality in ischemic stroke patients who admitted to Okmeydanı Training and Research Hospital Emergency Department with cerebrovascular disease between January 2016 and July 2016. The most common encountered neurological disease is cerebrovascular diseases. Of the cerebrovascular diseases, ischemic stroke has a major importance due to its high mortality and morbidity. Ischemic stroke is the third leading reason of death in the world.

Materials and Methods: This study is a retrospective study and covers 322 patients who admitted to our emergency department with cerebrovascular disease between January 2016 and July 2016.

Results: Patient information system was searched as covering the study period. Information of age, sex, platelet, mean platelet volume and C-reactive protein levels at first admission were recorded. Obtained data were recorded in study form. With our analysis we detected meaningful relation between the higher age, higher C-reactive protein levels and mortality in ischemic stroke patients. Study was performed with 322 patients in Okmeydanı Training and Research Hospital between January 2016 and July 2016. Quantitative data was reported as average ± standard deviation, categorical data was reported as number or percentage. In all statistical analysis $p<0.05$ was accepted as statistically meaningful difference. SPSS 10.0 for Windows was used for statistical analysis.

Conclusion: In our study, we detected meaningful relation between the higher age, higher C-reactive protein levels and mortality in ischemic stroke patients similar to the literature.

Keywords: Stroke, platelet, mean platelet volume, CRP, mortality

Introduction

Stroke is defined by the World Health Organization as a clinical syndrome consisting of rapidly developing clinical signs of focal disturbance of cerebral function due to disturbed cerebral blood flow, lasting more than 24 hours with no apparent cause other than a vascular origin. Ischemic stroke is the most common type of stroke in the whole world (1,2). Eighty-eighty five percent of stroke cases are with ischemic origin and 10-15% of them are hemorrhagic (1).

Acute stroke is still the 3rd most common reason of mortality and morbidity after heart diseases and malignancy (2,3). Furthermore, it causes economic and physicosocial outcomes that affects individuals, families and communities. For this particular reasons, prevention and treatment of stroke is an important public health problem.

Risk factors of ischemic cerebral vascular diseases like diabetes mellitus, hypertension, atrial fibrillation, smoking, coronary artery diseases are well defined by too many international multicentric researches (4 although the risk factors for acute ischemic stroke have been extensively studied, there is no definitive study related to the increased risk when these factors are present together. When we look at patients with ischemic stroke, majority is observed to have multiple chronic diseases and advanced age.

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In recent years, C-reactive protein (CRP) has become established as a risk factor for cerebrovascular disease. Increased levels of CRP relevant to poor prognosis, and it has been suggested that measurement of CRP, in addition to traditional risk factors, may improve our ability to predict ischemic stroke outcome.

In this study we aimed to analyze the relationship between platelet, mean platelet volume, C-reactive protein and mortality in ischemic stroke patients who admitted to Okmeydanı Training and Research Hospital Emergency Department with cerebrovascular disease between January 2016 and July 2016.

Materials and Methods

Patients admitted to Okmeydanı Training and Research Hospital emergency department between January 2016 and July 2016 who has one of the I63, I64, I65, I66, I67, I68, I69 and G46 diagnoses codes according to ICD-10 medical coding system were included in this retrospective study. Approval was obtained from the Institutional Ethics Board before starting the study.

Hospital electronic medical record system and hospital archive files was used to get information about patients' records. All patients older than 16 years of age and diagnosed and coded to ICD-10 system with ischemic stroke are included to study.

Patients with diagnoses of hemorragic infarct were excluded. Also patients with under age of 16 and whose medical follow up records were unabled to observe after discharging from hospital were exculeded.

Under these certain criterias, included patients were grouped according to their age, sex, platelet values, mean platelet volume values and CRP values.

Statistical Analysis

Statistical analysis was performed by using SPSS 22 for Windows (IBM Corp). The normality of distribution was assessed with Shapiro Wilks test. To compare groups, the Mann-Whitney U test was used for analysis of non-parametric continuous variables. The Pearson correlation test was used for the detection of correlation between quantitative variables. Chi square test was used for the detection of correlation between qualitative variables. The cut-off values of parameters were identified using the analysis of receiver operating characteristic (ROC) curves for the differentiation of groups. For all statistical tests performed, $p<0.05$ was considered to be statistically significant.

Results

For the time period of our study retrospectively analyzed data, between the age of 16 and 104, 322 patients were admitted to our emergency department with diagnosis of acute ischemic stroke and included to our study according to inclusion criterias.

One hundred forty (43.5%) of our patients were female and 182 (56.5%) of them were male. Median age value calculated as 70 and mean value was 66.6±15.1. Median platelet value was 288.000 and 87% of patients' platelet results were recorded as normal, 5.6% as low and 7.4% as high. Mean platelet volume recorded as normal with 97.5% of all patients and as high with 2.5% of them. 50.6% of CRP value were high and 49.4% of them were normal (Table 1).

Patients ended up with exitus were significantly older than alive patients group ($p<0.05$). Median age value of alive patients group was 67 and exitus patients group was 77.5.

There were no significant relationship between exitus and alive patients group according to their gender. Forty three point eight percent of alive patients group were female and 56.3% of them were male. Forty one point two percent 41.2% of exitus patients group were female and 58.8% of them were male (Table 2).

There is no significant diffirence of platelet and mean platelet volume values between exitus and alive patients groups (Table 3, 4).

Exitus patients group had significantly higher values of C-reactive protein than alive patients group ($p<0.05$). Alive group had a median CRP values of 5.5 and exitus group had 14.7. Seventy three point five percent of exitus patients C-reactive protein values were recorded as high (Table 5).

Discussion

Age is the most important risk factor of all. Incidence of stroke increases twice for every decade after the age of 55. Risk of stroke increases by the patients age. In several studies mean value of stroke patients ages were analyzed. It is found 70±11 by Yoneda et al. (5), 65.3±8.2 by Reganon et al. (6), 64±3 by Williams et al. (7), 63.5±13.6 by Hakbilir et al. (8), and 68.6±14.6 by Gürger at al. (9) Our study supported these numbers with mean age value of 66.6±15.1.

A study made by Bonita et al. (10) showed that mortality rates of stroke are higher in males than females and females had better prognosis than males. A study made by Redfors et al., (11) pointed that male patients are significantly more likely to have stroke than females. Besides these studies McCullough et al. (12) found that older female stroke patients had higher mortality and morbidity than males due to decreased hormon levels. In our study we had 56.5% of male and 43.5% of female patients coherent with literature. It had no significant difference between gender in our study.

Table 1. Relationship between age, C-reactive protein, platelet, mean platelet volume, gender and ischemic stroke

		Minimum-Maximum			Median	Mean ± SD/n-%		
Age		16.0	-	104.0	70	68.0	±	14.4
Age	16-30					5		1.1%
	31-45					34		7.6%
	46-60					74		16.5%
	61-75					183		40.8%
	76-90					146		32.6%
	>90					6		1.3%
Gender	Female					209		46.7%
	Male					239		53.3%
PLT		27.0	-	887.0	238	252.9	±	87.4
PLT	Low					25		5.6%
	Normal					393		87.7%
	High					31		6.8%
MPV		8.7	-	13.4	10.4	10.5	±	1.0
MPV	Normal					440		98.2%
	High					7		1.5%
CRP		0.2	-	377.9	6.8	18.4	±	36.8
CRP	Normal					203		45.2%
	High					245		54.7%

CRP: C-reactive protein, PLT: Platelet, MPV: Mean platelet volume, SD: Standard deviation

Table 2. Relationship between age, gender and mortality

		Alive				Exitus				p	
		Mean ± SD/n-%			Median	Mean ± SD/n%			Median		
Age		67.3	±	14.4	70.0	76.3	±	10.9	77.5	**0.000**	m
Age	16-30	5		1.2%		0		0.0%			
	31-45	33		8.0%		1		2.9%			
	56-60	73		17.6%		1		2.9%			
	61-75	175		42.3%		8		23.5%			
	76-90	124		30.0%		22		64.7%			
	>90	4		1.0%		2		5.9%			
Gender	Female	195		47.1%		14		41.2%		0.506	X^2
	Male	219		52.9%		20		58.8%			

SD: Standard deviation

Table 3. Relationship between platelet and mortality

		Alive				Exitus				p	
		Mean ± SD/n-%			Median	Mean ± SD/n-%			Median		
PLT		252.9	±	78.5	241,0	252.5	±	139.6	214.0	0.108	m
PLT	Low	22		5.4%		3		8.8%			
	Normal	364		87.9%		29		85.3%			
	High	29		6.9%		2		5.9%			

PLT: Platalet, SD: Standard deviation

Table 4. Relationship between mean platelet volume and mortality

		Alive				Exitus				p	
		Mean ± SD/n-%			Median	Mean ± SD/n-%			Median		
MPV		10.5	±	1.0	10.4	10.7	±	1.0	10.5	0.276	m
MPV	Normal	409		98.8%		31		91.2%			
	High	5		1.2%		2		5.9%			

SD: Standard deviation, MPV: Mean platelet volume

Table 5. Relationship between C-reactive protein and mortality

		Alive				Exitus				p	
		Mean ± SD/n-%			Median	Mean ± SD/n-%			Median		
CRP		16.6	±	31.0	5.5	32.0	±	65.3	14.7	**0.008**	m
CRP	Normal	194		46.8%		9		26.5%			
	High	220		53.1%		25		73.5%			

SD: Standard deviation, CRP: C-reactive protein

According to a study made by Korsakova et al., (13) age is a particular risk factor for long term survival after stroke. In our study exitus patients group were significantly ($p<0.05$) older than alive patients group smilar to study mentioned above.

We analyzed that C-reactive protein values of exitus patients group were significantly ($p<0.05$) higher than alive patients group like the study made by Irene et al. (14) and considered C-reactive protein levels as a deterministic factor of prognosis. Furthermore, our results of study were similar with the study made by Arıkanoğlu and Yücel (15) and analyzed the relationship between mortality and C-reactive protein levels in ischemic stroke patients.

Although Arevalo-Lorido et al. (16) found that mean platelet volume levels are related with mortality in ischemic stroke patients, in our study we found no significant relationship between mortality and mean platelet volume levels. But we have to notice that in study mentioned above mortality analyzed in a period of 12 months but we only analyzed mortality occured in 3 months after discharcing from hospital. So differences of time periods might effect the results.

In our study, we found no relationship between platelet levels and mortality. This result conflicts with the study made by Furlan and FANG (17) that shows significant relationship between platelet levels and mortality in ischemic stroke patients.

Study Limitations

The limitations of this study were in common with other prognosis and mortality based studies. Difficulity to have clinical follow up records of patients have limited our study.

Conclusion

Our study showed significant relationship between age and incidence of ischemic stroke and mortality.

There is no relationship between platelet and mean platelet volume levels and mortality.

It is important that we found significant relationship between C-reactive protein levels and mortality similar to literature, due to contributions to common approach on ischemic stroke patients. But in our study analyzed results of mean platelet volume and platelet levels were conflicted with similar studies. Further studies need to be made analyzing relationship between mortality and platelet and mean platelet volume levels.

We strongly suggest that patients admitted to emergency department and diagnosed as ischemic stroke and who have higher values of C-reactive protein and age, should be evaluated carefully and consider transferring to proper stroke centre due to higher rates of mortality according to these factors.

Ethics

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of İstanbul Okmeydanı Training and Research Hospital (25.10.2016, decision no: 531).

Informed Consent: Informed consent is not necessary due to the retrospective nature of this study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: A.D., M.A.Ç., Design: A.D., M.A.Ç., Data Collection or Processing: A.D., M.A.Ç., Analysis or Interpretation: A.D., M.A.Ç., Literature Search: A.D., M.A.Ç., Writing: A.D., M.A.Ç.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Lewandowski C, Barsan W. Treatment of acute ischemic stroke. Ann Emerg Med. 2001;37:202-16.
2. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ. Global and regional burden of disease a n d risk factors, 2001: systematic analysis of population health data. Lancet. 2006;367:1747-57.
3. Onat A, Keleş İ, Çetinkaya A. On Yıllık TEKHARF Çalışması Verilerine Göre Türk Erişkinlerinde Koroner Kökenli Ölüm ve Olayların Prevalansı Yüksek. Türk Kardiyol Dern Arş. 2001;29:8-19.
4. Bos MJ, Koudstaal PJ, Hofman A, Ikram MA. Modifiable etiological factors and the burden of stroke from the rottedam study: a population-based cohort study. 2014;11:e1001634.
5. Yoneda Y, Okuda S, Hamada R, Toyota A, Gotoh J, Watanabe M, et al. Hospital cost of ischemic stroke and intracerebral hemorrhage in Japanese stroke centers. Health Policy. 2005;73:202-11.
6. Reganon E, Vila V, Martínez-Sales V, Vaya A, Lago A, Alonso P, et al. Association between inflammation and hemostatic markers in atherothrombotic stroke. Thromb Res. 2003;112:217-21.
7. Williams LS, Bruno A, Rouch D, Marriott DJ. Stroke patients' knowledge of stroke. Influence on time to presentation. Stroke. 1997;28:912-5.
8. Hakbilir O, Çete Y, Göksu E, Akyol C, Kılıçaslan İ. İnme Popülasyonun Demografik Özellikleri ve Geç Acil Servis Başvurularının Yeni Tedavi Yaklaşımları Üzerine Etkisi. Turk J Emerg Med. 2006;6:132-8.
9. Gürger M, Bozdemir MN, Yıldız M, Gürger M, Özden M, Bozgey Z, et al. Acil Servise İskemik İnme Nedeniyle Başvuran Hastalarda Hastane İçi Mortalitenin Belirlenmesinde Kardiyak Belirteçlerin Rolü. Turk J Emerg Med. 2008;8:59-66.
10. Bonita R, Stewart A, Beaglehole R: International Trends in Stroke Mortality 1970-1985. Stroke. 1990;21:989-92.
11. Redfors P, Isaksen D, Lappas G, Blomstrand C, Rosengren, Jood K, et al. Living alone predicts mortality in patients with ischemic stroke before 70 years of age: a long-term prospective follow-up study. BMC Neurology. 2016;16:80.
12. McCullough LD, Mirza MA, Xu Y, Bentivegna K, Steffens EB, Ritzel R, et al. Stroke sensitivity in the aged: sex chromosome complement vs. gonadal hormones. AGING. 2016;8:1432-41.
13. Korsakova SS, Kryuchkov DV, Pavlova SV, Artamonova GV. Long-term survival in working-age patients after cerebrovascular accident. Europe PMC. 2016;116:36-42.
14. Irene M, M. Moniek de Maat. C-reactive protein predicts progression of atherosclerosis measured at various sites in the arterial tree. Stroke. 2002;33:2750-5.
15. Arıkanoğlu A, Yücel Y. The relationship of the mean platelet volume and C-reactive protein levels with mortality in ischemic stroke patients. European Review for Medical and Pharmacological Sciences. 2013;17:1774-7.
16. Arevalo-Lorido JC, Carretero-Gomez J, Álvarez-Oliva A, Gutiérrez-Montaño C, Fernández-Recio JM, Najarro-Díez F. Mean Platelet Volume in Acute Phase of Ischemic Stroke, as Predictor of Mortality and Functional Outcome after 1 Year. J Stroke Cerebrovasc Dis. 2013;22:297-303.
17. Furlan J, Fang J. Does Abnormal Blood Platelet Count Influence Mortality, Impairment and Disability After Acute Ischemic Stroke? Official Journal of the American Academy of Neurology. 2014;82;1141.

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The Vulnerability of Syrian Immigrant Pediatric Trauma Patients

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Abstract

Aim: Worldwide, 22.5 million refugees, half of them children, is a major humanity problem. Refugee children are among the most vulnerable in the world. Recently, we observed an increase in pediatric trauma cases of Syrian immigrant in our hospital. To determine the clinical characteristics of Syrian immigrant children admitted to the emergency department (ED) with trauma with respect to their frequency, socio-demographic characteristics such as living conditions, education of family, not to go to kinder-garden and corresponding high-risk injury.

Materials and Methods: This is a retrospective observational study. All records for children aged between 0-17 years were retrospectively evaluated and only patients admitted to the ED with trauma were included in the study. The data of interest investigated from patient records were age, sex, location, and timing of injury occurrence, as well as the family and education data of parents. The mechanisms of injuries were recorded as blunt or penetrating.

Results: Totally 200 children with a mean age of 8.29±4.85 years (range: 1-17 years) were included in the study. Falloffs were the most common cause in all age groups. Head injuries were more common compared with the extremities (82 head traumas compared with 60 upper and 32 lower extremity traumas). On the other hand, upper extremity fractures or dislocations were more common compared with the lower extremities (21 vs 3 cases). Interestingly, in this study, among 200 children included, 51 (25.5%) were Syrian immigrants. The mean age of Syrian immigrants was younger than that of Turkish children (p=0.002).

Conclusion: In that study, we have determined approximately one-quarter of the children with trauma are Syrian immigrants. Children between the ages of 1-3 years and 6-9 years, and boys were at a higher risk. Syrian immigrants cannot deal with their children enough because of living difficulties for them in Turkey. The living and educational conditions of the Syrian immigrant children who escaped from the war and took refuge should be made better and the sensitivity of the families should be increased. Kinder-garden education highly protects children from house accident so it is necessary especially for Syrian immigrant children.

Keywords: Syrian immigrant, pediatric trauma, emergency department, falls

Introduction

Trauma is the leading cause of disability and mortality among children admitted to the emergency departments (EDs). Unfortunately, in developed countries, trauma is accounting for approximately 1/3 of all deaths in children (1,2). Prompt diagnosis and treatment in ED is warranted for accomplished outcomes; but defining risk factors is also essential to prevent the undesirable outcomes of trauma among children.

The purpose of this study was to determine the clinical characteristics of Syrian immigrant children admitted to the ED with trauma with respect to their frequency, socio-demographic characteristics such as living conditions, education of family, not to going to go to kinder-garden and corresponding high-risk injury.

Materials and Methods

All records for children aged between 0-17 years who were admitted to the Konya Training and Research Hospital, Emergency

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Department, Konya, Turkey between May 2014 and May 2015 were retrospectively evaluated. Only patients admitted to the emergency department with trauma were included in the study. The study was approved by the local ethics committee.

The data of interest investigated from patient records were age, sex, location and timing of injury occurrence, as well as the family and education data of parents. The mechanisms of injuries were recorded as blunt or penetrating. Due to the very common nature, blunt injuries were also subdivided as motor vehicle related and non-motor vehicle related (bicycle, fall offs, sports-related, animal-related, and struck by person or object).

Statistical Analysis

Statistical analyses were performed using SPSS software (version 21.0, Chicago, IL, USA). Descriptive statistics are used and the data is expressed as numbers and percentages. A p value <0.05 was deemed statistically significant.

Results

Totally 200 children with a mean age of 8.29±4.85 years (range: 1-17 years) were included in the study. Among those 200 children 143 (71.5%) were boys and 57 (28.5%) were girls. The boys/girls ratio was 2.5. When the patients were sub grouped according to their ages; 63 (31.5%) were in 0-5 years of age group; 64 (32%) were between 6-10 years of age; 73 (30.5%) were older than 10 years of age. Maximum number of patients were at 1 year of age (n=19, 9.5%) group; followed by 16 cases in 3 years and 16 cases in 8 years of age and then 2 and 6 years of ages. In Figure 1 the distribution of different ages are shown.

The mechanisms of trauma are summarized in Table 1 and the falls (68%) were the most common cause in all age groups.

Table 1. Mechanisms of traumas in different age groups

	0-5 years (n=63)	6-10 years (n=64)	≥11 years (n=73)
Penetrating injury	1	4	4
Blunt injuris			
Motor vehicle related	2	4	2
Non-motor vehicle related			
Bicycle	2	3	4
Falls			
off building	11	11	13
off playground equipment	34	23	27
off tree	0	6	6
others (bed, or armchair)	3	2	0
Sports related	2	4	10
Animal related	2	5	3
Shattered	6	2	4

Penetrating or sports related injuries were more common in older ages while falls from playground equipment were more commonly reported in younger ages, as expected.

When the seasons of traumas were evaluated; 67 (33.5%) were in spring, 47 (23.5%) were in summer, 7 (3.5%) were in autumn, and 79 (39.5%) were in winter. Interestingly, accidents in autumn were reported very rarely compared with the other seasons.

The educational level and working history of parents were also evaluated. The educational levels of mothers were as follows: 158 mothers were graduated from mid-school: while 24 were from high school: and 18 were graduated from university. On the other hand, 136 fathers were graduated from mid-school: while 35 were from high school: and 29 were graduated from university. A great proportion of mothers (n=169, 84.5%) were housewives. The other jobs reported among mothers were nurse (n=4), teacher (n=12), tailor (n=5), employee (n=4), worker (n=3), architect (n=2) and cook (n=1). On the other hand among fathers, tradesmen (n=55), workers (n=54), employees (n=39), drivers (n=19), teachers (n=13), doctors (n=7), farmers(n=6), policemen (n=4) and soldiers (n=3) were present. Interestingly, only 31 (15.5%) of the children had had the kindergarten education. Remaining 169 children did not get the kindergarten education.

The numbers of children living in the same house are summarized in Figure 2 and 2 or 3 children were the most common ones. On the other hand, the numbers of people living in the same house are shown in Figure 3. Eighty-one of the included families were owners of their houses while remaining 119 were tenant. Smoking history was present in 13 mothers and 130 fathers. Drinking habit was not reported in any parents.

Imaging techniques were required in many of the cases to define the exact pathology. Acute pathology was not present in physical examination and imaging techniques were not required in 35 cases. In remaining 165 cases;

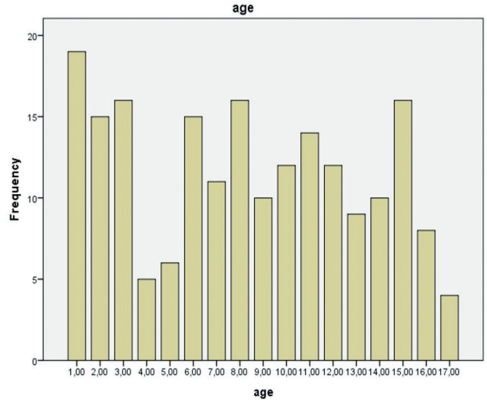

Figure 1. The distribution of different ages

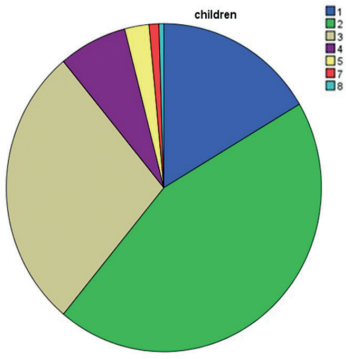

Figure 2. The Numbers of children living in the same house are summarized

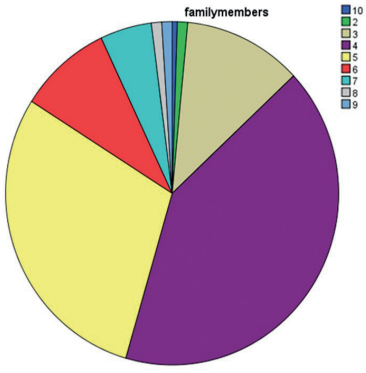

Figure 3. The Numbers of people living in the same house are shown. Purple area is more than 6 people without children

Table 2. Comparison of Syrian emigrants with Turkish children

	Syrian emigrants (n=51)	Turkish children (n=149)	p
Age (years)	6.47±4.78	8.93±4.72	0.002
Gender (female, %)	12 (23.5%)	45 (30.2%)	0.47
Kindergarten education	7 (13.7%)	23 (15.4%)	0.70
Children living at same house	4.45±1.45	2.45±1.14	0.01
Falls as the trauma cause	37 (72.5%)	99 (66.4%)	0.29
Head injury	23 (45.1%)	59 (39.6%)	0.43

- Lower extremity radiographs were required in 32 cases; 29 were normal; foreign material (needle) on left foot was determined in 1 case, fracture on metatarsals was determined in 2 cases;
- Upper extremity radiographs were required in 60 cases; 39 were normal, there was a fracture on humerus distal end in 1 case, fracture in radius distal in 9 cases, dislocation was present on right elbow in 1 case, fracture on scaphoid was present in 1 case, fracture on left elbow in 1 case, metacarpal or phalangeal fractures in 6 cases, fracture on humerus in 2 cases;
- Fracture on pelvis was determined on X-ray in 1 case, pelvis X-ray was normal in 2 cases,
- Abdominal ultrasound was required in 3 cases and all of them were normal,
- Hemorrhage on parotid gland was determined by ultrasound in 1 case,
- Brain computed tomography (CT) was required in 59 cases; 56 were normal, in 2 cases linear fracture was determined in frontal bone, and nasal fracture was present in 1 case;
- Cervical and thoracic CT was required in 1 case and it was normal;
- Abdominal CT was required in 2 cases; 2 were normal;
- Fracture was present in clavicle in 3 cases determined by X-ray,
- Maxillo-facial CT was required and normal in 1 case,
- Hemothorax or pneumothorax was determined in 2 cases with X-ray.

Head injuries were more common compared with the extremities (82 head traumas compared with 60 upper and 32 lower extremity traumas). On the other hand, upper extremity fractures or dislocations were more common compared with the lower extremities (21 vs 3 cases).

Interestingly, in this study, among 200 children included, 51 (25.5%) were Syrian immigrants. The comparison of Syrian immigrants with Turkish children is summarized in Table 2. The mean age of Syrian immigrants was younger than that of Turkish children (p=0.002) and the number of children living at the same house was statistically significantly higher in Syrian group (p=0.001).

Our study is the first study that aimed to draw attentions to the Syrian immigrant children who exposed to house accidents because of the living conditions while escaping from the war.

Discussion

In this study, we have evaluated the children admitted to the emergency department with trauma and the results are off importance for public health in terms of primary and secondary preventions. We have determined that; traumas were more common among children at the ages of 1-3 years and 6-9 years; a great proportion of mothers were housewives; while boys and the children who did not get the kindergarten education were under higher risk. The educational level of parents of trauma patients was not high but interestingly the families were not very crowded in many families. The most common types of traumas were falls in all age groups and upper extremities were affected

more commonly compared with the lower extremities. On the other hand, interestingly, among 200 children, 25.5% were Syrian immigrants. The mean age of Syrian immigrants was younger than that of Turkish children. To the best of our knowledge, this is the first study reporting the condition of Syrian immigrants in Turkey concerning the pediatric trauma cases.

Head injuries were more common compared with the other parts of the body in our study. But fortunately, the majority of patients with head trauma had a minor injury that required no specific therapy, with normal findings in imaging techniques. Kim et al. (3) reported the epidemiological data of traumatic head injury among Korean children and reported that the average age of the subjects was 5.6±4.9 years old, and 55.5% of them were 0-4 years old with a male-to-female ratio of 2.3 to 1. They reported the most common type of injury as collision. In our study; the male-to-female ratio was approximately equal to that ratio in all trauma patients but the mean age of the participants was higher (3). Alyafei et al. (4) aimed to describe the epidemiology and outcome of the traumatic injuries among children in Qatar and reported that the mean age of the trauma patients was 9.6±5.9 years and 83% of pediatric admissions due to trauma were male. They defined the most common type of injuries as for 0-4 years, motor vehicle or non-motor vehicle related injuries for patients older than 5 years of age (4). In a recent review of Brussoni et al. (5) it was emphasized that societal and familial gender role expectations shape boys' and girls' behaviors and parents are more likely to encourage boys to engage in risk taking behaviors. They also defined that gendered aspects of parenting practices have been associated with greater exploratory and less restrictive behaviors among boys than among girls, which may be a reason for such a great distribution difference between genders among trauma patients (5).

The growth plates, stronger periosteum, and dynamic state of growth makes the orthopedic injuries in children unique compared to those of adults (6). Upper extremities were more vulnerable to the trauma and the injuries in effected part of the body reported after trauma were also more common in upper extremities. In another study from our country, investigating the characteristics of pediatric patients exposed to road traffic accidents; the most commonly effected body parts was reported as head and neck similar with our study but in that study lower extremities were more effected than the upper ones (7).

We have determined that most common cause of trauma was the falls. Similarly, Snyder at al. (8) retrospectively studied on 5547 pediatric patients and reported the most common mechanisms of injury as falls (39%). Motor vehicle related, sports or animal related traumas were also very low compared with falls.

With short scan time, high quality of images, and availability, computed tomography is the imaging modality of choice for the management of major traumas in many centers (9,10). However its high cost and ionizing radiation used on CT that is potentially harmful especially for children are the main handicaps of CT (11). Recently, Muhm et al. (12) reported that; among 71 children admitted to the emergency department due to a trauma; 67.6% received a cranial scan and only one third of the children had had relevant trauma related findings in the CT scan. In our study CT scan was obtained in 63 (31.5%) cases and revealed pathology in only 3 of them. However, when patients with head trauma are evaluated, separately, CT scan was obtained in 59 (71.9%) of 82 head trauma patients. This high ratio may be associated with the small age of children since the history or physical examination may not be satisfactory for the emergency department clinicians. Recently, Glass et al. (13) reported that 53% of children with sports related head injury received CT in ED and only 4% had a traumatic brain injury on CT in a multicenter study. In order to reduce radiation exposure but preserve the advantages of CT, clinicians should take the child's clinical findings more into account before taking a CT scan.

To the best of our knowledge, this is the first and only study reporting the condition of Syrian immigrants in Turkey concerning the pediatric trauma cases. The mean age of immigrants was younger than that of Turkish children. But there was not any statistically significant difference between immigrants and Turkish children regarding the gender, kindergarten education history, trauma cause or presence of head injury. Since the number of children living at the same house was significantly higher in immigrant group, it can be suggested that, young immigrant children cannot protect themselves in crowded houses.

This is a retrospective, descriptive study and the low number of study participants is the main limitation of this study. The other limitation of this study is the lack of data about the outcomes of patients, since outcomes may be of important to define the priority among patients admitted to the ED.

Conclusion

In conclusion, we have determined that the educational level of parents and children, in the meaning of kindergarten education, was not very high among trauma patients younger than 17 years of age. Children between the ages of 1-3 years and 6-9 years, and boys were at a higher risk. Though the most common side was the head, upper extremities were affected more commonly than the lower extremities. Among 200 children, 25.5% were Syrian immigrants and the mean age of Syrian immigrants was younger than that of Turkish children. Syrian immigrants can not to deal

with their children enough because of living difficulties for them in Turkey. The living and educational conditions of the Syrian immigrant children who escaped from the war and took refuge should be made better and the sensitivity of the families should be increased. Kinder-garden education highly protects children from house accident so it is necessary especially for Syrian immigrant children.

Ethics

Ethics Committee Approval: Konya Training and Research Hospital.

Informed Consent: Retrospective study.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Concept: D.A., M.G., E.F.V., Design: D.A., M.G., E.F.V., Data Collection or Processing: D.A., M.G., E.F.V., Analysis or Interpretation: D.A., M.G., E.F.V., Literature Search: D.A., M.G., E.F.V., Writing: D.A., M.G., E.F.V.

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References

1. National Center for Injury Prevention and Control. Web-based injury statistics query and reporting system. Available at http://webappa.cdc.gov/sasweb/ncipc/leadcaus10.html.
2. Bayreuther J, Wagener S, Woodford M, Edwards A, Lecky F, Bouamra O, et al. Pediatric trauma: injury pattern and mortality in the UK. Arch Dis Child Educ Pract Ed. 2009;94:37-41.
3. Kim HB, Kim do K, Kwak YH, Shin SD, Song KJ, Lee SC, et al. Epidemiology of traumatic head injury in Korean children. J Korean Med Sci. 2012;4:437-42.
4. Alyafei KA, Toaimah F, El Menyar A, Al Thani H, Youssef B, Mollazehi M, et al. Analysis of pediatric trauma data from a hospital based trauma registry in Qatar. Int J CritIllnInj Sci. 2015;1:21-6.
5. Brussoni M, Gibbons R, Gray C, Ishikawa T, Sandseter EB, Bienenstock A, et al. What is the Relationship between Risky Outdoor Play and Health in Children? A Systematic Review. Int J Environ Res Public Health. 2015;12:6423-54.
6. Thornton MD, Della-Giustina K, Aronson PL. Emergency department evaluation and treatment of pediatric orthopedic injuries. Emerg Med Clin North Am. 2015;33:423-49.
7. Serinken M, Ozen M. Characteristics of injuries due to traffic accidents in the pediatric age group. Ulus Travma Acil Cerrahi Derg. 2011;17:243-7.
8. Snyder CW, Muensterer OJ, Sacco F, Safford SD. Paediatric trauma on the Last Frontier: an 11-year review of injury mechanisms, high-risk injury patterns and outcomes in Alaskan children. Int J Circumpolar Health. 2014;73:25066.
9. Larson DB, Johnson LW, Schnell BM, Goske MJ, Salisbury SR, Forman HP. Rising use of CT in child visits to the emergency department in the United States 1995-2008. Radiology. 2011;259:793-801.
10. Roudsari B, Moore DS, Jarvik JG. Trend in the utilization of CT for adolescents admitted to an adult level I trauma center. J Am CollRadiol. 2010;7:796-801.
11. Mueller DL, Hatab M, Al-Senan R, Cohn SM, Corneille MG, Dent DL, et al. Pediatric radiation exposure during the initial evaluation for blunt trauma. J Trauma. 2011;70:724-31.
12. Muhm M, Danko T, Henzler T, Luiz T, Winkler H, Ruffing T. Pediatric trauma care with computed tomography-criteria for CT scanning. Emerg Radiol. 2015;22:613-21
13. Glass T, Ruddy RM, Alpern ER, Gorelick M, Callahan J, Lee L, et al. Pediatric Emergency Care Applied Research Network (PECARN Traumatic brain injuries and computed tomography use in pediatric sports participants.). Am J Emerg Med. 2015;33:1458-64.

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A Randomized Double-Blind Study: Evulation of Comparing Intravenous Fentanyl with Intravenous Tramadol Administered to Patients with Pain Control Due to Urinary Stone Disease

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Abstract

Aim: The aim of our study is to compare the efficiency of fentanyl and tramadol as analgesics in renal colic patients.

Materials and Methods: Our research is a prospective, randomized, double-blind study. We administered intravenous (i.v.) non-steroid anti-inflammatory drugs as first line treatment. Then, "i.v. fentanyl" and "i.v. tramadol" were administered to the patients whose pain did not relieve. The outcomes of the analgesic efficacy in our study were the difference between VAS 0-VAS 60 values and the score less than 4 in VAS 60.

Results: A total of 912 renal colic patients were admitted during the study period. When the exclusion criteria were applied, the study was completed with 143 patients. The difference between VAS 0 and VAS 60 values-which is the primary outcome in the evaluation of analgesic efficiency in our study is 6.11±2.49 in fentanyl and 5.94±2.40 in tramadol group. While 16 patients responded to the treatment in the fentanyl group, 18 patients responded to the treatment in the tramadol group.

Conclusion: Our study concluded that both drugs are effective on renal colic pain and they do not have a significant advantage over each other.

Keywords: Renal colic, fentanyl, tramadol

Introduction

Pain is a global public health problem and is the most common cause of admission to the hospital. If the pain cannot be managed properly, it causes medical complications, chronic pain development and low patient satisfaction. Pain management is still a challenge for healthcare professionals today. These difficulties include the problems associated with the interaction of drugs, side effects and addiction to some drugs. Therefore, maximum care should be taken in pain management (1).

Acute flank pain is a common and complex clinical problem that most frequently caused by urolithiasis and also can be caused by urinary and extra-urinary anomalies (2). Renal colic is usually defined as acute pain in the flank due to the passing of a stone through the ureter.

Acute renal colic is a pain that starts in the flank and spreads to the groin. Renal colic is often accompanied with microscopic hematuria (85% of patients), nausea, vomiting and costovertebral angle tenderness (3). Acute renal colic can be described as a common disorder. The prevalence of kidney stone has roughly tripled in the last 10 years (4).

It is estimated that the risk of stone formation (lithiasis) in an individual is 5 to 10%. The recurrence rate was reported to be 50% in 5 years and 80-90% in 10 years after a kidney stone was formed. People who suffer from kidney stone are more likely to have urinary metabolic abnormalities compared to healthy population

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(level of evidence III/C). Patients who have recurrent kidney stones tend to have more significant metabolic abnormalities (5).

Kidney stone (nephrolithiasis) disease is 2-3 times more common in men - It is also more common in adults than in the elderly and prevalence in children is the least. Renal colic pain is often defined as the worst pain experienced by patients (3).

There are several diagnostic methods in the diagnosis of acute flank pain. Among these methods, intravenous (i.v.) urography is no longer preferred because of the low diagnostic value of kidney stone detection, the use of contrast agent, the risk of anaphylaxis and the need for bowel preparation. Another method used in the diagnosis of acute flank pain is ultrasonography. Ultrasonography is not a definitive diagnostic method because it is dependent on the observer and does not recognize some types of kidney stones. In the evaluation of acute flank pain, non-contrast spiral computed tomography (CT) is the method of choice imaging modality with its high sensitivity and specificity. Non-contrast spiral CT has become the method of choice imaging modality in the evaluation of acute flank pain as it identifies ureteral stones with a sensitivity and specificity from 98% to 100% regardless of size, location and chemical composition. It also describes extraurinary causes, which accounts for about one third of flank pain, and also, no contrast is used and the procedure can be completed in as short as 5 minutes (2).

Approximately 60% of the patients with renal colic have severe pain. One of the goals of emergency management related to this disease is to control pain until the obstruction is corrected by spontaneous passage or surgical manipulation (6). Non-steroid anti-inflammatory drugs (NSAIDs) and opioids are often used for analgesia in the treatment of renal colic. Both of them were shown to reduce pain significantly (7).

Acute renal colic should be treated with a NSAID as first-line therapy. If there is insufficient response, an opioid drug should be used for acute second-line treatment. Once the acute pain is alleviated, treatment with an NSAID should be continued (4,8-10).

Some sources suggest both the use of opioids and NSAIDs alone and also in combination with each other for acute renal colic treatment (11). The most important factors that determine the first choice analgesic are: safety, efficacy and cost, suitability, institutional culture and in addition, patient and clinician preferences (9,11).

Renal colic affects approximately 1.2 million people each year and accounts for 1% of all emergency room admissions and 1% of all hospital admissions. On average, emergency physicians treat at least one patient with acute renal colic each day. Often, the emergency physician is the first person to see and evaluate these patients. Emergency physicians should make the correct diagnosis in patients with acute flank pain, give correct treatment to them and guide the patient correctly (12).

Accordingly, our study is planned to guide the physicians to provide the right treatment for the renal colic patients in the emergency department. Pethidine is now abandoned due to its side effect profile. Fentanyl or tramadol has been frequently used as narcotic analgesics in renal colic patients (10,13). The aim of our study is to compare the efficiency of fentanyl and tramadol as analgesics in renal colic patients.

Materials and Methods

Study Design

This is a randomized double-blind study, comparing i.v. fentanyl with i.v. tramadol administered to patients with moderate and severe pain due to renal colic. This study was carried out between 03/01/2018 and 10/31/2018 at Atatürk University Research Hospital, the major hospital of the eastern Anatolia region, on patients admitted to the emergency department. Our study is conducted in accordance with "Good Clinical Practice" standards and approved by the ethics committee before it started. Written informed consent was obtained from all patients before enrollment.

Patients

Patients between the ages of 18-70 were accepted as candidates for the study. The patient selection of our study was based on the work of Sanchez-Carpena et al. (6). According to this study, pain starting from the flank region and spreading to the lateral and genital region, hematuria and kidney stones seen on radiography (X-ray) are determined as the inclusion criteria.

Since renal colic pain is severe and unbearable, study protocols were applied before the laboratory and imaging procedures were performed as in the method applied by Sanchez-Carpena et al. (6). Patients without renal colic were excluded from the study. NSAIDs were applied to all patients as suggested by the literature. Afterwards, patients who needed analgesia were divided into two groups. One group of patients received fentanyl and the other group received tramadol.

The definitive diagnosis of renal colic is determined as the presence of kidney stones in non-contrast spiral abdominal tomography. VAS scores at the time of presentation are recorded for all patients included in the study. Fifty mg of dexketoprofen i.v. (Ufsa Pharmaceutical Industry and Trade Inc.) in 100 cc saline solution was given to patients who agreed to participate in our study, as first-line treatment (14,15).

Thirty minutes after the first-line treatment, additional analgesia requirement was considered. The rescue medication is planned to be applied earlier when the pain worsens during the first 30 minutes, or if the patient demanded. The VAS score of the patients was asked again 30 minutes after NSAID administration and patients with VAS score 6 and above were given the study drug in 5 minutes in 100 cc isotonic solution via i.v. route. The study drugs, fentanil 1.5 mcg/kg (Johnson & Johnson Medical Supplies Industry and Trade Limited Company) (7) and tramadol (Abdi İbrahim Pharmaceutical Industry and Trade Inc.) were administered for 5 minutes in 100 cc saline solution.

During the study period, 912 patients were admitted to our emergency department with a complaint of renal colic. Five hundred forty-four of these patients did not agree to participate in the study. Six patients were excluded from the study depending on the initial VAS score as <6 and 101 patients were excluded from the study due to exclusion criteria. The remaining 261 patients were treated with i.v. NSAID. Hundred of these patients were excluded from the study because of the decrease in pain with NSAIDs (VAS <6) and 18 patients were excluded from the study because they were diagnosed as non-renal colic and our study was completed with 143 patients (Figure 1).

Exclusion criteria were as follows:

- Complicated renal colic,
- Uretero-nephrosis,
- Pyelonephritis,
- General contraindication of NSAID drug use (such as active peptic ulcer),
- Using NSAIDs within 6 hours before application to the emergency department,
- Acute or chronic renal failure,
- Chronic lung disease,
- Heart disease,
- Chronic liver disease,
- Pregnancy or breastfeeding,
- Use of alcohol,
- The presence of bleeding disorder,
- Cognitive impairment or psychiatric illness,
- Cancer patients,
- History of mono amino oxidase inhibitor drugs taken within the last 2 weeks,
- Allergy to opiates,
- Patients who were previously enrolled in the study were not included in the study in their recurrent admissions.

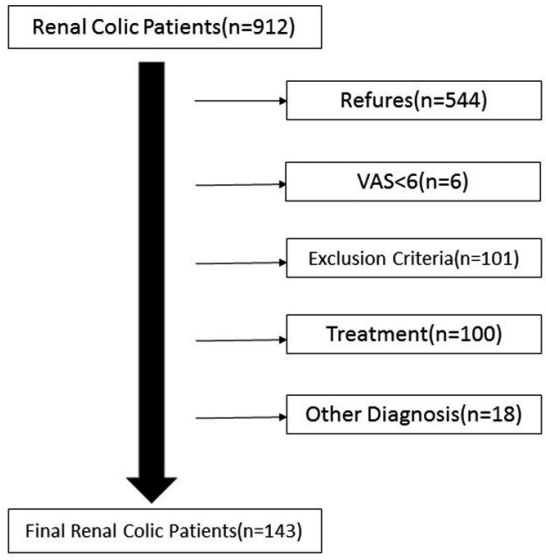

Figure 1. Patient selection scheme for the study

Prior to the study, physicians and nurses were given training about our research. Random separation software was used to determine which patients would be in each group. Gender was not taken into account during randomization because it was not a factor that could affect patients' response to treatment. Patients were included in the study according to the randomization table. Enclosed envelopes, stating which treatment the patient will receive, were prepared by a physician who did not know what treatment to take for each patient number. The drugs to be administered were prepared and packaged by a physician in advance, who did not know the research. The drugs were applied in accordance with the randomization table prepared by the nurse participating in the study. The nurse participating in the study did not know the content of the treatment. The physician who ordered the treatment did not know which drug was applied to the patient too. By this way, the study was provided to be double-blinded. An emergency medicine specialist was responsible for collecting data who was also blind to the study. Patients were not given any medication other than rescue therapy. The choice of rescue drug is left to the decision of the physician.

Measurement

Age, sex, vital signs (blood pressure, pulse rate, respiratory rate and fever and oxygen saturation) of the patients who agreed to participate in the study were recorded. Also, data regarding to the time (hour) of pain onset, admission to the hospital (outpatient or by ambulance), and the personal or family history of kidney stone were collected. The VAS score which was assessed 30 minutes after administration of NSAID, was accepted as VAS 0. The VAS score of the patients at the time of initial admission

to the hospital is not used in the study. Subsequent times are referred to VAS 0. Other VAS periods are 5, 15, 30 and 60 minutes after VAS 0.

The primary outcome in the evaluation of analgesic efficiency in our study is the difference between VAS 0 and VAS 60. Our secondary outcome is that the score given in VAS 60 is 3 or less. Response to treatment is defined as a VAS 60 value below 4.

Statistical Analysis

Statistical analyses were performed using SPSS 20 statistical analysis program (IBM). Data are presented as mean, standard deviation, median, minimum, maximum, percentage and number. Normal distribution of continuous variables was assessed using Shapiro-Wilk and Kolmogorov-Smirnov tests. Independent samples t-test was used for comparing normally distributed data between two independent groups and Mann-Whitney U test was used to compare non-normally distributed data. Categorical variables were compared using chi-square and Fisher's exact tests. A p value of <0.05 was considered statistically significant.

Results

Our study was completed with the patients admitted to the emergency department and diagnosed with renal colic. Our study was completed with 143 patients. Seventy-one of these patients were grouped as group 1 (fentanyl administered) and 72 of them grouped as group 2 (tramadol administered).

Demographic data of the patients are summarized in Table 1. In our study, there was no significant difference between the groups.

Only 5 of the patients included in our study were admitted to the hospital with an ambulance. In our study, the number of patients who had previously undergone renal colic is 83 in total, with 42 in the fentanyl group and 41 in the tramadol group. In the evaluation of patients with renal colic, 30 patients in the fentanyl group and 32 patients in the tramadol group have family history of renal colic.

The VAS scores 0, 15, 30, 60 and the difference between VAS scores 0-5, 0-15, 0-30, 0-60 and the response to the treatment is summarized in Table 2.

Respond to treatment: It is accepted as no response to the treatment if the VAS 60 score was <4 after the administration of the study drugs.)

When evaluating the difference between VAS 0 and VAS 60, which is the primary parameter in the evaluation of the analgesic activity in our study, the mean VAS value in the fentanyl group was 6.11±2.49, while in the tramadol group the VAS value was 5.94±2.40. There is no statistically significant difference between the efficiencies of the two drugs.

Table 1. Demographic data of patients

	Group fentanyl (n=71)	Group tramadol (n=72)	p value
Age	37.87±13.10	41.24±12.77	p>0.05
Sex (M/F)	48/23	45/27	p>0.05
Duration of pain (mean ± standard deviation)	11.7±19.6	16.11±34.35	p>0.05
Duration of pain (median, minimum, maximum)	3, minimum 1, maximum 72	4, minimum 1, maximum 240	p>0.05

M: Male, F: Female,

Table 2. Analysis of patients according to VAS scores (values are presented as number or mean ± standard deviation

	Group fentanyl	Group tramadol	p value
VAS 0	8.14±1.46	8.1±1.43	p>0.05
VAS 5	6.27±2.45	6.1±2.29	p>0.05
VAS 15	4.92±2.69	5.04±2.44	p>0.05
VAS 30	3.37±2.55	3.69±2.44	p>0.05
VAS 60	2.03±2.34	2.15±2.25	p>0.05
VAS difference 0-60	6.11±2.49	5.94±2.40	p>0.05
VAS difference 0-30	4.77±2.56	4.4±2.43	p>0.05
VAS difference 0-15	3.23±2.58	3.06±2.41	p>0.05
VAS difference 0-5	1.87±2.22	2.00±2.11	p>0.05
Response to treatment (yes/no)	16/55	18/54	p>0.05

Our secondary evaluation parameter is that the score given in VAS 60 is 3 or less. This is accepted as response to the treatment. While 16 patients responded to the treatment in the fentanyl group, 18 patients responded to the treatment in the tramadol group. The difference is not statistically significant.

In the analysis made in terms of these two parameters, it is shown that there is no superiority of both drugs on each other. However, our study shows that both drugs are effective in the treatment of renal colic.

During the study, 1 patient in the fentanyl group and 3 patients in the tramadol group required additional analgesic treatment. Side effects were seen in 13 patients in the fentanyl group and in 7 patients in tramadol group. However, this is not statistically significant (p>0.05).

The side effects were; nausea (fentanyl administered group: 11, tramadol administered group: 4 p>0.05), vomiting (fentanyl administered group: 3, tramadol administered

group: 3 $p>0.05$), dizziness (fentanyl administered group: 13, tramadol administered group: 4 $p<0.05$), hypotension (fentanyl administered group: 2, tramadol administered group: 4 $p>0.05$). In the analysis of side effect profile, there is significantly more patients experienced dizziness in fentanyl treatment group.

Discussion

As far as we know, this is the first study evaluating the analgesic efficiency of i.v. fentanyl and i.v. tramadol in renal colic patients. Our results suggest that both of i.v. tramadol and i.v. fentanyl provides effective analgesia in renal colic patients. Although both drugs provide effective analgesia, no superiority is found on each other.

In our study, the VAS 0 score of the fentanyl group is 8.14 while the VAS 0 score of the tramadol group is 8.1. VAS 60 values are 2.03 and 2.15 respectively. This is an indication of the similar effectiveness of narcotic drugs used in our study.

According to the side effects both drugs were found to have similar properties. The only difference between the two drugs is that fentanyl administration causes significantly more dizziness as a side effect.

Acute flank pain is usually caused by a stone in the ureter (16). Urine excretion decreases due to stone. The urine will then accumulate in the renal pelvis and increase renal pressure. In order to remove the stone, smooth muscles in the urinary system will begin to contract (6). Tension in the kidney pelvis leads to stimulation, synthesis and local release of prostaglandins (3). Prostaglandins increase both the renal blood flow and glomerular filtration rate and consequently the pressure increase in the urinary tract exacerbates pain (6). In addition, these prostaglandins also activate the ureter peristalsis and promote the local inflammatory reaction. Prostaglandin production plays an active role in renal colic (17). If ureteral obstruction is not resolved, kidney failure may occur. The best and most effective treatments for renal colic pain are; spontaneous passage of the stone, removal of the stone, insertion of a stent into the ureter and percutaneous nephrostomy. Fortunately, most patients do not have complete ureteral obstruction and therefore most patients do not face a risk of renal failure (3).

As most kidney stones are spontaneously excreted, the most important point in acute management is the relief of pain and the recognition of complications. Both NSAIDs and opioids reduce pain in acute renal colic. Opioids have the advantages of being cheap, titrable, efficient and familiar, but there are concerns about addiction. Opioids do not directly affect the cause of pain, which can limit their usefulness. NSAIDs act directly on prostaglandin release (the main cause of pain). In particular, they are effective when administered intravenously. However, when compared to opioids, the NSAIDs are generally non-titrable and has well-known side effects such as renal failure and gastrointestinal bleeding (18).

Since the late 1970s, NSAIDs have been widely used alone or in combination with opioids for the treatment of renal colic. Many studies have confirmed the efficacy of NSAIDs, especially when administered i.v. (6). NSAIDs have predominant effects through the inhibition of the cyclooxygenase (COX) enzyme, which regulates the synthesis of autacoids, such as prostaglandins and thromboxane.

As prostaglandin inhibitors, the pharmacological effects of these agents interfere with the underlying renal colic mechanism, rather than suppressing pain. It is concluded that patients who received NSAIDs achieved a further reduction in their pain scores and the likelihood of requiring more analgesia was lower in the short term, when compared to patients treated with opioid (6).

Dexketoprofen trometamol is an anti-inflammatory and analgesic drug that inhibits COX1 and COX2 (1). Dexketoprofen trometamol has a dual pain-relieving effect. Dexketoprofen trometamol has peripheral effect by inhibiting the sensitization of pain receptors induced by locally released prostaglandins. It centrally reduces the effect of central sensitization by inhibiting COX activity. Therefore, it blocks the transfer of the pain stimulus to the upper nerve centers (19). In addition to this direct effect, it also affects other inflammatory mediators such as quinine, creating an indirect effect (20).

Dexketoprofen trometamol has a good analgesic efficacy as well as a good safety profile compared to other NSAIDs in terms of side effects. Furthermore, there is strong evidence that Dexketoprofen trometamol has a faster onset of action (17,21). Dexketoprofen is eliminated very quickly after being metabolized. This situation prevents the accumulation of drugs in healthy adults (20). Dexketoprofen trometamol was selected as the non-steroidal anti-inflammatory drug of choice in our study with all these properties.

Narcotics have been used for pain control in renal colic for a long time. The benefits of opioid use are; low cost, good efficacy, being able to titrate and not causing gastrointestinal bleeding and renal failure. However, the majority of physicians are not comfortable to use these medications because of side effects such as nausea, vomiting, sedation, dizziness, narcotic dependence, disorientation, respiratory depression and hypotension (3,9). Fentanyl is a synthetic μ receptor stimulating opioid which is a fast-onset opioid with 90 times stronger

analgesic potential than morphine (22,23). Analgesia may occur 1 to 2 minutes after i.v. fentanyl administration (22). The duration of effect of fentanyl usually lasts from 2 to 4 hours after i.v. or transmucosal administration (24). After administration of fentanyl, constipation and pruritus are less common than morphine. Fentanyl has recently become popular as it has minimal cardiovascular effects, does not cause an increase in plasma histamine, is relatively faster in effect onset and shorter duration of action, easy to synthesize and easy to prepare for market (22). It is also used for analgesia in the treatment of renal colic (13). Tramadol is considered to be the first member of the "atypical opioids" group. Unlike other opioids, tramadol can modulate the reuptake of serotonin (5HT) in the monoaminergic system, noradrenaline and presynaptic terminals. Other effects of tramadol are that M1 and M3 muscarinic receptors affect the hyperpolarization of neurons by inhibiting NMDA receptors and opening K+ channels (25).

Although in some academic works (3,8) tramadol has been reported to be ineffective in severe and acute pain; in many other researches, tramadol has been shown to be effective in acute and severe pain (1,25-27). In our study, tramadol was found to be effective in acute and severe pain.

In the studies performed, tramadol was also found to be effective in cases such as neuropathic pain, inflammation, depression, obsessive compulsive disorder, renal colic, cancer pain, joint diseases and low back pain. Tramadol has no effect on cardiovascular and pulmonary parameters. It causes less constipation and opioid-induced intestinal dysfunction and has a low dependency ratio. Tramadol analgesic activity can be further improved in combination with a non-opioid analgesic. Due to preliminary clinical studies in nociception models, first evidence of analgesic synergy between tramadol and dexketoprofen was provided and positive interaction between drugs with a different mechanism of action was demonstrated (1,25).

It is supported by various studies that tramadol and dexketoprofen provide effective analgesia (28,29). In our study, tramadol and dexketoprofen are used as an up-to-date combination. Our study is the first study in which tramadol and dexketoprofen were used together in renal colic patients.

In a study by Engeler et al., (4) urologists in Switzerland were asked what they use for renal colic treatments. In the study, it was concluded that 81% of urologists used non-opioid analgesics as the first-line treatment. In a double-blind, randomized controlled study, it is found that the combination of i.v. NSAIDs and morphine is superior to the single drug in reducing pain scores (30). However, there is no advantage of opioid use as first-line analgesic (9). In our study, NSAIDs drugs were applied as the first choice in the treatment.

It is reported in many studies that, NSAIDs are more effective than opioids in renal colic patients (9,11,18). In our study, NSAID medication was used as the initial treatment in accordance with the literature. At the end of 30 minutes, the patients who still had pain, were treated with narcotic analgesics (fentanyl, tramadol) as second-line treatment and the results were compared.

In one study, in a group of patients who received i.v. fentanyl for renal colic, the rate of severe pain was 44.4% after the 5th minute, 28.9% after the 10th minute and 24.4% after the 15th minute and 28.9% after the 30th minute (31). In another study, fentanyl was administered to a renal colic patient and VAS values were determined as VAS 0: 75.56, VAS 15: 36.29, VAS 30: 28.18 (7). In our study, fentanyl effect was found to be higher. In our study, VAS 0: 8.14, VAS 15: 4.92, VAS 30: 3.37.

In the study conducted by Hazhir et al., (32) on the evaluation of the effect of intramuscular tramadol and meperidine, they concluded that the effects of intramuscular 100 mg tramadol and 50 mg meperidine were similar. In our study, tramadol and fentanyl are found to be similar effective for renal colic patients.

Conclusion

Our study is the first research to compare the efficiency of i.v. fentanyl and i.v. tramadol in renal colic pain. In our study, it is concluded that both drugs are effective on renal colic pain, but they do not have any superiority on each other.

Ethics

Ethics Committee Approval: Atatürk University, approval number:B.30.2.ATA.0.01.00/70.

Informed Consent: Written informed consent was obtained from all patients before enrollment.

Peer-review: Externally and internally peer-reviewed.

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References

1. Varrassi G, Hanna M, Macheras G, Montero A, Montes Perez A, Meissner W, et al. Multimodal analgesia in moderate-to-severe pain: a role for a new fixed combination of dexketoprofen and tramadol. Curr Med Res Opin. 2017;33(6):1165-73.
2. Heidenreich A, Desgrandschamps F, Terrier F. Modern approach of diagnosis and management of acute flank pain: review of all imaging modalities. Eur Urol. 2002;41(4):351-62.
3. Golzari SE, Soleimanpour H, Rahmani F, Zamani Mehr N, Safari S, Heshmat Y, et al. Therapeutic approaches for renal colic in the emergency department: a review article. Anesth Pain Med. 2014;4(1):e16222.
4. Engeler DS, Schmid S, Schmid HP. The ideal analgesic treatment for acute renal colic-theory and practice. Scand J Urol Nephrol. 2008;42(2):137-42.

5. Skolarikos A, Straub M, Knoll T, Sarica K, Seitz C, Petrik A, et al. Metabolic evaluation and recurrence prevention for urinary stone patients: EAU guidelines. Eur Urol. 2015;67(4):750-63.
6. Sanchez-Carpena J, Dominguez-Hervella F, Garcia I, Gene E, Bugarin R, Martin A, et al. Comparison of intravenous dexketoprofen and dipyrone in acute renal colic. Eur J Clin Pharmacol. 2007;63:751-60.
7. Imamoglu M, Aygun A, Bekar O, Erdem E, Cicek M, Tatli O, et al. A retrospective analysis of nebulized versus intravenous fentanyl for renal colic. Am J Emerg Med. 2017;35:757-63.
8. Micali S, Grande M, Sighinolfi MC, De Carne C, De Stefani S, Bianchi G. Medical therapy of urolithiasis. J Endourol. 2006;20:841-7.
9. Pathan SA, Mitra B, Cameron PA. A Systematic Review and Meta-analysis Comparing the Efficacy of Nonsteroidal Anti-inflammatory Drugs, Opioids, and Paracetamol in the Treatment of Acute Renal Colic. Eur Urol. 2018;73:583-95.
10. Guidelines on urolithiasis. European Association of Urology [Internet]. [cited July 1, 2018]. Available from: http://uroweb.org/guideline/urolithiasis/.
11. Holdgate A, Pollock T. Nonsteroidal anti-inflammatory drugs (NSAIDs) versus opioids for acute renal colic. Cochrane Database Syst Rev. 2005:CD004137.
12. Phillips E, Kieley S, Johnson EB, Monga M. Emergency room management of ureteral calculi: current practices. J Endourol. 2009;23:1021-4.
13. Bektas F, Eken C, Karadeniz O, Goksu E, Cubuk M, Cete Y. Intravenous paracetamol or morphine for the treatment of renal colic: a randomized, placebo-controlled trial. Ann Emerg Med. 2009;54:568-74.
14. Cordell WH, Wright SW, Wolfson AB, Timerding BL, Maneatis TJ, Lewis RH, et al. Comparison of intravenous ketorolac, meperidine, and both (balanced analgesia) for renal colic. Ann Emerg Med. 1996;28:151-8.
15. al-Sahlawi KS, Tawfik OM. Comparative study of the efficacy of lysine acetylsalicylate, indomethacin and pethidine in acute renal colic. Eur J Emerg Med. 1996;3:183-6.
16. Davenport K, Waine E. The Role of Non-Steroidal Anti-Inflammatory Drugs in Renal Colic. Pharmaceuticals (Basel). 2010;3:1304-10.
17. Sanchez-Carpena J, Sesma-Sanchez J, Sanchez-Juan C, Tomas-Vecina S, Garcia-Alonso D, Rico-Salvado J, et al. Comparison of dexketoprofen trometamol and dipyrone in the treatment of renal colic. Clin Drug Investig. 2003;23:139-52.
18. Holdgate A, Pollock T. Systematic review of the relative efficacy of non-steroidal anti-inflammatory drugs and opioids in the treatment of acute renal colic. BMJ. 2004;328:1401.
19. Mauleon D, Artigas R, Garcia ML, Carganico G. Preclinical and clinical development of dexketoprofen. Drugs. 1996;52 Suppl 5:24-45; discussion -6.
20. Barbanoj MJ, Antonijoan RM, Gich I. Clinical pharmacokinetics of dexketoprofen. Clin Pharmacokinet. 2001;40:245-62.
21. Ceyhan D, Bilir A, Gulec MS. Evaluation of the Analgesic Efficacy of Dexketoprofen Added to Paracetamol. Turk J Anaesthesiol Reanim. 2016;44:312-6.
22. Stanley TH. The fentanyl story. J Pain. 2014;15:1215-26.
23. Ahmadi O, Dehkordi AS, Heydari F, Esfahani MN, Mahaki B. The effect of nitrous oxide in comparison to oxygen combined with fentanyl on the hospitalization time and pain reduction in renal colic patients at emergency department. J Res Med Sci. 2018;23:18.
24. Bailey PL. Intravenous opioid anesthetics. Anesthesia. 1994:291-387.
25. Bravo L, Mico JA, Berrocoso E. Discovery and development of tramadol for the treatment of pain. Expert Opin Drug Discov. 2017;12:1281-91.
26. Affaitati G, Giamberardino MA, Lerza R, Lapenna D, De Laurentis S, Vecchiet L. Effects of tramadol on behavioural indicators of colic pain in a rat model of ureteral calculosis. Fundam Clin Pharmacol. 2002;16:23-30.
27. Lopopolo M, Affaitati G, Fabrizio A, Massimini F, Lapenna D, Giamberardino MA, et al. Effects of tramadol on viscero-visceral hyperalgesia in a rat model of endometriosis plus ureteral calculosis. Fundam Clin Pharmacol. 2014;28:331-41.
28. What place is there for tramadol/dexketoprofen? Drug Ther Bull. 2018;56: 66-8.
29. Derry S, Cooper TE, Phillips T. Single fixed-dose oral dexketoprofen plus tramadol for acute postoperative pain in adults. Cochrane Database Syst Rev. 2016;9:CD012232.
30. Safdar B, Degutis LC, Landry K, Vedere SR, Moscovitz HC, D'Onofrio G. Intravenous morphine plus ketorolac is superior to either drug alone for treatment of acute renal colic. Ann Emerg Med. 2006;48:173-81.
31. Motamed H, Maleki Verki M. Intravenous Lidocaine Compared to Fentanyl in Renal Colic Pain Management; a Randomized Clinical Trial. Emerg (Tehran). 2017;5:e82.
32. Hazhir S, Badr YA, Darabi JN. Comparison of intranasal desmopressin and intramuscular tramadol versus pethidine in patients with renal colic. Urol J. 2010;7:148-51.

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Chemical Pneumonia Due to Paint Thinner Ingestion: A Case Report and Literature Review

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Abstract

Paint thinner is an organic solvent which includes aromatic hydrocarbons and is widely used in the paint, varnish, and plastic products industries. Regular inhalation of such solvents is known to cause chronic intoxication. Oral thinner over-exposure is rare but quite fatal. Volatile liquids can cause pulmonary complications even with oral ingestion. Therefore, in patients with oral volatile liquid thinner intake, emergency physicians should be aware of local complications as well as the systematic effect even with initial normal physical or radiological findings. In this report, we present a patient with chemical pneumonia due to self-vomiting after accidentally drinking paint thinner.

Keywords: Chemical pneumonitis, thinner, hydrocarbons, ingestion

Introduction

Exposure to hydrocarbons is common in modern society. Thinner is an organic solvent that contains aromatic hydrocarbons such as toluene and xylene and is easily accessible in products such as gasoline, paint, varnish, and plastic production industries. Types of exposure include unintentional ingestion, intentional recreational abuse, unintentional inhalation, and dermal exposure or oral ingestion in a suicide attempt. Regular inhalation of such solvents is known to cause chronic intoxication. Toluene and xylene are absorbed in the gastrointestinal tract and are shown to cause rhabdomyolysis, metabolic acidosis, hepatic and renal dysfunction, neurotoxicity, and pulmonary toxicity due to their lipophilic affinity in rodents and humans.

Oral thinner over-exposure is rare, but quite fatal. Oral intake of 45-50 mL thinner is known to cause severe complications (1). Toluene accumulates in the liver following oral exposure, and thinner accumulates in the brain following respiratory exposure. Volatile organic compounds act as central nervous system depressors due to their lipophilic characteristics and cause death after oral ingestion. Herein we report an adult male who was admitted to our hospital with complaint of fever with the history of paint thinner ingestion.

Case Report

A 54-year-old male patient presented to the emergency department (ED) with fever. He had drunk half bottle of paint thinner (approximately 100 mL) accidentally 9 hours before his admission. Upon realizing his mistake, he had self-induced vomiting in an attempt to get rid of the thinner about 2-3 times, and then had drunk a lot of water to minimize the effect of the thinner.

Physical examination revealed an alert and oriented male with a regular pulse of 110 beats/min, blood pressure of 119/75 mmHg, respiratory rate of 20 breaths/min, body temperature of 38.9 °C, and O_2 saturation of 98% on room air. Cardiac examination revealed normal S1 and S2 with no audible murmurs, rubs, or gallops. Chest examination showed bilateral equal aeration; there were crepitant rales over the right lower zone but no wheezing or rhonchi. The abdomen was soft, non-tender, and non-distended, without any evidence of organomegaly. No lower

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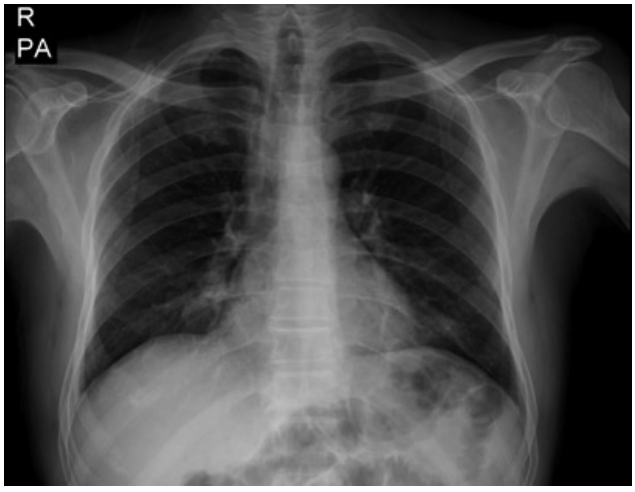

Figure 1. Normal posterior-anterior chest X-ray without anysign of pneumonia taken in the first hour of the admission

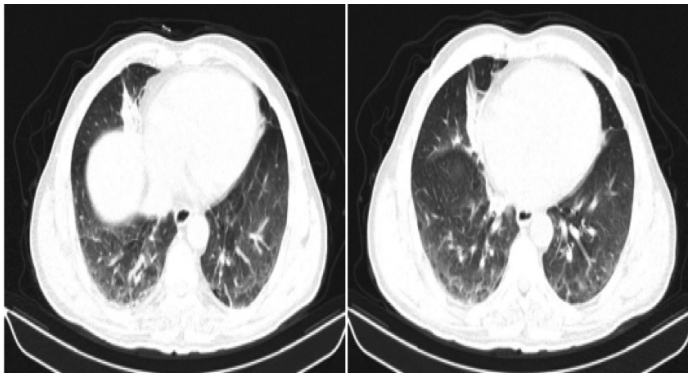

Figure 2. Chest computed tomography scan (without contrast) performed on the 16th hour of ingestion: Consolidation are as containing air bronchograms secondary to parenchymal infiltration can be seen in the anterobasal segment of inferior lobe of the right lung

extremity edema, cyanosis, or clubbing was seen. The peripheral arterial pulses were palpable. The neurologic examination was normal.

Laboratory tests, including arterial blood gas, renal and liver function tests, and a comprehensive metabolic panel were all within normal limits. The results of the complete blood count were as follows; white blood cell count: 19.300 L; neutrophil ratio: 83.4%; platelet count, hemoglobin and hematocrit levels were within the normal range. No invasive or infiltrative lesion was detected in the chest X-ray (Figure 1).

The patient was hospitalized for supportive treatment and further workup and monitoring. At third hour of admission, the patient developed an attack of bronchospasm. Meanwhile, the vital findings were as follows: SpO_2: 97% (on room air), pulse: 109/min, blood pressure: 120/67 mmHg. After inhalation of nebulized ipratropium bromide plus budesonide, his symptoms regressed. At 7th hour of admission, the same inhaler treatment was administered because of a recurrent attack of bronchospasm. Therefore, chest computed tomography (CT) scan (without contrast) was performed for differential diagnosis. It showed consolidation areas containing air bronchograms secondary to parenchymal infiltration in the inferior lobe of the right lung (Figure 2). Hence, chemical pneumonitis was diagnosed and amoxicillin-clavulanate was started. Patient was discharged after he had been symptom-free and hemodynamically stable for 24 hours on the 3rd day of admission.

Discussion

Oral intake or inhalation of less than 1 mL of some hydrocarbons has been shown to cause chemical pneumonia and death. Respiratory symptoms generally begin in the first few hours after exposure and usually resolve in 2-8 days. Symptoms such as cough and broncho-obstruction may occur shortly after oral intake. Tachypnea, wheezing, and chemical pneumonitis may follow thereafter. In such cases death due to chemical exposure, which is usually related to bacterial infections and other respiratory complications, may ensue (2). Our patient, who had self-vomited after accidentally having drunk thinner, developed fever and respiratory signs. Inducing vomiting in such patients is not advised because it can increase the risk of pulmonary complications as a result of aspiration (3).

Hydrocarbons can be aspirated after oral ingestion and may cause toxic effects on lungs. Nonetheless, they may also cause systematic toxic effects due to oral, respiratory, or dermal exposure. Especially in thinner and naphtha intoxications respiratory symptoms can slowly occur. Death has been reported in patients with multi-organ failure secondary to oral intake of hydrocarbons (4). While signs of chemical pneumonitis can appear in the chest radiogram as early as 30 minutes after exposure to any chemical in symptomatic patients, they may variably occur between 2-24 hours in asymptomatic patients (5). In our case, fever and leukocytosis with negative chest X-ray occurred 9 hours after the oral intake and signs of chemical pneumonitis in the chest CT settled 16 hours after the intake. Therefore, the patient was given broad-spectrum antibiotic due to increasing infiltrate in radiological imaging. Occurrence and persistence of fever, increasing infiltrate in chest radiograph, leukocytosis or sputum or tracheal aspirate positive for bacteria after hydrocarbon aspiration over 48 hours suggests bacterial superinfection. Hence, pneumonitis caused by hydrocarbon aspiration should not be treated routinely with antibiotics unless signs of secondary infection (6).

In the literature reports fatal toluene levels were reported to be 29-119 µg/g in 3 cases (7); in one case who was externalized in

full health after 8 days of follow-up in the intensive care unit, toluene level was reported to be 17 µg/g (1). Blood toluene level test cannot be performed in our hospital therefore, we cannot provide any data about the blood toluene level of our case.

In a report of 20 cases with toluene inhalation, the most frequent complaint was muscle weakness due to hypokalemia, followed by altered mental status and gastrointestinal complaints including nausea, vomiting, and abdominal pain with elevation of creatine-phosphokinase concentration to the level approximately 6 times the upper normal limit and elevated gamma-glutamyl transpeptidase and alkaline phosphatase (ALP) levels (8). In another report of 37 adult thinner intoxication cases, the most frequent complaint was nausea and vomiting with elevated ALP and lactate dehydrogenase levels, approximately 2-3 times the upper limit of normal (9). In our case, there was no abnormality in the electrolytes, or liver, or kidney function tests.

Treatment with surfactant in pediatric patients with acute respiratory distress syndrome (ARDS) due to toluene inhalation and treatment with budesonide and nitric oxide in patients with respiratory distress and bronchospasm were found effective (5). On the contrary, treatment with corticosteroids in dogs with fulminant hydrocarbon aspiration was found ineffective (10). Our patient had fever without respiratory distress in initial examination and had bouts of bronchospasm 12 hours and 16 hours after exposure. The patient was treated with inhalation of nebulized ipratropium bromide plus budesonide during the bronchospasm attacks.

Emergency physicians should be aware of pulmonary complications even with oral exposure to volatile liquids. Therefore, the occurrence of local pulmonary complications as well as the possible systemic complications should be closely monitored due to implication in pneumonitis but also in central nervous and gastrointestinal system toxicity, arrhythmias, hypokalemia and metabolic acidosis. The absence of symptoms or radiological findings immediately after thinner or any chemical ingestion or the presence of only short-lived symptoms is possibly determined by the amount and physical characteristics of the substance reaching tracheobronchial tree. Herewith, the healthcare professionals should be aware of developing serious complications in patients with chemical exposure who have normal physical findings initially. It should not be forgotten, in 5% of cases with pneumonitis, the disease progresses rapidly with severe manifestations such as multiple organ failure and ARDS (11).

Conclusion

The patients with a history of any chemical exposure should be hospitalized for at least twenty-four hours after exposure for monitoring of local and systemic toxic effects. It should be noted that the diagnosis of hydrocarbon exposure is based upon clinical features. It is not necessary to take the results of the laboratory tests rapidly because they do not change the management priorities.

Ethics

Informed Consent: It was taken.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: M.K., Design: M.K., Data Collection or Processing: M.K., K.A., Analysis or Interpretation: M.K., Literature Search: M.K., K.A., Writing: M.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Malingre MM, Hendrix EA, Schellens JHM, Koks CHW, Tibben MM, Challa EE, et al. Acute poisoning after oral intake of a toluene-containing paint thinner. Eur J Pediatr. 2002;161:354-5.
2. Jayashree M, Singhi S, Gupta A. Predictors of outcome in children with hydrocarbon poisoning receiving intensive care. Indian Pediatr. 2006;43:715-9.
3. Yang CC, Wu JF, Ong HC, Hung SC, Kuo YP, Sa CH, et al. Taiwan National Poison Center: epidemiologic data 1985-1993. J Toxicol Clin Toxicol. 1996;34:651-63.
4. Gurkan F, Bosnak M. Use of nebulized budesonide in two critical patients with hydrocarbon intoxication. Am J Ther. 2005;12:366-7.
5. Horoz OO, Yildizdas D, Yilmaz HL. Surfactant therapy in acute respiratory distress syndrome due to hydrocarbon aspiration. Singapore Med J. 2009;50:e130-2.
6. Ellenhorn MJ. The hydrocarbon products. In: Ellenhorn's Medical Toxicology: Diagnosis and Treatment of Human Poisoning, 2nd, Ellenhorn MJ, Schonwald S, Ordog G, Wasserberger (Eds), Williams & Wilkins, Baltimore 1997. p.1420
7. Ameno K, Fuke C, Ameno S, Kiriu T, Sogo K, Ijiri I. A fatal case of oral ingestion of toluene. Forensic Sci Int. 1989;41:255-60.
8. Camara-Lemarroy CR, Rodríguez-Gutiérrez R, Monreal-Robles R, González-González JG. Acute toluene intoxication-clinical presentation, management and prognosis: a prospective observational study. BMC Emerg Med. 2015;15:19.
9. Rahimi HR, Agin K, Shadnia S, Hassanian-Moghaddam H, Oghazian MB. Clinical and biochemical analysis of acute paint thinner intoxication in adults: a retrospective descriptive study. Toxicol Mech Methods. 2015;25:42-7.
10. Steele RW, Conklin RH, Mark HM. Corticosteroids and Antibiotics for the Treatment of Fulminant Hydrocarbon Aspiration. JAMA J Am Med Assoc. 1972;219:1434.
11. Makrygianni EA, Palamidou F, Kaditis AG. Respiratory Complications Following Hydrocarbon Aspiration in Children. Pediatr Pulmonol. 2016;51:560-9.

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A Lucky Open Rib Fracture After Falling from a Donkey

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Abstract

Open bone fractures are frequently seen in fingers (45%) and in long bones such as tibia and fibula (11.2%). Open fractures of the thorax due to rib fracture rarely result in antagonism. Rib fracture treatment is often conservative, but fracture-related complications may require surgical intervention. We presented a case report of a child who had open rib fracture in the left hemithorax after falling from a donkey and who was followed up by the family for a long period of time falsely, considering that it was a piece of wood. There was a story of a 9 years old female patient falling from a donkey 20 days ago. After the trauma, a hard, creamy colored piece of rib extending out about 2 cm from the surface of the skin in the patient's left hemithorax was thought to be a foreign body by the family. After the tetanus vaccination was performed, the necessary antibiotic treatment was started and the rib piece about 6 cm in length was removed under local anesthesia. Follow-ups were normal and no complications are encountered yet. As a result, chest wall should be intervened early to reduce or eliminate morbidity in compound rib fractures. Although initiation of treatment in the late period may reduce the chances of success of treatment, morbidity can be reduced by appropriate surgical intervention.

Keywords: Rib fracture, open fracture, trauma

Introduction

Open bone fractures are frequently seen in fingers (45%) and in long bones such as tibia and fibula (11.2%) (1). Open fractures of the thorax due to rib fracture rarely result in antagonism. Rib fracture treatment is often conservative, but fracture-related complications may require surgical intervention (2). Open fractures are complex injuries involving both the bone and the surrounding soft tissues (3). It can cause loss of function in the area where the fracture occurs because it is feared that infection may occur in the open fracture site (4). There are several precautions with the aim of preventing thoracic wall infections; the surgical removal of infected tissues, the use of appropriate and effective antibiotics, and the occlusion of the remaining defect surgically or with secondary healing (5). Beginning the treatment in late period will reduce the chance of successful therapy.

We presented a case report of a child who had open rib fracture in the left hemithorax after falling from a donkey and who was followed up by the family for a long period of time falsely, considering that it was a piece of wood. At the end, a rib fragment extending out of the skin was removed by surgical intervention in our hospital with no significant complication.

Case Report

There was a story of a 9-year-old female patient falling from a donkey 20 days ago. After the trauma, a hard, creamy colored piece of a rib extending out about 2 cm from the surface of the skin in the patient's left hemithorax was thought to be a foreign body by the family. Over time, infectious debris in a small amount gathered on that part of rib outside the skin, seemed like a green and cream color and it was thought that this was a foreign body, a piece of wood with the prejudice as a result of history taken from the family. In the physical examination of the patient who applied to our hospital for removal of the supposed-foreign body, there was a partial pectus excavatum except for current condition (Figure 1). Auscultation was normal.

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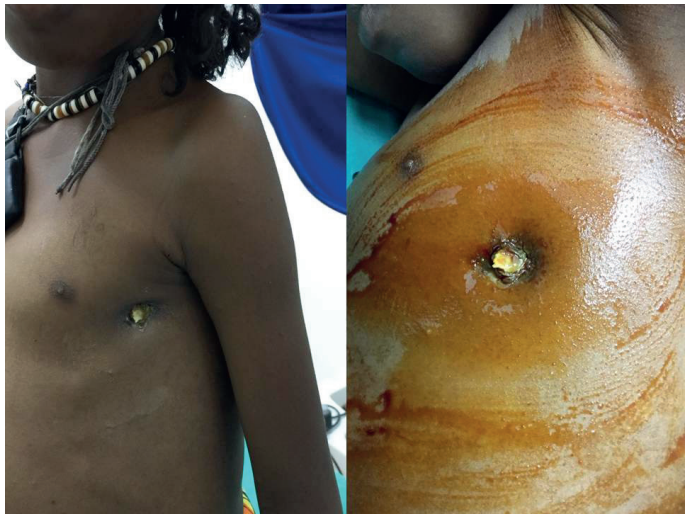

Figure 1. Patients admission

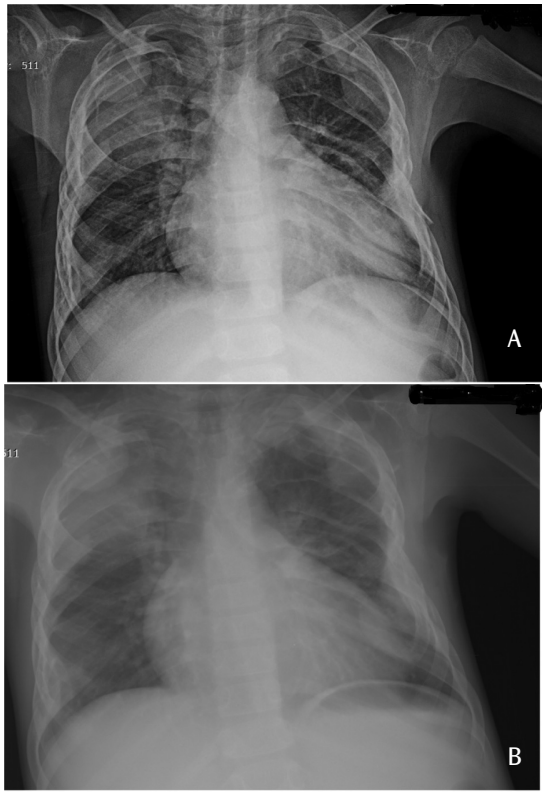

Figure 2. a) First chest X-ray. b) After removal

Leukocytosis, elevation of CRP and deep anemia were present in laboratory tests. On chest X-ray, there was a foreign body appearance in the same opacity as the ribs that went out of the skin on the lateral side of the 5th rib in the left hemithorax. There was no pneumothorax or hemothorax but bilateral rib fractures and cardiomegaly were present with multiple callus tissues (Figure 2a). In thorax CT, it was understood that this was a part of a rib outside the skin after the depletion fracture in the 5th rib (Figure 3a, 3b). After the tetanus vaccination was performed,

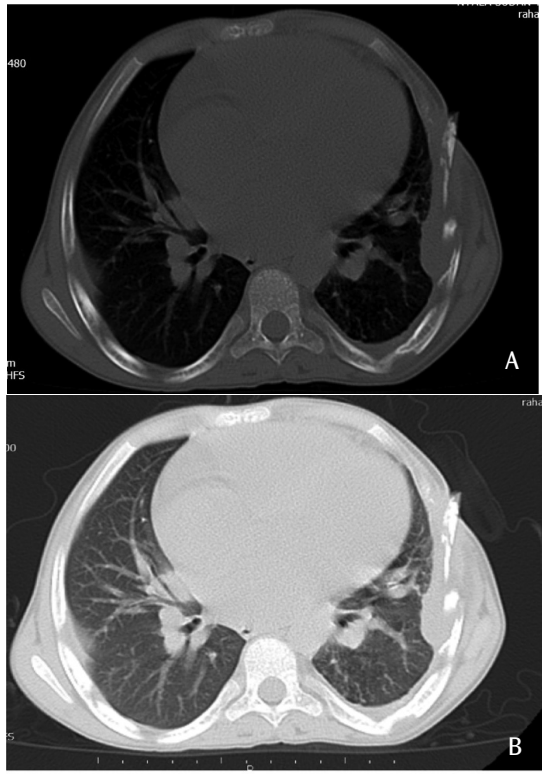

Figure 3. Thorax computed tomography scan

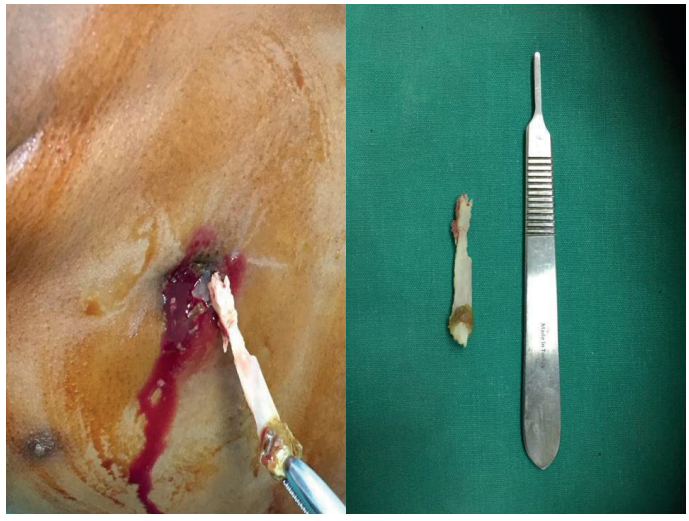

Figure 4. Broken rib

the necessary antibiotic treatment was started and the rib piece about 6 cm in length was removed under local anesthesia (Figure 4). The necrotic tissue in the skin was debrided and the skin was closed without any flapping. There were no complications after the procedure. No new pathology was observed in post-procedural lung X-ray (Figure 2b). The patient was followed up for 3 days in the pediatric service with the aim of medical treatment and anemia after discharge. Follow-ups were normal and no complications are encountered yet.

Discussion

Although rib fractures are common in thoracic trauma, more than 40% of patients who have thoracic trauma experience rib fractures (6). In the child age group, rib fractures are less common due to the elasticity of the ribs. Pain is frequently observed after rib fractures and pain increases during thoracic movements (7). In our pediatric age group, multiple rib fractures were present and there was pain while breathing and coughing. Rib fracture can be diagnosed by chest X-ray and thorax computed tomography (CT). It should be kept in mind that 50% of rib fractures can be ignored in PA graphs (7). Despite the presence of rib fractures in chest X-ray as radiological examination of the patient, thoracic CT was useful in order to understand the foreign body characteristics of the chest wall and to determine if there was a penetration to the thorax. In thorax CT, it was found that the foreign body on the chest wall was opaque to the same level as the rib and that it was located on the chest wall, did not pass the parietal pleura, and was a part of the rib fracture. Furthermore, thorax CT had multiple rib fractures with bilateral callus formation. After rib fracture, vital preventive complications such as hemothorax, pneumothorax, parenchymal laceration, flail chest may occur, but these complications were not seen in our patient.

Compound fracture is often found in the limbs, thoracic compound ones due to rib fractures are rarely emerges. There is not enough data in the literature to indicate the frequency of compound rib fracture. In our patient, compound rib fractures and callus tissues due to the fall of the cargo animal from the anterolateral of the left hemithorax to the outer skin were formed by a part of the 5th rib and other bilateral multiple rib fractures were present.

Although rib fracture treatment is often conservative, fracture-related complications may require surgical intervention (2). Compound fractures are complex injuries involving both the bone and the surrounding soft tissues (3). It is feared to have an infection in the compound fracture because it may cause loss of function in the region (4). In order to prevent the thorax wall infections; the surgical removal of infected tissues, the use of appropriate and effective antibiotics, and repairing of the remaining defect surgically or with secondary healing will be considered as possible options (5). Beginning the treatment in the late period will reduce the chances of success. Our patient applied after 20 days of compound rib fracture and there was no other thoracic pathology. In order to prevent infection and not to disturb chest wall stability, the rib piece and surrounding dead tissue were removed by debriding, which lost its vitality, appropriate antibiotic started, tetanus prophylaxis was performed and the defect was primary. Despite the late admission of the patient, the patient could be followed without complication by appropriate surgical procedure. Luckily, there was not any thoracic pathology associated with the compound rib fracture or significant soft tissue infection, except for other rib fractures before the patient had a chance to consult.

Conclusion

As a result, chest wall should be intervened early to reduce or eliminate morbidity in compound rib fractures. Although initiation of treatment in the late period may reduce the chances of success of treatment, morbidity can be reduced by appropriate surgical intervention.

Ethics

Informed Consent: Consent of the family was obtained also to present the care process as a case report.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: H.F.S., H.D., Concept: H.F.S., H.D., Design: H.F.S., H.D., Data Collection or Processing: H.F.S., H.D., Analysis or Interpretation: H.F.S., H.D., Literature Search: H.F.S., H.D., Writing: H.F.S., H.D.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Sop LJ, Sop A. Fracture, open. StatPearls [Internet]. Stat Pearls Publishing.2017.
2. Apikogulları B, Yoldas BA, Esme H. Rib Fractures Requiring Surgical Repair: A Case Report. JEMCR 2011;2:23-5
3. Zalavras CG1, Patzakis MJ. Open fractures: evaluation and management. J Am Acad Orthop Surg. 2003;11:212-9.
4. Diktaş H, Öncül O. Overview of Infection Prophylaxis and Antibiotic Treatment in Open Fractures. Turkiye Klinikleri J Orthop & Traumatol-Special Topics. 2014;7: p. 22-26.
5. Demiroz MS, Findik G. Chest Wall Infections. Turkiye Klinikleri J Orthop & Traumatol-Special Topics. 2018;9:44-49.
6. Guitron J, Huffman LC, Howington JA, LoCicero J III. Blunt and Penetrating Injuries of the Chest Wall, Pleura, and Lungs. In: Shields TW, Locicero J, Reed CE, Feins RH, eds. General Thoracic Surgery. 7th ed. Philadelphia: Lippincott Williams & Wilkins; 2009. p. 891-902.
7. Kantarcıoğlu Ö, Şahin E. Göğüs duvarı travmalarına yaklaşım. In: Özyurtkan MO, Bostancı K, Özpolat B, (Eds). Toraks Travması.1 st ed. Ankara: Nobel Tıp Kitapevleri; 2018. p. 157-163.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
Case Report
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Warfarin Resistance: A Case Report

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Abstract

Warfarin is the most widely prescribed anticoagulant in the world. Patients who need more than 15 mg per day should be considered warfarin-resistant. Nearly 30 genes have been reported in association with warfarin pharmacogenetics but genetic polymorphisms in the genes encoding CYP2C9 and VKORC1 have been shown to act as the most important determinants of drug dosage requirements. The major enzyme responsible for the metabolism of S-warfarin, the more potent of warfarin's two stereoisomers, is CYP2C9. Warfarin inhibits vitamin K epoxide reductase (VKOR). A 30-year-old woman was referred to our clinic for pulmonary embolism. She was treated with low molecular weight heparin. The warfarin dose was titrated up to 15 mg daily but after one week, the INR (international normalized ratio) was still subtherapeutic level at 1.8. In this paper, we discuss underlying genetic polymorphisms about warfarin resistance.

Keywords: Warfarin, vitamin K epoxide reductases, VKORC1

Introduction

An outbreak was observed cattle in the Northern USA and Canada in the 1920s. The disease was characterised by fatal bleeding, either spontaneously or from minor injuries. Nearly 20 years later, Karl Link discovered that the anticoagulant in sweet clover was 3,3′-methylenebis (4-hydroxy coumarin). Further work by Link led in 1948 to the synthesis of warfarin. The name warfarin is derived from the sponsor (Wisconsin Alumni Research Foundation) and -arin from coumarin (1).

The glutamate residues in some coagulation factors (II, VII, IX, X) are carboxylated in presence of O_2, CO_2, and the enzyme carboxylase, to form γ- carboxyglutamate (Gla) residues. Vitamin K is essential for this post translational modification in the liver. In this process, vitamin K hydroquinone converted to vitamin K epoxide. Then, vitamin K epoxide reductase (VKOR) turned its epoxide to vitamin K again. Warfarin exerts its anticoagulant effect by inhibiting (2) the protein vitamin K epoxide reductase complex, subunit 1 (VKORC1).

The frequency of referral of patients with warfarin related complications to the emergency unit increases (3). The patients with warfarin resistance can present atypical chest pain due to pulmonary emboli (4,5). Intracardiac thrombi can develop during warfarin therapy in such cases (6). Warfarin resistance defined as warfarin requirements greater than 15 mg per day to maintain the international normalised ratio (INR) in the target therapeutic range (7). We present a patient with warfarin resistance who had related mutations.

Case Report

A 30-year-old woman was admitted to the outpatient clinic of chest department of the city hospital for chest pain. Her medical history was unremarkable. Chest computed tomography (CT)-angiogram was consistent with pulmonary embolism. The patient's initial treatment was low-molecular-weight heparin. A loading dose of warfarin 5 mg daily was started at the second day of admission. The warfarin dose was titrated up to 15 mg daily for one week, the INR was still subtherapeutic at 1.8. She did not

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report any dietary changes or other drug intake. We performed genetical analyses to explain warfarin resistance. Warfarin therapy was stopped and low-molecular-weight heparin was started again.

Real time technique was used in the genotype analysis of target genes in current proband patient. Total genomic DNA was extracted from peripheral blood sample from patient with spin column extraction technique (Roche). *SERPINC1* gene was sequenced with Genetic analyser (ABI Prism 3130, Germany) and target thrombophila genes of factor V Leiden, factor II, *MTHFR* C677T and A1298G, PAI1, exon 7 of *CYP2C9**2*3 (rs1057910) and promoter region of VKORC1 (rs9923231) were amplified by using real-time PCR technique (LightCycler 2.0, Roche). Case was intermediate metabolising profile for the *CYP2C9* gene (*CYP2C9**1/*2), Both SNPs (C677T and A1298C) were also in heterozygous mutated profile for target *MTHFR* gene. Heterozygous point mutation was detected in VKORC1 -1639>A allele in the current proband case with warfarin resistance. The rest of genes that analysed (factor V Ledien, factor II, PAI-1 and SERPINC1) were in normal structure.

Discussion

It has been shown that methylenetetrahydrofolate reductase C677T and A1298C, plasminogen activator inhibitor-1(PAI-1) 4G/5G mutations were associated with an increased risk of deep venous thrombosis (8). We did not find any other predisposing factors related to pulmonary embolism in our case.

Combining age and body surface area together with genetic polymorphisms in *CYP2C9* and VKORC1 accounted for 55% of the variance in dosage requirements (1). The daily warfarin doses of patients with the *CYP2C9**1/*2 were not significantly different from those of patients with the wild-type (*CYP2C9**1/*1) mutation in Turkish population (9). Consequently, we suggested that *CYP2C9**1/*2 mutation found in our patient did not contribute to warfarin resistance.

In Turkish patients, VKORC1-1639 G>A polymorphism found approximately 15% of the inter-individual variability in the warfarin dose requirement as the largest contribution (9). Mean dose was reported as 5 mg in wild-type GG mutation but 3.5 mg in the heterozygous (AG) group. Because our patient had heterozygous mutation, we cannot explain warfarin resistance via this mechanism. In Turkey, it has been shown that GG mutation had a higher dosage requirement for warfarin compared with the other genotypes (10). On the other hand, in Chinese population, warfarin maintenance doses in AG + GG carriers were higher than those in AA carriers (11).

D'Andrea et al. (12) reported that the mean dose of warfarin was higher (6.2 mg) among Caucasian patients with the VKORC1 1173CC genotype than those of patients carrying the CT (4.8 mg) or the TT genotype (3.5 mg). In Chinese patients, warfarin dose was apparently higher in patients with CT genotype (3.8 mg) as compared with patients with TT genotype (3.1 mg). There is no study about VKORC1 1173 genotyping in Turkish patients. Turkish society is composed of people of many different ethnic backgrounds such as Turkish, Asian, and Caucasian.

The *in vitro* analysis revealed that only six mutations of the VKORC1 (A26P, A41S, V54L, H68Y, I123N and Y139H) have been found to be associated with warfarin resistance among more than 26 missense mutations (2). Our study has limitation because of the absence of investigations for constitutional mutations of VKORC1. We could perform only VKORC1 promoter G-1639A and first intron C1173T polymorphisms genotyping in our patient.

Conclusion

In conclusions, warfarin resistance in the present case was still unknown. We continued low-molecular-weight heparin in our patient. Ethnic difference is important because of other genes and other rare polymorphisms affect warfarine metabolism. In addition to CYP2C9 and VKORC1, polymorphisms in other genes that may help determine the dose of warfarin should be investigated.

Ethics

Informed Consent: It was taken.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: U.G., T.G., Concept: U.G., T.G., Design: U.G., T.G., F.S., Ö.Ö., Data Collection or Processing: U.G., T.G., Analysis or Interpretation: U.G., T.G., Literature Search: U.G., T.G., Writing: U.G., T.G., F.S., Ö.Ö.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Pirmohamed M. Warfarin: almost 60 years old and still causing problems. Br J Clin Pharmacol. 2006;62:509-11.
2. Hodroge A, Matagrin B, Moreau C, Fourel I, Hammed A, Benoit E, et al. VKORC1 mutations detected in patients resistant to vitamin K antagonists are not all associated with a resistant VKOR activity. J Thromb Haemost. 2012;10:2535-43.
3. Altunbaş G, Ercan S, Davutoğlu V, Al B. Overview of warfarin treatment and answers to questions. The Journal of Academic Emergency Medicine. 2013;12:38-42.

4. Sabol BJ, Basa RR, Wilkins CE. Malabsorption-associated warfarin resistance. Am J Health Syst Pharm. 2009;66:1548-53.

5. Sattar A, Willman JE, Kolluri R. Possible warfarin resistance due to interaction with ascorbic acid: case report and literature review. Am J Health Syst Pharm. 2013;70:782-6.

6. Pescetelli I, Genovesi E, Renda G, Di Renzo E, De Caterina R. Intracardiac thrombi during warfarin anticoagulation – A case report and a brief literature review. Cor et Vasa 2017;59:e277-81.

7. Osinbowale O, Al Malki M, Schade A, Bartholomew JR. An algorithm for managing warfarin resistance. Cleve Clin J Med. 2009;76:724-30.

8. Hosseini S, Kalantar E, Hosseini MS, Tabibian S, Shamsizadeh M, Dorgalaleh A. Genetic risk factors in patients with deep venous thrombosis, a retrospective case control study on Iranian population. Thromb J. 2015;13:35.

9. Yildirim E, Erol K, Birdane A. Warfarin dose requirement in Turkish patients: the influences of patient characteristics and polymorphisms in CYP2C9, VKORC1 and factor VII. Hippokratia. 2014;18:319-27.

10. Yardım O, Emektar E, Çevik Y, Çorbacıoğlu ŞK, Karabulut AE. Evaluation of the VKORC1 and CYP2C9 gene polymorphisms and their effects on the emergency complications in the patients using warfarin. Eurasian J Emerg Med. 2017;16:65-9.

11. Yan X, Yang F, Zhou H, Zhang H, Liu J, Ma K, et al. Effects of VKORC1 genetic polymorphisms on warfarin maintenance dose requirement in a Chinese Han population. Med Sci Monit. 2015;21:3577-84.

12. D'Andrea G, D'Ambrosio RL, Di Perna P, Chetta M, Santacroce R, Brancaccio V, et al. A polymorphism in the VKORC1 gene is associated with an interindividual variability in the dose-anticoagulant effect of warfarin. Blood. 2005;105:645-64.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
Image of Interest
DOI: 10.4274/eajem.galenos.2018.35229
Eurasian J Emerg Med. 2019;18(1): 64-5

Restricted Movement of the Shoulder and Severe Pain: Separation of the Acromioclavicular Joint

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A 22-year-old male patient was admitted to the emergency room after falling on the left arm while playing football. On the examination, he has severe pain on the left arm and restricted to bring abduction. An anti-inflammatory analgesic drug was administered intramuscularly to the patient whose vital signs were stable at the time of admission. Then, the patient had a two-sided AP shoulder graphy. On the graphy, type III acromioclavicular joint (ACJ) dislocation was detected according to Rockwood classification on the left shoulder (Figure 1a,b). The patient was consulted in the orthopedics department. The patient had a shoulder tomography (Figure 2) and admitted to the orthopedic clinic. Surgical operation was performed by the orthopedic clinic (Figure 3). The patient was discharged without any problem after the operation.

We wanted to present a case of ACJ separation assessed as type III in the emergency department patient with shoulder motion restriction and severe pain. ACJ separation is a rare diagnosis in patients presenting with emergency services with limited shoulder movement and severe pain. The ACJ separation is an injury that accounts for approximately 12% of shoulder injuries in all populations. This rate can reach up to 50% in athletes (1). According to the Rockwood classification, there are six types of ACJ injuries. Type I, II, III is more common and, type IV, V, VI is more rare. Type III ACJ injury is described as torning of the acromioclavicular and coracoclavicular ligaments with a pronounced elevation of the distal clavicle (25-100% widening at the coracoclavicular distance). While types I and II are typically treated conservatively, types IV and VI are often surgically treated. The management of type III injuries is still controversial (1-3). In type III AC injuries, the choice of treatment depends on the decision of the surgeon and the patient. Some studies prefer surgery to obtain anatomically of the shoulder good functioning in physically active young adults. Thus, chronic instability and pain will also be reduced (2-4). Some researchers prefer

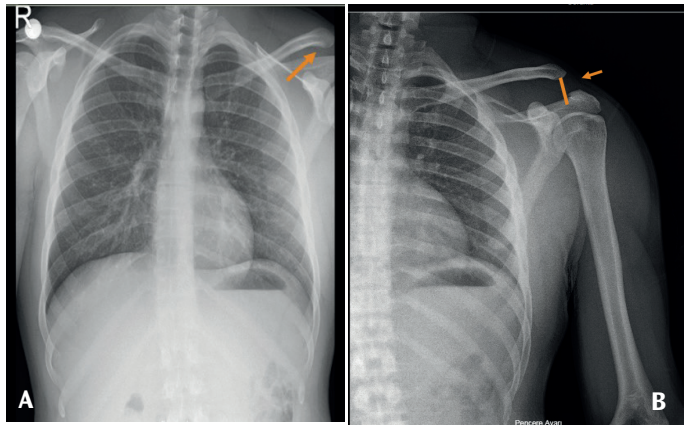

Figure 1. a,b) Type III acromioclavicular joint separation according to Rockvvood classification on left shoulder on unilateral and bilateral AP graph

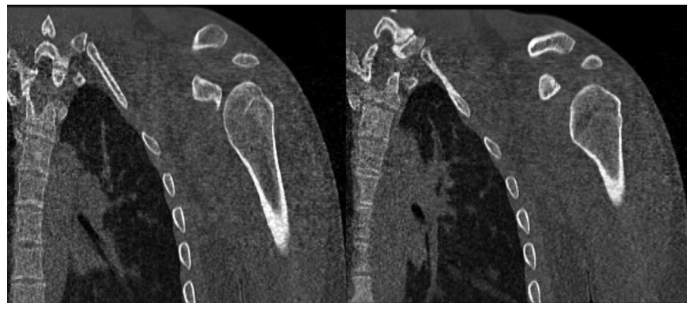

Figure 2. Acromioclavicular joint separation in the left shoulder in the captured tomography

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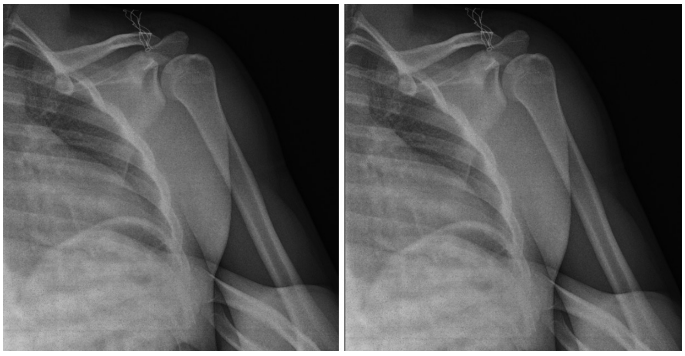

Figure 3. AP shoulder X-ray after surgery of the patient

conservative treatment especially in elderly patients due to low complication rate and duration of healing (2-5). In conclusion, most studies found no significant difference in outcomes between the operated and nonoperated groups (2,3).

It is important to remember the ACJ injuries in the emergency department with severe pain in the shoulder. The patient can face cosmetic and disability consequences when such injuries are overcome. For this reason, correct classification of the injury is important and bilateral comparative radiographies may be necessary.

Keywords: Shoulder, separation, acromioclavicular joint, emergency medicine

Ethics

Ethics Committee Approval: Not required in this study.

Informed Consent: Not required in this study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.K., S.K., G.Y., Concept: A.K., S.B., Design: A.K., S.B., Data Collection or Processing: S.K., G.Y., Analysis or Interpretation: A.K., S.B., Literature Search: A.K., Writing: A.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Ibrahim EF, Forrest NP, Forester A. Bilateral weighted radiographs are required for accurate classification of acromioclavicularseparation: an observational study of 59 cases. Injury. 2015;46:1900-5
2. Smith TO, Chester R, Pearse EO, Hing CB. Operative versus non-operative management following Rockwood grade III acromioclavicular separation: a meta-analysis of the current evidence base. J Orthop Traumatol. 2011;12:19-27.
3. Korsten K, Gunning AC, Leenan LPH. Operative or conservative treatment in patients with Rockwood type III acromioclavicular dislocation: a systematic review and update of current literature. Int Orthop. 2014;38:831-8.
4. Gstettner C, Tauber M, Hitzl W, Resch H. Rockwood type III acromioclavicular dislocation: Surgical versus conservative treatment. J Shoulder Elbow Surg. 2008;17:220-5.
5. Calvo E, Lopez-Franco M, Arribas IM. Clinical and radiological outcomes of surgical and conservative treatment of type III acromioclavicular joint injury. J Shoulder Elbow Surg. 2006;15:300-5.

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Letter to the Editor
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Patient Mismanagement by Physician Turnover

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Dear Editor,

As the first "healers" were chronicles in cave paintings, depicting the use of plants as medicines in what is today's France, the Greeks enjoy having laid the foundation of medical diagnosis, advanced medical ethics and also the Hippocratic Oath which has formed the basis of modern medicine. The connection between the doctors and their respective patients has long been under the scrutiny since the time of Hippocrates and is an issue of many ethical debates in modern literature (1,2).

With the existing and evolving model of health care, the locus of power thus has shifted within the patient's hands (3). Effective communication between the doctor and patient is essential to clinical function the result of which is the golden art of medicine and a crucial element in the timely provision of adequate healthcare. The physicians are increasingly complaining of losing patients to follow up, patients switching physicians and dealing with noncompliance to medications (1). Moreover, the constant altering of doctors breeds miscommunication between the two parties. Especially in the emergency department, the ambiguity of treatment already given, leads to polypharmacies that can result in drug interactions and eventual mismanagement of the patient. The under treatment or overtreatment can lead to exacerbation of symptoms or worse, the overall condition of the patient. Multiple drug usage could also result in lowering of the efficacy hence, the effects of the drugs on the disease (4-6).

Since the relationship between the patient and their physician determines the quality and totality of information extracted and understood which significantly influences the doctor and patient satisfaction. It is therefore necessary to minimize the strain between the doctor and patient as well as the obscure facts essential in reaching a diagnosis (7). This contributes to maintenance of standard practice and prevents physician burnout with resulting turnover and is an important determinant of compliance.

Having limited amount of knowledge or clinical evidence for decision making is not the only challenge faced by the physicians in the hospital setting. Treatment bias and differences in clinical experience and exposure also become major factors in the mismanagement of the patients. Sometimes, even the most experienced physicians make errors in diagnosing patients due to the masking of the symptoms of a disease after being managed by some other doctor and not following through properly (6,7).

The decentralization of patient care has long celebrated its negative connotations on compromised patient care. The maintenance of the interests of patients along with the physician has become an indispensable challenge to overcome in Pakistan. Emphasis is laid on organized patient care to improve the healthcare standards in the country. Adoption of the healthcare system abroad which advocates patient satisfaction as a top tier priority may now be good system to consider (8).

United States law strictly considers this sort of relationship as fiduciary where doctors are expected and required to solemnly act in their patients interests, even if that means those interests may not be very well aligned with their own (9). The patients can be encouraged to question and actively take part in their own healthcare. Increasing evidence suggest that the patients actuated in the medical encounter to partake in the decisions about their care have a better compliance, quality of life and higher patient satisfaction (10).

Similarly the positives of primary healthcare include the opportunity of establishing a strong relationship with the doctors

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and their patients. Integrated systems provide opportunities for improving the continuity of healthcare. It allows the institutions to manage and monitor the patients efficiently as well as allows the patients to have the power to decide their code. With integration, there were new responsibilities for physicians and other health care providers to maintain long lasting communication, adequate teamwork and a much more longitudinal approach towards patient care, increasing multitudes of standardized paperwork and documentation. This continuity can still be at risk by constant turnover in staff or members (9,10). As they famously say "A penny of good communication time may avert a pound of unnecessary or even harmful spending used to reassure an anxious patient or substitute for a sketchy history."

Keywords: Patient, physician, continuity of patient care, quality of healthcare, Pakistan

Ethics

Ethics Committee Approval: Aga Khan University Hospital, Karachi, Pakistan (DERC-1432).

Informed Consent: N/A.

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Authorship Contributions

Surgical and Medical Practices: H.S., M.A.B., Concept: H.S., M.A.B., Design: H.S., M.A.B., Literature Search: H.S., M.A.B., Writing: H.S., M.A.B.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Martin LR, Williams SL, Haskard KB, DiMatteo MR. The challenge of patient adherence. Ther Clin Risk Manag. 2005;1:189-99.
2. Goold SD, Lipkin M. The Doctor–Patient Relationship: Challenges, Opportunities, and Strategies. J Gen Intern Med.1999;14:S26-S33.
3. Shahin I. Managing the Psychology of Health Care: What it means and what it is worth. MJM. 2008;11:191-8.
4. Khandeparkar A, Rataboli PV. A study of harmful drug–drug interactions due to polypharmacy in hospitalized patients in Goa Medical College. Perspect Clin Res. 2017;8:180-6.
5. Rodrigues MCS, de Oliveira C. Drug-drug interactions and adverse drug reactions in polypharmacy among older adults: an integrative review . Rev Lat Am Enfermagem. 2016;24:e2800.
6. Salwe KJ, Kalyansundaram D, Bahurupi Y. A Study on Polypharmacy and Potential Drug-Drug Interactions among Elderly Patients Admitted in Department of Medicine of a Tertiary Care Hospital in Puducherry. J Clin Diagn Res. 2016;10:FC06-FC10.
7. Saposnik G, Redelmeier D, Ruff CC, Tobler PN. Cognitive biases associated with medical decisions: a systematic review. BMC Med Inform Decis Mak. 2016;16:138.
8. Mehlman JM. Why physicians are fiduciaries for theirpatients. Indiana Health Law Review. 2017;12:1-64.
9. Institute of Medicine (US) Roundtable on Evidence-Based Medicine; Yong PL, Saunders RS, Olsen LA, editors. The Healthcare Imperative: Lowering Costs and Improving Outcomes: Workshop Series Summary. Washington, DC: The National Academies Press (US) 2010. The National Academies Collection: Reports funded by National Institutes of Health.
10. Reddy A, Pollack CE, Asch DA, Canamucio A, Werner RM. The Effect of Primary Care Provider Turnover on Patient Experience of Care and Ambulatory Quality of Care. JAMA Intern Med. 2015;175:1157-62.