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Prevalence of Upper Extremity Injuries in Military Personnel and the Assessment of Disability Conditions according to Military Regulations

Askeri Personel Üst Ekstremite Yaralanmalarının Yaygınlığı ve Sakatlık Durumlarının Askeri Yönetmeliklere Göre Değerlendirilmesi

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ABSTRACT

Objective: Musculoskeletal injuries have an essential place among the injuries of military personnel. Depending on the severity of these injuries and the degree of functional loss, return to work is delayed, and sequela leads to job loss and disability as well. This study has aimed to assess the distributions of current injuries and make recommendations to reduce these injuries and evaluate the conditions causing disability.

Material and Method: Upper limb injury distribution and disability status of injured contracted soldiers/NCOs, who applied to a tertiary trauma center between January 2019 and January 2020, were evaluated according to Turkish Armed Forces Health Ability Regulation No. 6405.

Results: The number of patients included in the study was 31. Their mean age was 21.45. A significant relationship was found when the relationship between injured areas and disability occurrence was evaluated (p=0.036). In this relationship, it was observed that the possibility of especially hand (excluding finger), forearm, and upper arm injuries to cause disability was high and that although the number of finger injuries was high, their possibility to cause disability was at 60%. There was no significant difference between combat and noncombat occupational accidents in terms of the injured areas (p=0.305).

Conclusion: Although injuries in military personnel require long rest periods and finger loss poses a major obstacle to serving, there are loss of rights due to the limited disability conditions and insufficient details of the regulations. It is recommended that military guidelines be made more functional, reviewed by a board that includes a hand surgeon, increased training, and the development of double-stage security systems and protective equipment.

Keywords: *Musculoskeletal injuries, Military personnel, Sequelae, Work accidents.*

ÖZET

Giriş: Askeri personel yaralanmaları arasında kas-iskelet yaralanmaları önemli bir yere sahiptir. Bu yaralanmaların ciddiyetine ve fonksiyonel kaybın derecesine bağlı olarak işe dönüş gecikir ve sekel, iş kaybına v esakatlığa da yol açar. Bu çalışmada, mevcut yaralanmaların dağılımlarının değerlendirilmesi ve bu yaralanmaların azaltılmasına yönelik önerilerde bulunulması ve engelliliğe neden olan durumların değerlendirilmesi amaçlanmıştır, bunu etkileyen sosyal, demografik ve klinik özellikleri belirlemek ve tanı yöntemlerinin duyarlılığını karşılaştırmaktır.

Materyal ve Metot: Ocak 2019-Ocak 2020 tarihleri arasında üçüncü basamak bir travma merkezine başvuran sözleşmeli asker/ Astsubayların üst ekstremite yaralanma dağılımı ve sakatlık durumları, 6405 Sayılı Türk Silahlı Kuvvetleri Sağlık Yetenekleri Yönetmeliğine gore değerlendirildi.

Bulgular: Çalışmaya alınan hasta sayısı 31'di. Yaş ortalamaları 21.45'ti. Yaralanan alanlar ile sakatlık oluşumu arasındaki ilişki değerlendirildiğinde anlamlı bir ilişki bulundu (p=0,036). Bu ilişkide özellikle el (parmakhariç), önkol ve üst kol yaralanmalarının sakatlığa neden olma olasılığının yüksek olduğu ve parmak yaralanmalarının sayısı yüksek olmasına rağmen sakatlığa neden olma olasılıklarının %60 olduğu görüldü. Yaralanan alanlar açısından muharebe ve muharebe dışı iş kazaları arasında anlamlı fark bulunmadı (p=0,305).

Sonuç: Askeri personelde yaralanmaların uzun istirahat raporlarını gerektirmesi ve parmak kayıplarının görev yapmaya büyük engel oluşturmasına rağmen, maluliyet koşullarının sınırlı ve yönetmeliklerin yetersiz detayları nedeniyle hak kayıpları yaşanmaktadır. Askeri yönergelerin daha işlevsel hale getirilmesi, bir el cerrahisi uzmanının da yer aldığı bir kurul tarafından gözden geçirilmesi, eğitimlerin artırılması, çift kademeli güvenlik sistemlerinin ve koruyucu ekipmanların geliştirilmesi önerilmektedir.

Anahtar kelimeler *Kas-iskelet yaralanmaları, Askeri personel, Sekel, İş kazaları.*

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INTRODUCTION

Many of our military personnel get injured due to military actions in the eastern border of our country, and an important part of these injuries are orthopedic problems especially hand injuries. A part of these injuries is caused by firearm injuries, the other part and occurs during the use of explosives. There are quite a limited number of studies on injuries of military personnel in our country, and these studies have found that the costs have increased due to high rates of amputation and due to serious complications in military personnel injuries (Bektaş et al., 2020). Epidemiological studies have been performed worldwide on combat-related musculoskeletal and hand injuries of military personnel (Amako et al., 2005; Anakwe et al., 2006; Miller et al., 2011). In our country, according to the Turkish Armed Forces Health Ability Regulation No. 6405, these injuries cause various disabilities, similar to the study conducted by Atik et al., (2019). Our aim in this study is to analyze the workforce losses of injured soldiers applying to a tertiary health institution and measures to increase their protection from injury, accompanied by current literature.

MATERIAL and METHOD

The files of contracted soldier/NCO (non-commissioned officer) military personnel patients who have been admitted to the Orthopedic outpatient clinic and Emergency Department of Faculty of Medicine, Van Yuzuncu Yil University, and diagnosed with musculoskeletal or hand injuries between January 2019 and January 2020 were obtained from automation records. A total of 121 patients were excluded from the study, those who were not contracted soldiers or NCOs or those who were not with the military as well as those patients who did not have upper extremity orthopedic injuries. The reason for choosing the contracted soldier/NCO group is that when there is permanent disability, the soldiers in this category cannot be subordinated and cannot continue their work. A total of 31 patients meeting these criteria were included in the study. Injured areas were grouped as a finger injury, hand (excluding fingers) injury, as well as the forearm, upper arm, and shoulder injuries. In the Guideline of Turkish Armed Forces, Health Regulations No: 6405 for contracted soldiers/NCOs, injuries corresponding with B and D groups of main titles, Musculoskeletal System Diseases, and Plastic and Reconstructive Surgery, create permanent disability for this military group. A and C groups cover no disability or temporary disability. After the injured areas of all patients were grouped, their conditions covering disability criteria according to military guidelines were determined. In addition, the most commonly injured areas were assessed, and potential weak points in available protective equipment were detected. The study was conducted according to the World Medical Association Declaration of Helsinki. The local ethics committee of the University hospital approved the study on 22.05.2020 with approval number 03-23.

Statistical analysis

The required statistical analyses were performed with SPSS 23 statistical software. Categorical variables were presented as numbers and percentiles. Fisher Exact test was used to determine whether there was a relationship between classifications and admission times, classifications and treatment status, treatment status according to the cities, and between admission times according to the cities.

RESULTS

The contracted soldiers/NCOs included in the study were between the ages of 20-25, and their mean age was 21.45. Age and conditions for disability were compared (p=0.781), and no relationship was found. 67.7% of the total cases (21 cases) injured their dominant upper extremity. No relationship was found between dominant extremity injuries and disability occurrence (p=0.602). While 19 cases were injured during combat-related occupational accidents, 12 cases were injured during noncombat-related occupational accidents. No significant relationship (p=0.305) was found between the type of injuries and disability occurrence.

Of the total cases, 87.1% (27 cases) had injuries requiring surgery and received surgical treatment. The rest of the cases were conservatively treated.

No significant relationship was found between injuries that required surgery and injuries that did not require surgery in terms of disability occurrence (Figure 1).

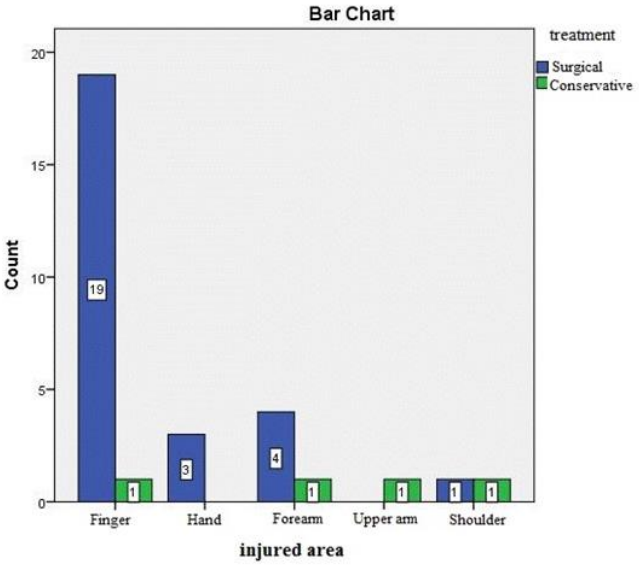

Figure 1. Distribution of conditions including disability criteria and treatments.

The plots of cases included in A, B, C, and D groups according to the disability guidelines are given below (Figure 2).

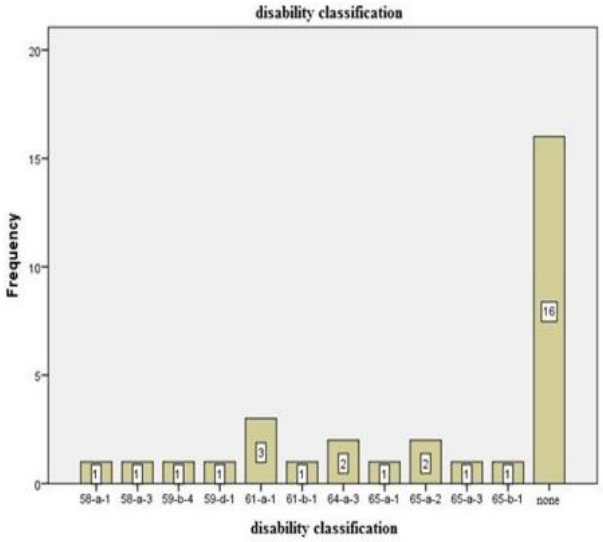

Figure 2. Distribution of disability classifications

When the injured areas were evaluated, it was observed that finger injuries were the most commonly injured areas of the upper extremity.

However, there was no significant relationship between combat and noncombat-related occupational accidents in terms of injured areas (Figure 3). There was no significant relationship between the injured area and the dominant extremity, either.

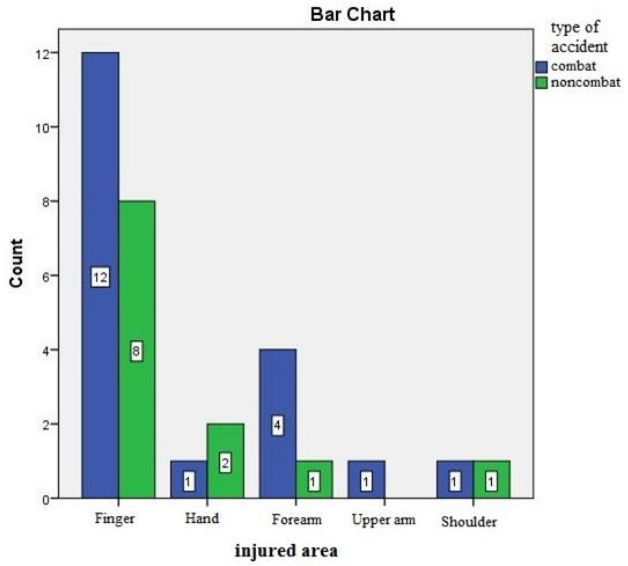

Figure 3. Distribution of injured areas in combat and noncombat-related occupational accidents.

A significant relationship was found in the comparison of the injured area and type of treatment (p=0.027) (Figure 4). It was found that the ultimate treatment for finger, hand, and forearm injuries was surgery.

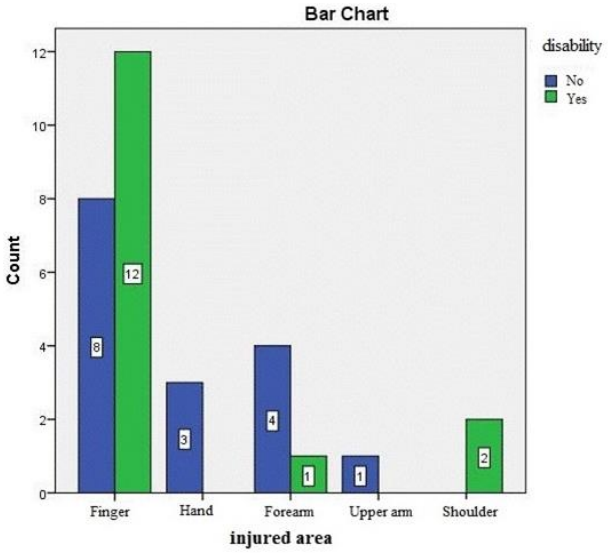

Figure 4. Distribution of injured areas according to the type of treatment.

A significant relationship was found between injured areas and disability occurrence (p=0.036). In this relationship, it was observed that the possibility of especially hand (excluding finger), forearm, and upper arm injuries to cause disability was high.

The risk of shoulder injuries to cause disability was found low, and although the number of finger injuries was high, their possibility to cause disability was 60% (Figure 5).

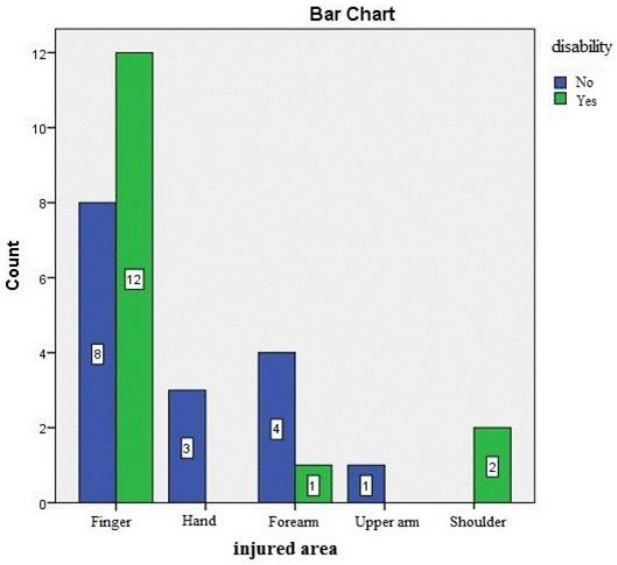

Figure 5. Comparison of injured areas and presence of disability.

Four of the patients with finger injury were entitled to get permanent disability (B and D criteria), while 8 of the patients were accepted as healthy or entitled to get only temporary disability (A and C criteria), and 8 patients were not included in any disability criteria. While the total disability rate was 60%, the rate of entitlement to get permanent disability was 20%.

DISCUSSION

Military injuries were researched in many aspects of international studies. In a study on the Syrian civil war, ways of military musculoskeletal injuries, types of injuries, treatment groups, and costs during treatment process were investigated, and hence it was found that high-energy injuries caused a high rate of amputation, complications, as well as high treatment costs (Bektaş et al., 2020). Miller et al. (2011) found in their study on traumatic noncombat-related hand injuries in US military personnel, that 331 out of 7,520 patients seen in the Emergency Room of Iraq Ibn Sina Hospital within a period of 24 months met the criteria for disability. They found that injuries were generally caused by getting stuck in various doors, gates, and turrets, and thus recommended to establish an optimization according to these structures. Toman E et al. (2018), pointed out that US military personnel were exposed to injuries requiring significant rehabilitation at a rate of 11.6% while working under conditions without an active combat (mostly sports, falling, or traffic accidents).

In our study, 19 patients were injured during combat, and injuries of 12 patients were due to noncombat-related occupational accidents. There was no relationship between the cause of injuries and the presence of disability criteria. Of the patients, 87.1% (27 patients) were surgically treated. A significant relationship was found in the comparison of injured area and treatment type ($p=0.027$), and it was found in our study that the ultimate treatment for finger, hand, and forearm injuries was surgery. When the relationship between injured areas and disability occurrence was evaluated, a significant relationship was found. In this relationship, the possibility of especially hand (excluding finger), forearm, and upper arm injuries to cause disability was high; the risk of shoulder injuries to cause disability was low; and although the number of finger injuries was high, their possibility to cause disability was 60%. However, the rate of entitlement to get permanent disability was 20% for finger injuries. As recovery and rehabilitation period lasts up to 6 months in our clinical follow-ups of especially finger injuries, the patients cannot recover sufficiently to return to work and the rest report they demand after 6 months cannot be provided due to the regulations, as the patients thereby need to receive a permanent report after being assessed by a committee. Since disability is determined according to the guidelines; injuries are not sufficiently covered for disability eligibility. For example, a patient with crash injury in the first finger of the dominant hand did not meet the disability criteria in the guideline, although his grip strength had declined. Another patient whose second finger of his dominant hand had distal phalanx amputation after frostbite, could only be entitled to get temporary disability, as the number of joints lost was insufficient for the regulations, even though he had lost the function of his finger which he has to use for pulling the trigger of his weapon. Another patient whose second finger of dominant hand disarticulated from the proximal inter phalangeal joint after firearm injury was assessed in the same manner.

As nonfunctional soldiers cannot be entitled to get permanent disability and assigned to a lower position/rank, they lose their jobs. In an epidemiological study on the Japanese army, injury classification, division of injuries into areas, and ways and causes of injury were investigated; it was found that hand/fingers were the most commonly injured areas after the knee region and that injuries most commonly occurred during exercises (Amako et al.,2005).

In a study performed at the British military hospital, it was found that hand injuries were common and had an important place in the distribution of military hospital surgeries, especially soft tissue injuries were at the forefront, and these injuries were mostly seen in workers who actively used their hands, as well as in soldiers, and engineers/technicians. Especially hand injuries caused the loss of labor force in the number of active personnel and these individuals to be assigned to lower positions, although their requirement for surgery was low (Anakwe et al., 2006).

Staruch et al. (2017), reported in their study on hand injuries due to military explosives that hand injuries caused by explosive devices during military combat operations had an important effect on form, function, mental health, and future employment; but did not draw attention as much as emergent conditions threatening the limbs.

These findings disprove the conventional belief in an ulnar focus of injury and support the quest for the development of combat hand protection that addresses the injury pattern seen. In the distribution of military injuries causing fractured extremity injury in Iraq and Afghanistan between 2003 and 2014, upper extremity phalangeal and metacarpal fractures were significantly higher, and it was reported that humerus, ulna, and radius fractures were also seen in high rates (Chandler et al., 2017).

In our study, finger injuries were found to be the most common injured area in upper extremity when injured areas were evaluated. This may be due to the difference in the structure of armor and equipment.

Low number of patients may seem to decrease the reliability of data; however, regardless of the number, spot samples with available injuries reveal the missing points of military guidelines mentioned in the article.

Conclusion

Due to long term physical therapy need in clinical follow-ups of military personnel injuries, return to work is delayed. There is a need to use a long rest report without patient simulation. Despite the fact that the functional loss occurring in some patients is a significant obstacle to the military service, permanent disability conditions are restricted due

to the lack of sufficient coverage in the articles in the Turkish Armed Forces Health Skill Regulation No. 6405 and lead to loss of rights for the patient. As in the motor homunculus (Gandhoke et al., 2019), which schematizes the place occupied by the organs in the brain, the upper extremity also has a prominent place in the brain as the fingers have fine motor activity. We think the content of such an important body part should be assessed and detailed more functionally in military guidelines. We also think that the guideline should be revised by a committee, including a hand surgeon. Incidences, etiologies and characteristics of work-related hand injuries should be highlighted and preventive strategies based on these facts be implemented due to higher level of suffering and more serious consequences attributed to this specific injury (Serinken et al., 2008). Similar to the study of Serinken et al. (10), it is seen that increasing training on inventory use, establishing double-stage, and safe systems that prevent getting stuck in materials such as gate, and door, and detailing protective equipment, especially in fingers, are needed in order to decrease job loss due to upper extremity and especially finger injuries regardless of having combat or noncombat origin.

Conflict of interest

The authors have no conflicts of interest to report.

Ethical approval

The local ethics committee of the University hospital approved the study on 22.05.2020 with approval number 03-23.

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