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Demographical, clinical, and psychological differences of patients who suffered hand injury accidentally and by punching glass

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Objective: The aim of this study was to compare patients who were injured by punching glass with patients who were injured accidentally, according to demographical, clinical, and psychological parameters.

Methods: The Hand Injury Severity Score (HISS), the Duruöz Hand Index, the Quick Disabilities of the Arm, Shoulder and Hand scale (Q-DASH), the Impact of Event Scale-Revised (IES-R), the Adult Attention-Deficiency/Hyperactivity Scale (A-ADHS), the Borderline Personality Inventory (BPI), and the Beck Depression Inventory (BDI) were used for evaluating severity of the injury, functionality, impact of the injury on the patient, attention deficiency, patterns of borderline personality symptoms, and level of depression, respectively.

Results: Patients who were injured by punching glass were significantly younger and more likely to injure their dominant hand. The severity of injury and all psychological scales were significantly higher in patients who were injured by punching glass.

Conclusion: Hand therapy specialists should be aware of potential problems in patients who were injured by punching glass.

Keywords: Hand injury/injuries; post-traumatic; psychology; rehabilitation; stress disorder.

Severe hand injuries often cause permanent impairment, resulting in psychological, social, and economic problems.[1] The majority of hand traumas are accidental, including industrial injuries, hobby- and home-related injuries, and traffic accident-related injuries. In industrial injuries, which constitute a significant percentage of injuries, attention deficiency is one of the leading causes of injury.[2,3] One study reported that individuals with adult attention-deficit hyperactivity disorder (ADHD) have a 2 times higher risk of workplace accidents and that these individuals exhibit poorer job performance (4–5%) than colleagues as a result of absenteeism due to illness.[2] In addition to workplace accidents, adult ADHD subjects have been found to have a higher risk of traffic- and leisure-related accidents.[3]

Punching glass is reported as an injury mechanism

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for hand trauma. Problem-solving skills have been reported to be worse in those who punch glass than in control groups,[4] and impulsive anger behavior has been reported as a common cause of such behavior.[5] These individuals have been reported to use the denial mechanism instead of consulting a professional to help them deal with their problems.[6,7] The incidence of psychiatric disease has been found to be much higher among subjects who injure themselves by punching a wall than among the general population.[4] Pre-injury psychopathology and alcohol/drug abuse have been found to be associated with penetrating injuries and incidence of trauma. In particular, intentional self-inflicted injury among young men resulting from poor impulse control eventuates during discussions or fights.[8–10]

Psychological problems, especially during the post-traumatic period, have been the subject of research since the early 1980s, and the most commonly reported disorders are stress and anxiety disorders, major depression, and post-traumatic stress disorder (PTSD).[11–15] Psychiatric disorders (panic disorders, depression, personality disorders, etc.), insufficiencies in accuracy and/or appropriateness of perceptions and judgments have been demonstrated, especially in patients with complex regional pain syndrome and traumatic amputations of the upper extremities.[11,16–18]

The aim of this study was to compare demographical, clinical, and psychological parameters of 2 patient groups: the 1st group consisting of patients who were injured accidentally, and the 2nd group consisting of patients who were injured by intentionally punching glass.

Patients and methods

Patients between the ages of 18–65 years were recruited from 2 centers. Patients with any type of trauma (tendon, nerve, fractures, burns, amputation, or any combination of these) that had occurred at least 3 months prior were included in this series. Patients were informed of the aim of the study, and those who agreed to participate signed a document providing informed written consent. All questionnaires were given in the same order and completed by patients under the supervision of a research assistant. Patients who experienced any difficulty with reading or comprehension were given assistance. The questionnaire included information regarding history of alcohol use, sleep disturbance, medication for sleep disturbance, psychiatric illness, and previous hand injury.

Assessment methods:

1. Determination of clinical severity of the hand trauma via Hand Injury Severity Score (HISS).
2. Functional assessment via Duruöz Hand Index (DHI) and Quick Disabilities of the Arm, Shoulder and Hand (Q-DASH).
3. PTSD assessment via Impact of Event Scale-Revised (IES-Revised).
4. Assessment of attention deficiency via Adult Attention-Deficiency/Hyperactivity Scale (A-ADHS).
5. Assessment of personality disorders via Borderline Personality Inventory (BPI).
6. Assessment of depression via Beck Depression Inventory (BDI).

Details of the scales and the questionnaire are summarized in Table 1.

The HISS is an assessment system that considers the main structures of the hand and carpal region separately, i.e., skin, skeletal, motor, and neural (SSMN) structures. Each category was detailed to cover all possible patterns of injury, and each specific injury was scored according to its relative importance. The individual SSMN structures should be assessed separately. Although the minimum score is 0, the maximum score can be changed according to the tissues injured.[19]

The DHI is a self-assessment tool and includes 18 items regarding hand abilities in kitchen work, dressing, personal hygiene, job work, and other general activities. Patients score their abilities from 0 (no difficulty) to 5 (impossible to do) (Table 1). Higher scores represent more activity restriction and more difficulty in activities of daily living (ADL).[20] The validity and reliability of the Turkish version of the questionnaire have been established in patients with traumatic hand injury.[21]

The Q-DASH is a self-administered questionnaire obtained from the DASH Outcome Measure. The Q-DASH uses 11 items instead of 30 items to measure physical function and symptoms in people with any or multiple musculoskeletal disorders of the upper limb. The Q-DASH is scored in 2 components: the disability/symptom section (11 items, scored 1–5) and the optional high performance sport/music or work modules (4 items, scored 1–5). In this study, the disability/symptom section was used. To calculate the Q-DASH disability/symptom section score, at least 10 of these 11 items should be answered. Each item includes 5 response options, and the total score is calculated as the sum of the scores on each item. Scores range from 0 (no disability) to 100 (the most severe disability).[22] The validity and reliability of the Turkish version of the questionnaire have been established.[23]

The IES-R is a self-administered questionnaire that was developed to evaluate the symptoms of traumatic

Table 1. Features of the scales.

Scale	Objective	Min.-Max. score	Grades and cut-off scores
Hand Injury Severity Score	To grade the severity of hand injury	0–dependent on injured tissue	<20: mild injury; 20–50: moderate injury; 50–100: severe injury; >100: major injury
Duruöz Hand Index	Self-assessment questionnaire for evaluation of hand functions	0–90	N/A, Higher scores represent more activity restriction
Quick-Disabilities of Arm, Shoulder and Hand Scale	Self assessment questionnaire for evaluation of upper extremity functions	0–100	N/A, Higher scores represent more activity restriction
Impact of Event Scale-Revised	Self-assessment questionnaire for evaluation of traumatic stress symptoms	0–88	≥33 cut-off score suggests probable diagnosis of post-traumatic stress disorder
Adult Attention-Deficiency and Hyperactivity Scale	Self-administered questionnaire for screening A-ADHD* and establishing symptom severity	0–144	<20: mild level of symptoms of A-ADHD; 20–59: moderate level of symptoms of A-ADHD; >60: high level of symptoms of A-ADHD
Borderline Personality Inventory	Self-assessment tool covering all aspects of the symptoms of borderline personality	0–51	Cut-off score is 15/16
Beck Depression Inventory	Self-administered questionnaire for level of depression	0–63	0–7: normal; 8–13: minimal depression; 14–19: mild depression; 20–28: moderate depression; 29–63: severe depression

*A-ADHD: Adult attention-deficiency/hyperactivity disorder.

stress. The scale consists of 22 questions which the individual scores according to the severity of his/her symptoms over the past 7 days. It consists of 3 subscales: an intrusion subscale (questions 1–3, 6, 9, 14, 16, 20), an avoidance subscale (questions 5, 7, 8, 11–13, 17, 22), and a hyperarousal subscale (questions 4, 10, 15, 18, 19, 21). Each item is evaluated on a 5-point scale (0–4). Despite the lack of an exact cut-off score, a score of ≥33 suggests a probable diagnosis of PTSD (Table 1). The validity and reliability of the Turkish version of the scale have been established.[24,25]

The A-ADHS is a self-administered questionnaire developed to screen adult attention-deficiency and hyperactivity disorder (A-ADHD) according to DSM-IV criteria and to investigate the severity of the symptoms. Each item of the scale is scored from 0–3, and the maximum total score is 144. In terms of the total score, scores of <20, 20–59, and >60 indicate mild, moderate, and high levels of symptoms of A-ADHS, respectively (Table 1). The validity and reliability of the Turkish version of the scale have been established.[26]

The Borderline Personality Inventory is a self-assessment tool which covers all aspects of the symptoms of borderline personality disorder (BPD). It consists of sets of identity confusion, primitive defense mechanisms, and reality distortion symptoms. The scale is comprised of 52 items which are answered as "true" or "false." The items marked as "true" are scored as 1 point, and those marked as "false" are scored as 0 points. The total score is calculated by the sum of the scores of the first 51 of the 52 items. The cut-off score was reported as 15/16 in a validation study using the Turkish version (Table 1).[27]

The Beck Depression Inventory BDI is a self-administered questionnaire developed to measure a patient's level of depression. The scale consists of 21 multiple-choice questions which are scored from 0–4. The total score ranges from 0–63 (Table 1).[28] The validity and reliability of the Turkish version of the scale have been established.[29]

Statistical analysis was performed using Microsoft Office SPSS 17.0 (SPSS Inc., Chicago, IL, USA) software. Mann-Whitney U test was used to compare the numeric data, and chi-square test was used to compare categorical variables between groups. P values <0.05 were considered statistically significant.

Results

A total of 146 patients (119 male and 27 female) with a mean age of 37.03±11.9 years were recruited. Average time between the event or surgery and evaluation of patients was 15.6±3.3 weeks. The patients were divided into 2 subgroups: patients who were injured by punching glass (n=18) and patients who sustained accidental

injuries (n=128). Patients who were injured by punching glass were younger than accidentally injured patients; mean age of patients 28.4±11.5 and 27.1±10.08 years respectively. Additionally, patients who were injured by punching glass were more likely to have injured their dominant hands than the accidentally injured patients. Data on education, occupation, history of alcohol use, previous hand injury, diagnosis of psychiatric disorders, sleep disturbances, and use of sleep medications are shown in Table 2; no significant differences were found between the 2 subgroups in terms of the mentioned parameters. The use of sleep medications was higher in patients who were injured by punching glass than the accidentally injured patients (p=0.055) (Table 2).

A significant difference was found in terms of injured tissues (Table 3). It was observed that the injured tissues were predominately flexor tendon, nerve, and tendon+nerve in patients who were injured by punching glass. This distribution was not observed in the accidentally injured group.

Table 2. Comparison of demographical and clinical features between accidentally injured patients and patients injured by punching glass.

	Patients who were injured accidentally (n=128) (87.7%)	**Patients who were injured by punching glass (n=18) (12.3%)**	**p**
Age (years)	38.4±11.5 (18–65)	27.1±10.8 (18–65)	0.001
Gender			
Male	104 (81.2%)	15 (83.3%)	0.83
Female	24 (18.8%)	3 (16.7%)	
Mean time between injury /trauma and evaluation (weeks)	15.5±3.3 (12–24)	16.4±3.5 (12–23)	0.25
Education			
Illiterate	1	1	
Primary	89	10	0.32
Moderate	22	4	
High	16	3	
Occupation			
Worker	60	10	
Housewife	18	3	
Carpenter	13	0	
Technician	14	1	
Retired	8	0	0.22
Student	4	3	
Officer	1	0	
Unemployed	1	1	
Other	9	0	
Dominant hand injury	63	15	0.007
History of alcohol use			
No	126	18	0.59
Yes	2	0	
History of previous hand injury			
No	96	14	0.79
Yes	32	4	
Diagnosis of psychiatric disorders			
No	121	14	0.25
Yes	7	4	
Sleep disturbance			
No	103	12	0.18
Yes	25	6	
Use of sleep medications			
No	125	16	0.055
Yes	3	2	

Table 3. Comparison of injured tissues between accidentally injured patients and patients injured by punching glass.

	Patients who were injured accidentally (n=128)	Patients who were injured by punching glass (n=18)	p
Flexor tendon	14	6	
Extensor tendon	18	0	
Nerve	7	3	
Fracture	34	0	
Flexor tendon+nerve	24	9	0.02
Extensor tendon+fracture	14	0	
Extensor tendon+nerve	3	0	
Flexor tendon+extensor tendon+nerve+artery	4	0	
Extensor tendon+fracture+nerve	1	0	
Amputation (interphalangeal joints)	9	0	

The severity score and mean total score on the IES-R, A-ADHS, BPI, and BDI of patients who were injured by punching glass were significantly higher than those of the accidentally injured patients ($p<0.05$). Both Q-DASH and DHI scores were not significantly different between the 2 groups ($p>0.05$) (Table 4).

Since the mean age of punching glass group was 27.1±10.8 years, and there was significant difference between the 2 groups, patients older than 38 years in the accidentally injured group were excluded. Thereby, a subgroup of accidentally injured patients was obtained (61 patients with a mean age of 28.2±5.8 years) with the similar age of the punching glass group. Analysis of the demographic and clinical features is demonstrated in Table 5. Only dominant hand injury was more predominant in patients who were injured by punching glass, similar to the whole group analysis ($p=0.004$). Comparisons of the severity score, mean total score on the IES-R, A-ADHS, BPI, and BDI of patients who were injured by punching glass were significantly higher than those of the subgroup of accidentally injured patients ($p<0.05$). Both Q-DASH and DHI scores were not significantly different between the 2 groups ($p>0.05$) (Table 5).

Discussion

In the present study, the patients who were injured by punching glass were younger, and they were more likely to injure their dominant hands than the accidentally injured patients. Severity of the injury, level of event impact, mean BPI score, A-ADHD score, and BDI score were significantly higher in patients who were injured by punching glass. While mild attention deficiency was present in the accidentally injured patients, the patients who were injured by punching glass had moderate attention deficiency and depression.

Studies of patients with self-inflicted hand injuries have noted that >90% are male, 80% injure their dominant hand, mean age is 24–26 years, and that they are

Table 4. Comparison of severity of injury scores, functional assessment scores, level of event impact scores, personality scores, and depression scores between accidentally injured patients and patients injured by punching glass.

	Patients who were injured accidentally (n=128)		Patients who were injured by punching glass (n=18)		p
	Mean±SD	Min.–max.	Mean±SD	Min.–max.	
HISS	25.3±25.6	2–160	34.2±26.1	4–116	0.03
DHI score	22.2±22.3	0–90	27.9±29.8	0–98	0.48
Q-DASH score	28.1±23.5	0–98	35.2±28.2	0–86	0.30
IES-R total score	16.9±11.03	0–44	23.7±10.2	4–38	0.01
A-ADHS total score	17.7±16.1	0–719	32.6±21.6	1–96	0.001
BPI total score	6.7±6.7	0–30	16.8±12.0	2–42	0.001
BDI total score	7.7±9.1	0–45	14.1±14.6	1–56	0.02

HISS: Hand Injury Severity Score; DHI: Duruöz Hand Index; Q-DASH: Quick Disabilities of Shoulder Arm and Hand; EIS-R: Event of Impact Scale-Revised; A-ADHS: Adult Attention Deficiency and Hyperactivity Scale; BPI: Borderline Personality Inventory; BDI: Beck Depression Inventory.

Table 5. Comparison of severity of injury scores, functional assessment scores, level of event impact scores, personality scores, and depression scores between accidentally injured patients and patients injured by punching glass (Age corrected).

	Patients who were injured accidentally (n=61)		Patients who were injured by punching glass (n=18)		p
	Mean±SD	Min.–Max.	Mean±SD	Min.–Max.	
HISS	21.4±19.9	2–100	34.2±26.1	4–116	0.007
DHI score	16.4±19.7	0–90	27.9±29.8	0–98	0.09
Q-DASH score	22.8±21.9	0–98	35.2±28.2	0–86	0.07
IES-R total score	13.4±10.2	0–42	23.7±10.2	4–38	0.001
A-ADHS total score	16.2±15.6	0–66	32.6±21.6	1–96	0.01
BPI total score	6.03±6.1	0–24	16.8±12.0	2–42	0.001
BDI total score	6.3±8.4	0–35	14.1±14.6	1–56	0.005

HISS: Hand Injury Severity Score; DHI: Duruöz Hand Index; Q-DASH: Quick Disabilities of Shoulder Arm and Hand; EIS-R: Event of Impact Scale-Revised; A-ADHS: Adult Attention-Deficiency and Hyperactivity Scale; BPI: Borderline Personality Inventory; BDI: Beck Depression Inventory.

younger than control groups.[5,7,30] These observations held true for the patients in our study who were injured by punching glass. Although a previous study stated that education level is significantly lower in patients with self-inflicted injuries, education level of the 2 groups was similar in our study.[7]

Self-inflicted hand injuries are closely associated with alcohol use. Trybus et al.[10] reported that the majority of injuries at home, in particular, occur following consumption of alcohol. The percentage of patients with a history of alcohol use was not high in either group in this study, and there was no significant difference between the 2 groups. This situation is probably related with the cultural and religious values of Turkey. Interestingly, although sleep problems were more common in the accidentally injured patients, a higher percentage of those who were injured by punching glass were using sleep medications. This may suggest a tendency toward drug addiction or an inadequacy of coping strategies in this group of patients. Similarly, Ozen et al.[7] also found inadequate problem-solving skills in patients who were injured by punching glass, compared with control patients.

It has been reported that the most common tissues injured by punching glass are tendons, nerves, and arteries.[30] In our study, tendon and nerve injuries predominated in the patients who were injured by punching glass, whereas a wide range of tissue types were injured in the accidentally injured patients. Moreover, the injuries were more severe in the cases of punching glass compared with the accidental injuries.

Studies of the psychological status of patients with traumatic hand injuries have focused on PTSD, anxiety, and depression.[11,14,15,31–36] Nearly 50% of work-related injuries of the upper extremities have been found to be associated with the development of PTSD.[14,37,38] In a study evaluating 67 patients with hand injuries, 44 of the patients had experienced some symptoms of PTSD, although they did not fulfill the diagnostic criteria.[39] Another study reported increased trauma-related distress symptoms in almost half of patients with self-inflicted injuries.[40] In our study, neither group reached the reported cut-off scores, but the mean IES-R total scores were significantly higher in patients who were injured by punching glass, compared with the accidentally injured patients.

Although it has been suggested that the premorbid psychological status of patients inhibits recovery following injury, other authorities believe that the injury is the result of anxiety, depression, and anger.[9,12] Factors affecting the psychological compliance of patients with upper extremity injuries include personality disorders, resentment, anger, and bitterness, all of which can limit the patient's communication skills. The current emotional state of patients is also affected by their personality, so that the patient's personality might be responsible for the trauma.[12] In this context, emotional dysregulation (ED) associated with BPD—characterized by impulse control disorder, aggression, cognitive dysfunction, and dissociation—is particularly noteworthy in patients with self-inflicted injuries.[41] Several studies have proposed the existence of a structural relationship between BPD and lifelong risk of trauma.[41,42] Trauma may be due to patients' impulsivity, chaotic relationships, and/or substance use and alcohol dependence, all of which may increase the risk of PTSD.[42,43] In our study, patients who were injured by punching glass had significantly higher scores on both the EIS-R and BPI than the accidentally injured patients, providing valuable data about their psychological profile.

In a study of patients admitted to an orthopedic clinic, the frequency of A-ADHD was investigated in trau-

ma patients, with non-trauma patients used as a control group. The authors reported that A-ADHD was found in 62% of the trauma patients and in 13% of the control subjects.[3] In our study, the A-ADHS scores were significantly higher in the patients who were injured by punching glass than in the accidentally injured patients. Similar to PTSD, A-ADHD is also included in DSM-IV Axis 2, and it shares similar core diagnostic criteria with BPD.[44,45]

Many studies that have evaluated the role of psychological factors in injuries have focused on patients with hand injuries, upper extremity injuries, or general trauma.[4–7,10–15,31–36] The present study is the 1st to compare the differences in terms of various demographical, clinical, and psychological features of patients with only hand injuries. The scales used for psychological evaluation were all self-assessment questionnaires for screening disorders. The patients in our study were not evaluated by a psychiatrist. Thus, a limitation of this study is that the exact diagnosis was unknown. The other limitations are that some patients experienced difficulty reading the questionnaires, some patients experienced boredom reading the questionnaires, and the small sample size of the punching glass group.

Mutilating hand injuries should be treated from a biopsychosocial perspective. The integrity of the patient's anatomy and realization of the optimum range of motion or muscle strength are considered successful outcomes of management. Quality of life should be optimized when considering factors such as pre-injury medical history, personality, psychological make-up, social and cultural background, employment, and hobbies.[46] Preoperative psychiatric evaluation is not possible in cases of hand injuries requiring emergency surgery.[12] However, postoperative psychological assessment may be beneficial in eliminating adjustment problems faced by physicians in the rehabilitation period.

Since the patients who were injured by punching glass were younger and more likely to injure their dominant hands, it was postulated that they would experience more function loss in the future. When we considered the high scores of attention deficiency, borderline personality disorder, depression, and the event impact responses of patients injured by punching glass compared to accidentally injured patients, we concluded that hand surgeons, physicians, and hand therapy specialists should be aware of potential injury related-psychological problems, especially in patients who were injured by punching glass, and that they should work collaboratively with psychiatrists.

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