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DEMOGRAPHIC, ANATOMICAL AND CLINICAL FEATURES OF PATIENTS WITH GLASS-PUNCHING INJURIES

Cam Yumruk Atan Hastaların Demografik, Anatomik ve Klinik Özellikleri

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ABSTRACT

Objective: Glass-punching behavior may lead to simple injuries, or sometimes to permanent disabilities. The purpose of this study was to investigate the demographic, anatomical, and clinical features of patients presenting to the emergency department due to glass-punching, and to examine the relations between these factors.

Material and Methods: This retrospective study was performed with patients presenting to the emergency department due to glass-punching. Patients' demographic data, where the incident took place, its cause, patient's alcohol and substance use, history of psychiatric disease, the scale of the resulting injury, its location, whether it occurred in the flexor or extensor zones, accompanying injuries, and treatments administered were recorded. The chi-square test was used for data comparisons. *p* values <0.05 were regarded as significant.

Results: One hundred thirteen patents were included. Patients' mean age was 25.39 ± 7.58 years and 88.5% were male. More than half of the patients (56.6%) were single, and 83.2% were injured on the right side. Alcohol consumption at time of injury was determined in 29.2%, and 12.4% of patients had a diagnosed psychiatric disease. The flexor zone 5 (33.6%) and zone 4 (18.6%), and the extensor aspect zone 5 (49.6%) and zone 6 (36.3%) were the most commonly injured regions. No correlation was determined between gender, marital status, or presence of psychiatric disease, and zone injuries (p>0.05). However, significant correlation was determined between extensor zone 4 injury and right-side injury, and alcohol use (p= 0.036; 0.014, respectively).

Conclusion: Glass-punching behavior is commonly seen in males, in single subjects, and in the right hand. The most commonly affected regions in such injuries are extensor zones-5 and 6, and flexor zones-4 and 5. Extensor zone-4 injury is more common in right-handed subjects and those using alcohol.

Keywords: *Hand injury, glass-punching, tendon injury, trauma*

ÖZ

Amaç: Cama yumruk atmaya (CYA) davranışı, bazen basit yaralanmalara bazen de kalıcı sakatlıklara yol açar. Bu çalışmanın amacı, cama yumruk atma sonucu acil servise başvuran hastaların; demografik, anatomik ve klinik özelliklerini araştırmak ve bu faktörlerin birbiriyle olan ilişkisini incelemektir.

Gereç ve Yöntemler: Çalışma, acil servise cama yumruk atma nedeniyle başvuran hastalar üzerinde retrospektif olarak yapıldı. Hastaların demografik verileri, cama yumruk atma olayının gerçekleştiği yer, olay sebebi, olay tarihi, hastalardaki alkol ve madde kullanımı, psikiyatrik hastalık öyküsü, oluşan yaralanmanın boyutu, yeri, ekstansör ve fleksör zonda nerede bulunduğu, eşlik eden yaralanmalar ve tedaviler kaydedildi. Verilerin karşılaştırılmasında ki-kare testi kullanıldı. *p*<0.05 anlamlı kabul edildi.

Bulgular: Çalışmaya 113 hasta dahil edildi. Hastaların, yaş ortalaması 25.39 ± 7.58 /yıl olup %88.5'i erkek ve %56.6'sı bekar ve %83.2'sinin de sağ taraf yaralanması mevcuttu. Yaralanma anında %29.2'sinde alkol tespit edilirken, %12.4'ünün tanısı konmuş psikiyatrik bir hastalığı bulunmaktaydı. Hastalarda, fleksör tarafta zon-5 (%33.6) ve zon-4 (%18.6), ekstansör tarafta ise zon-5 (%49.6) ve zon-6 (%36.3) en fazla yaralanan bölgelerdi. Cinsiyet, medeni hal ve psikiyatrik hastalığı olma ile zon yaralanmaları arasında ilişki saptanmadı (p>0.05). Ekstansör taraf zon-4 yaralanması ile sağ taraf yaralanması ve alkol kullananımı arasında anlamlı ilişki saptandı (sırasıyla, p= 0.036; 0.014).

Sonuç: Cama yumruk atma davranışı sıklıkla erkeklerde, bekârlarda ve sağ elde izlenmektedir. Bu tarz yaralanmalarda, ekstansör tarafta zon-5 ve 6, fleksör tarafta ise zon-4 ve 5 en fazla yaralanan bölgelerdir. Sağ elini kullananlarda ve alkol alanlarda ekstansör taraf zon-4 yaralanması daha sık izlenir.

Anahtar Kelimeler: *El yaralanması, cama yumruk atma, tendon yaralanması, travma*

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INTRODUCTION

The hands are the organs most exposed to injury during daily activities (1). Accidental injuries to the hand occur in industrial workers, agricultural workers, and in subjects doing housework or engaged in hobbies (2, 3). However, self-harm type hand injuries caused by glass-punching are generally associated with such factors as underlying psychiatric disease or alcohol use, economic difficulties, unemployment, and family problems, and are conscious and impulsive injuries resulting from momentary anger (4-7). Injuries occurring after glass-punching may consist of simple soft tissue injury, or diffuse muscle, tendon, blood vessel, nerve or bone injury (2). Although the damage occurring in such injuries is not generally life-threatening, resulting disabilities may involve prolonged and expensive therapeutic processes (2, 8, 9). Understanding the general characteristics of injuries resulting from glass-punching and the factors underlying injury, and the ability to predict the anatomical, clinical, and functional outcomes of such injuries are therefore of great importance.

The aim of this study was to investigate the demographic, anatomical, and clinical features of patients presenting to the emergency department due to glass-punching, and to examine the relations between these factors.

MATERIALS AND METHODS

Following approval from the local ethical committee (No. 2018-12/01), patients presenting to the Kırıkkale University Medical Faculty Emergency Department, Turkey, between 1 January 2013, and 31, December 2017, were investigated retrospectively.

Study Group Determination and Data Collection

Patient data were accessed from the hospital archive and police records. Demographic data (age, gender, economic status, and marital status), date of the glass-punching incident (year, month, day, and time), where and why the incident occurred, history of alcohol and/or drug use, presence of psychiatric disease, the dominant and injured hand, the size of the injury, number of lesions, the zone, accompanying injuries, clinical examination findings, and treatments applied were recorded for all patients.

Anatomical zone maps drawn up by Klienert and Verdan were used to determine the site of the injury and the relevant flexor and extensor zone (10-12).

Accidental hand injuries, occupational accidents, patients presenting due to wall-punching, and subjects whose records were unavailable were excluded from the study.

Statistical Analysis

Statistical analysis was performed on SPSS 21.0 software (IBM SPSS Statistics 21.0, IBM Corporation, Armonk, NY, USA). Normality of data was analyzed using the Shapiro-Wilk test. Parametric data were expressed as mean ± standard deviation (SD), and categorical variables as number (n) and percentage (%). The chi-square test was used for group comparisons. $p<$values 0.05 were regarded as significant.

RESULTS

We identified 154 patients presenting to the emergency department due to glass-punching during the study period. Forty-one patients meeting the exclusion criteria were excluded, and the study was completed with 113.

Patients' mean age was 25.39 ± 7.58 (range: 8–47) years, 88.5% were male, and 56.6% were single. The employment rate was 36.3% (n=41), while 39.8% (n=45) of patients were students. Glass-punching incidents took place at home in 36.3% of cases (n=41), during arguments with friends in 26.5% (n=30), while the reason for the incident was unknown in 28.3% (n=32). Alcohol consumption was determined at the time of the incident in 29.2% (n=33) of patients, while

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12.4% (n=14) had a previously diagnosed psychiatric disease (Table 1).

Presentations to the emergency department due to glass-punching were most numerous in 2014–2015 (49.6%; n=56), in May (15.9%; n=18), on Fridays (20.4%; n=23) and between the hours of 18:00 – 00:00 (39.8%; n= 45) (Figures 1, 2, 3 and 4).

Injuries were on the right side in 83.2% (n=94) of cases, two or more lesions were observed in 79.6% (n= 96), and lesion size varied between 3–5 cm in 38.9% (n=44). Tendon damage occurred in 43.4% (n=49) of cases, vascular damage in 9.7% (n=11), nerve damage in 5.3% (n=6), and bone fracture in 4.4% (n=5), while at least two of tendon, nerve, vein, and bone damage were present in 11.5% (n=13).

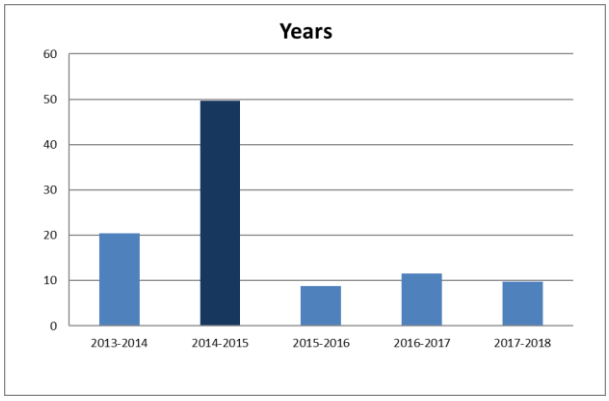

Figure 1. Distribution of patients presenting due to glass punching by years

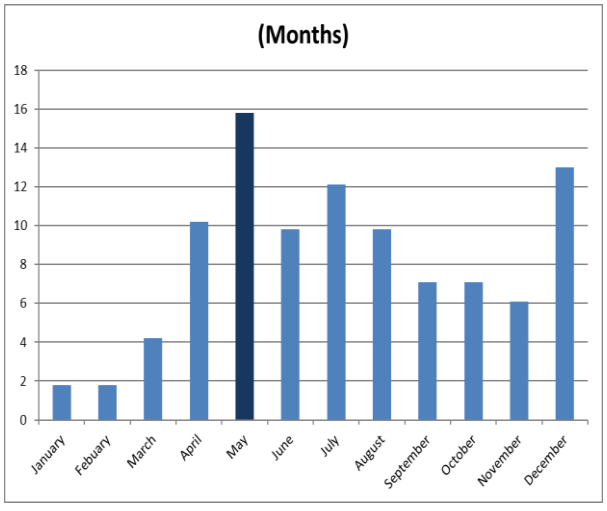

Figure 2. Distribution of patients presenting due to glass punching by months

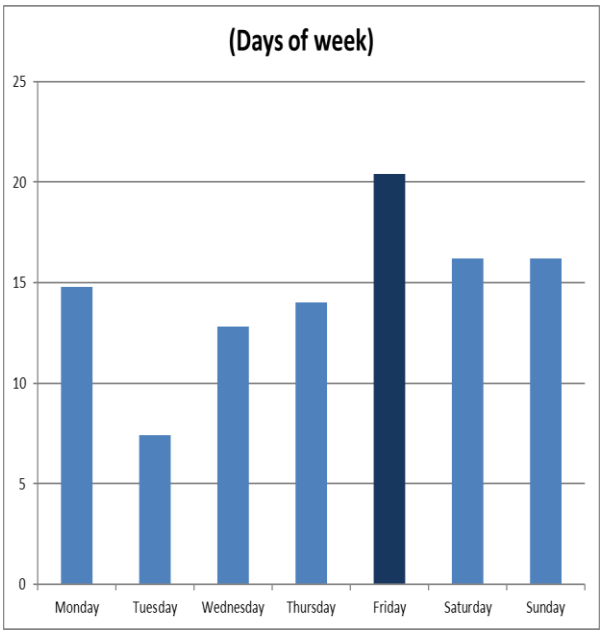

Figure 3. Distribution of patients presenting due to glass punching by days of the week

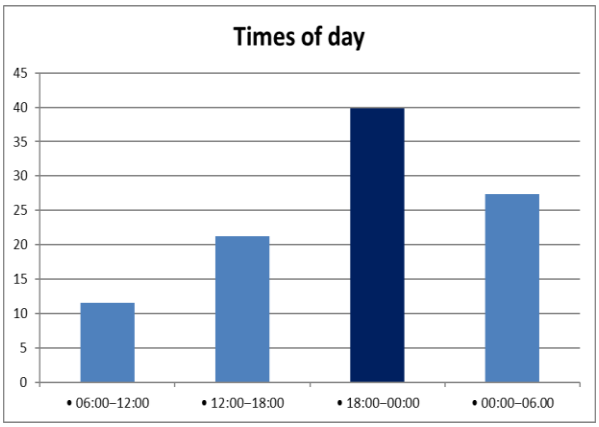

Figure 4. Distribution of patients presenting due to glass punching by times of day

The most commonly injured regions due to glass-punching were flexor zone-5 (33.6) and zone-4 (18.6%), and extensor zone-5 (49.6%) and zone-6 (36.3%) (Table 2).

No difference was determined between male and female gender in terms of zone injury ($p>0.05$), nor between married and single patients and zone injury ($p>0.05$). A difference was determined in terms of extensor zone-4 injury between the right and left sides ($p=0.036$), and also in terms of extensor zone-4 injury between alcohol users and non-users ($p=0.014$). No

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difference was determined between subjects with and without psychiatric diagnoses in terms of zone injury ($p>0.05$) (Tables 3 and 4).

Table 1. Demographic data for glass-punching patients

Gender	n (%)
• Male	100 (88.5)
• Female	13 (11.5)
Marital status	
• Married	49 (43.4)
• Single	64 (56.6)
Economic status	
• Working	41 (36.3)
• Unemployed	27 (23.9)
• Elementary education student	7 (6.2)
• University student	38 (33.6)
Scene of the incident	
• Home	41 (36.3)
• Dorm/student residence	27 (23.9)
• Workplace	7 (6.2)
• School	2 (1.8)
• Open public space	25 (23.3)
Cause of the incident	
• Argument with friends	30 (26.5)
• Argument with boy/girlfriend	21 (18.6)
• Family problems	12 (10.6)
• Work-related problems	5 (4.4)
• Financial problems	9 (7.9)
• Other (sport, politics)	4 (3.5)
• Unknown	32 (28.3)
Using alcohol at the time of the incident	33 (29.2)
With psychiatric disease	14 (12.4)

Table 2. Anatomical and clinical features of the injury region

Injured side	n (%)
• Right	94 (83.2)
• Left	19 (16.8)
Dominant side	
• Right	96 (84.6)
• Left	17 (15.4)
Number of lesion	
• One	23 (20.4)
• 2	50 (44.2)
• 3 or more	40 (35.4)
Size of lesion	
• < 2 cm	38 (33.6)
• 3–5 cm	44 (38.9)
• ≥ 6 cm	31 (27.4)
Flexor zone damage	
• Zone 1	6 (5.3)
• Zone 2	4 (3.5)
• Zone 3	2 (1.8)
• Zone 4	21 (18.6)
• Zone 5	38 (33.6)
Extensor zone damage	
• Zone 1	3 (2.7)
• Zone 2	6 (5.3)
• Zone 3	9 (7.9)
• Zone 4	15 (13.3
• Zone 5	56 (49.6)
• Zone 6	41(36.3)
• Zone 7	24 (21.2)
• Zone 8	13 (11.5)
Tendon damage	49 (43.4)
Vascular damage	11 (9.7)
Nerve damage	6 (5.3)
Fracture	5 (4.4)

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Table 3. Relations between flexor zone injuries and demographic data

Flexor damage (yes/no)	**Zone-1**	**Zone-2**	**Zone-3**	**Zone-4**	**Zone-5**
Male (n=100)	5/95	4/96	2/98	18/82	31/69
Female (n=13)	1/12	0/13	0/13	3/10	7/6
p	0.684	0.463	0.607	0.658	0.101
Married (n=49)	1/48	1/48	0/49	14/35	15/34
Single (n=64)	5/59	1/63	1/63	7/57	23/41
p	0.175	0.848	0.379	0.170	0.553
Right side (n=90)	3/87	2/88	2/88	16/74	27/63
Left side (n=23)	3/20	2/21	0/23	5/18	11/12
p	0.064	0.134	0.471	0.663	0.106
Alcohol consumed (n=33)	3/30	2/31	2/31	6/27	14/19
Alcohol not consumed (n=83)	3/77	2/78	2/78	15/65	4/56
p	0.250	0.352	0.352	0.944	0.204
Psychiatric disease present (n=13)	0/13	0/13	0/13	3/10	5/8
No psychiatric disease (n=100)	6/94	4/96	2/98	18/82	33/67
p	0.364	0.463	0.607	0.658	0.695

Table 4. Relations between extensor zone injuries and demographic data

Extensor damage (yes/no)	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**Zone 6**	**Zone 7**	**Zone 8**
Male (n=100)	3/97	5/95	9/91	14/86	49/51	35/65	20/80	10/90
Female (n=13)	0/13	1/12	0/13	1/12	7/6	6/7	4/9	3/10
p	0.527	0.684	0.260	0.528	0.742	0.431	0.372	0.164
Married (n=49)	1/48	1/48	7/42	9/40	26/23	19/30	8/41	5/44
Single (n=64)	2/62	5/59	2/62	6/58	30/34	22/42	16/48	8/56
p	0.722	0.159	0.185	0.163	0.515	0.630	0.264	0.705
Right side (n=90)	3/87	6/84	9/81	15/75	48/42	31/59	20/70	11/79
Left side (n=23)	0/23	0/23	0/23	1/22	8/15	10/13	4/19	2/21
p	0.375	0.203	0.114	**0.036**	0.112	0.421	0.613	0.636
Alcohol consumed (n=33)	1/32	3/30	4/29	9/24	16/17	10/23	6/27	5/28
Alcohol not consumed (n=80)	2/78	3/77	5/75	6/74	40/40	31/49	18/62	8/72
p	0.873	0.064	0.295	**0.014**	0.884	0.396	0.610	0.435
Yes Psychiatric disease (n=13)	1/12	1/12	0/13	0/13	6/7	4/9	4/9	1/12
No psychiatric disease (n=100)	2/98	5/95	9/91	15/85	50/50	37/63	20/80	12/88
p	0.722	0.685	0.260	0.134	0.794	0.660	0.372	0.647

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DISCUSSION

Self-harm behavior resulting from glass-punching is a psychiatric disorder with orthopedic, reconstructive, and neurovascular outcomes (3, 13, 14). This behavior is particularly common among males in their second and third decades, alcohol or substance users, and in patients with schizophrenia, and antisocial or borderline personality disorder (5-7, 15). Aggressive behavior toward both their surroundings and other people on the part of patients exhibiting self-harm behavior may sometimes be directed against objects such as glass, mirrors, bottles, walls, and timber (16). The hand that patients employ to strike these objects is normally the dominant hand used in normal life (9, 17, 18). Studies have reported that glass-punching often occurs in the home or in public places, and that the incidence increases on special occasions, such as match finals, weekends, New Year's, or birthdays (2, 9). In addition, acts of violence and associated injuries are known to increase in line with changes in weather conditions, and particularly during hot weather and during the night (19-21). This is thought to derive from increased alcohol consumption and due to increased interpersonal interactions in warm seasons (19-21). The extent of glass-punching injuries is not directly proportional to damage occurring in tendons, nerves, blood vessels, or osseous structures, and severe damage may occur to these structures even in the event of small injuries (22, 23). The mean age of the patients in our study was 25, and the study population was predominantly a young one, including university and elementary students. Glass-punching incidents were most common in Spring-Summer, and in December close to New Year. Injuries in the majority of cases occurred at night (18:00–00:00) and in the home, and the number of injuries occurring in dorms or student residences was also significant. This may be attributed to the large number of university students in our study. Glass-punching generally occurred following arguments with friends or a girl/boyfriend. However, a significant proportion of patients cited no reason for the incident. Additionally, glass-punching events were most common on Friday, and increased toward the weekend. Twenty-nine percent of patients had imbibed alcohol at the time of the incident, and 12% had a previous psychiatric diagnosis. Hand injuries were frequently on the right and in the dominant hand. A single cutaneous lesion associated with glass-punching was observed in only one patient in five, and lesion dimensions exceeded 3 cm. These data are compatible with the results from previous publications regarding glass-punching or hand injuries.

Understanding the anatomical and clinical significance of damage that may appear in hand injuries is highly important in terms of appropriate treatment aimed at preventing potential subsequent disability. For that reason, anatomical classifications for use in hand surgery and therapeutic protocols were developed following the Second World War in particular, by Bunnel and later by Verdan amd Kleinert, and upper extremity injuries were examined by division into flexor and extensor zones (10-12, 24). Şakrak et al. assessed accidental hand injuries in general terms and reported that glass-punching was the second most common etiology in these patients (25). That study also reported that flexor zones-2 and 5, and extensor zones-2, 6 and 7 were most commonly affected in hand injuries caused by traumatic mechanisms, while in another study, Keskin et al. cited flexor zones-2 and 5, and extensor zone-5 as the most common injury sites (17, 25). In our study, flexor zones-4 and 5, and extensor zones-5 and 6 were the most common sites. These data are compatible with the previous literature, with any differences being attributed to our study involving only glass-punching cases. During glass-punching, zones-3, 4, 5, 6, 7, 8 of the extensor aspect are directly or indirectly affected by the breaking glass, while since zones-1 and 2 remain inside the clenched fist and are not exposed to glass-punching injuries. Similarly, zones-1, 2, 3 on the flexor aspect also

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remain inside the clenched fist and are less affected by the glass shards, while zones-4 and 5 are more exposed to injury. Gökhan et al. reported that flexor zone-4 and 5 injuries derive from broken glass fragments damaging the wrist area in particular as the fist is being withdrawn (9). From that perspective, our results are valuable in terms of showing anatomical zones affected by glass-punching injuries.

Studies of hand injuries have reported alcohol being detected in 15-51% of patients (26-28). Previous studies have also reported that alcohol consumption beginning 6 h before injury increases the risk of injury 1.5-fold (29, 30). Levels of self-harm, which range between 4% and 14% in the general population, are higher among individuals with psychiatric disease (31, 32). In addition, the right hand is frequently involved in hand injuries resulting from self-harming, and patients are often single males aged 20-30 (2, 3, 9, 17, 25). In our study, use of the right hand and alcohol consumption were correlated with extensor zone-4 injury, but no correlation was observed between other variables and zone injuries. This may be due to extensor zone-4 constituting the area where the fist impacts on the external object. In addition, the greater incidence of extensor zone-4 injuries among subjects using their right hands is associated with the great majority of our patients being right-handed. On the other hand, it is also possible that zone-4 injuries were more common due to subjects who had consumed alcohol being unable to fully control their balance or punch force.

There are a number of limitations to this study. The first is that since the research was planned retrospectively, the study data rely entirely on patient files or police records. Incomplete or incompletely recorded data may therefore have affected our findings. Secondly, although the individual harms himself as a result of glass punching behavior, the incident is still one with legal implications. Some patients may have concealed these incidents at presentation to the emergency department and have attributed their injuries to some other trauma mechanism. This may have resulted in a decrease in the number of patients in the study.

Self-harm behavior resulting from glass-punching is associated with various causes. It is frequently seen in males, in single subjects, and on the right side. The most commonly damaged areas in such injuries are extensor zone-5 and 6, and flexor zones-4 and 5. Extensor zone-4 injury is more common among individuals who use their right hands and who consume alcohol.

Conflict of interest: None.

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