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Plastic and Reconstructive Surgery in the Wake of the Eid Al-Adha: A Single-Center, Five-Year Experience

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Abstract: Background: The Festival of Sacrifice, commonly known as Eid al-Adha, has a profound religious and 5 cultural impact on nations with a majority of Muslims. This festival is celebrated every year in Muslim 6 countries; however, it is a time when patients present to the emergency department with serious injuries. In 7 our study, we examined current injuries at the time of Eid al-Adha in the largest patient population in one of 8 the largest hospitals in Turkiye, including tendon injury map and maxillofacial injuries for the first time in the 9 literature. To the best of our knowledge, this is the largest case series of injuries sustained during Eid al-Adha. 10 The significance of this study lies in its potential to significantly benefit the patients and healthcare systems. 11 **Methods:** Between 2019 and 2023, patients admitted to Ankara City Hospital during Eid al-Adha were 12 examined. The demographic characteristics, injury patterns, and injury sites of the patients were evaluated by 13 analyzing the patients admitted on the four days of Eid al-Adha. Maxillofacial traumas during the festival 14 were analyzed. Tendon injuries on the left hand, which is the most commonly injured body part in the 15 literature, were mapped as a figure. Statistical analysis were performed using IBM SPSS Statistics for 16 Windows. **Results:** Six hundred and ten patients, including 101 female and 509 male patients, were included 17 in this study. There was a statistically significant increase ($p<0.001$ for all years). Individuals between the 18 ages of 30–40 years were the most frequently admitted patients (n=182, 29.8 %). Knife injuries were 19 significantly more common in all patients ($p<0.001$). When the total number of patients was evaluated in terms 20 of injured areas where patients present to the emergency department, left-hand injuries were found to be 21 significantly more common than injuries in other injury areas (for all $p<0.001$).). The extansor pollicus longus 22 tendon was the most injured tendon among all extansor and flexor tendon injuries (n=104). The most injured 23 tendon was the 1st finger flexor tendon zone 2 (n=45). The study showed that 5th finger zone 1 extensor 24 injury, first finger zone 4 flexor tendon injury and 5th finger zone 1 flexor tendon injury were never seen. 25 Twenty-five patients with maxillofacial injuries were admitted to the hospital. Orbital floor fractures were the 26 most common type of injuries. The anesthesia technique we preferred for the patients was mostly local 27 anesthesia (n=267). Wide awake anesthesia no tourniquet (WALANT) was then the second most preferred anesthetic technique. **Conclusions:** According to this study, which is the largest known case series in the 29 literature, the number of patients admitted to the hospital increased annually. The left-hand extensor tendon 30 injuries with a knife were the most common injury in middle-aged men. The extensor pollicis longus tendon 31 was the most commonly injured extensor tendon and zones 3 and 4 are the most commonly affected. The 32 flexor pollicis longus tendon was the most commonly injured flexor tendon in zone 2. During this period, the 33 patients may need not only hand surgery, but also maxillofacial surgery in plastic surgery. We recommend 34 during Eid al-Adha that the WALANT technique should be widespread in addition to the indications in the 35 literature in patients where local anesthesia will be insufficient.

Keywords: eid al-adha; extensor tendon injuries; flexor pollicis longus tendon injury; hand surgery; 38 maxillofacial trauma

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1. Introduction

The Festival of Sacrifice, also known as Eid al-Adha, resonates deeply in the cultural and religious fabric of Muslim-majority countries. This festival, celebrated annually in alignment with the Hajj pilgrimage, is not only a time of spiritual reflection and communal gatherings but also a period marked by a distinctive practice: the sacrificial cutting of animals, such as sheep, goats, and cattle. This ritual, rooted in the story of Prophet Abraham's sacrifice which is taken as an episode from the Torah and reported beyond that in the Qur'an and even in the Christian Bible, extends beyond religious observance, fostering social solidarity through the distribution of meat to families, friends, and those in need. However, this auspicious event also brings forth unique medical challenges, especially in the field of plastic and reconstructive surgery [1]. A notable increase in specific types of injuries, predominantly hand and maxillofacial injuries, has been observed during this period [2]. These injuries often result from the handling and sacrifice of animals by non-professionals, using tools such as knives and cleavers without employing adequate safety measures [2,3]. This rise in cases of injury, akin to the surge observed during festivals, such as Halloween in the West, poses a significant strain on the medical resources and necessitates a specialized surgical response.

Despite the regular occurrence of these injuries on Eid al-Adha, there is no significant the gap in comprehensive data on its nature, frequency and management. This study aims to fill this gap by posing a critical question: How does Eid al-Adha affect the demand and characteristics of plastic and reconstructive surgery services? What are the characteristics of injuries? Can this ritual be mapped in hand injuries? Our research, we aimed to perform a five-year retrospective analysis in a single center and examine it in its most up-to-date form.

Eid al-Adha has made a name for itself in the new literature with orf infection, Crimean-Congo hemorrhagic fever and Salmonella Typhimurium infections [4–6]. In terms of plastic surgery injuries, although the literature focuses more on hand injuries, our study is the first to comprehensively analyze maxillofacial injuries because it was conducted from the perspectives of plastic, reconstructive, and aesthetic surgery. The significance of this study lies in its potential to significantly benefit the patients and healthcare systems. To the best of our knowledge, this is the largest case series of injuries sustained during Eid al-Adha. This study also differs from other studies in that it includes the current data and the tendon injury zone mapping and examines maxillofacial injuries.

2. Patients and Methods

In this study conducted at Ankara Bilkent City Hospital, one of the largest hospital in Turkiye, we retrospectively analyzed the data from 610 patients who presented to our Plastic, Reconstructive, and Aesthetic Surgery Clinic via the emergency department during Eid al-Adha between 2019 and 2023. These patients were included based on their consultation over a four-day period each year. The analysis focused on the age and sex of the patients, etiology and date of injury, anatomical structures and localizations affected, anesthetic and surgical procedures performed, and maxillofacial trauma. Tendon injuries on the left hand, which is the most commonly injured body part in the literature, were mapped. Patients with inaccessible or incomplete records were excluded. This comprehensive inclusion of patients consulted during Eid al-Adha was vital to effectively assess the plastic surgery demand, considering that emergency cases included not only hand surgery emergencies, but also traffic accident related injuries and maxillofacial traumas. These findings are essential for future health planning.

The study received approval from the local ethics committee (Approval Number: E1-23-4128) and adhered to the principles of the Declaration of Helsinki.

Statistical analysis were performed using IBM SPSS Statistics for Windows, Version 23 (IBM Corp, Armonk, NY, USA). The conformity of the data to the normal distribution was visualized by (histograms and probability graphs) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk tests) were evaluated. The descriptive statistics of parametric results were depicted by mean (standard deviation), descriptive statistics for nonparametric results were depicted by the median (maximum low value-high value). A significant difference was observed between the two independent variables. The independent samples t-test and Mann-Whitney U test were used for

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parametric and nonparametric data, respectively. Notably, more than two variables were used for parametric data. The ANOVA test was used to evaluate whether there was a significant difference between the two variables. For nonparametric data, whether there was a significant difference between more than two variables was evaluated with the Kruskal-Wallis test. Categorical variables and the chi-square test were used to evaluate differences between the two groups. A proportion z-test was used for comparison. Statistical significance was set at $p<0.05$.

3. Results

A total of 610 patients, including 101 female and 509 male patients) were included in the study (Table 1). When all patient numbers were evaluated on a year basis, there was no significant difference between 2019 and 2020 (p=0.260), while there was a statistically significant increase in the number of patients in other years compared to 2019 ($p<0.001$ for all years). Compared with 2020, the number of patients increased significantly by 2021, 2022, and 2023 ($p < 0.001$, 0.001, and 0.015,respectively). The number of patients in 2021 with the highest number of patients is statistical no difference was found between 2022 and 2023 (p values=0.136 and 0.548, respectively).

Table 1. The number of the patients including their sex.

	Number of patients female/male (total %)				Total (%)
Year	1st day	2nd day	3rd day	4th day	
2019	6/51 (67.8%)	1/9 (11.9%)	7/2 (10.7%)	5/3 (9.5%)	84 (13.8%)
2020	3/58 (62.2%)	5/15 (20.4%)	2/9 (11.2%)	1/5 (6.1%)	98 (16%)
2021	9/62 (46.4%)	5/27 (20.9%)	6/23 (18.9%)	4/17 (13.7%)	153 (25.1%)
2022	8/69 (53.4%)	4/17 (14.5%)	5/16 (14.5%)	8/17 (17.3%)	144 (23,6%)
2023	6/68 (56.4%)	5/22 (20.6%)	7/12 (14.5%)	4/7 (8.3%)	131 (21,5%)
Total (%)	340 (55.7%)	110 (18%)	89 (14.6%)	71 (11.7)	610 %100

In the last five-year period, 90.6% of patients admitted on the first day were male, while this rate was 81.8% on the 2nd day, 69.7% on the 3rd day, and 69% on the 4th day. The proportion of men who visited the hospital on the first day was significantly higher than that of those who visited the hospital on the other days (p-values: 0.028, <0.001, <0.001, respectively). When all days were evaluated individually, the number of males was significantly higher than that of females ($p<0.001$ for all days). Analyzing the total male/female ratio by years, it was 77.4% in 2019, 88.8% in 2020, 84.3% in 2021, 82.6% in 2022 and 83.2% in 2023. When the change in the male-to-female ratio was evaluated over the years, no statistically significant difference was found (p=0.354) (Table 1).

Individuals between the ages of 30–40 years were the most frequently admitted patients (n=182, 29.8 %). This was followed by individuals aged 40–50 years at a rate of 26.2% (n=160). The lowest rate was found in individuals aged 80-90 with 0.82%. The admission rate of individuals aged 70-80 was the second lowest at 1.15%. There was no significant difference between individuals aged 30–40 and 40–50 (p=0.160). However, individuals in these age group (30–40 and 40–50 years) were significantly higher than those in all other age groups which were 0-10 (n=11), 10-20 (n=39), 20-30 (n=75), 50-60 (n=82), 60-70 (n=49), 70-80 (n=7), 80-90 (n=5) (all $p<0.001$). When changes in the age group distribution over the years were examined, no significant changes were observed (p=0.231).

Comparing injuries from other injury types to those caused by knives, we discovered that knife injuries rank highest across all the time periods. This was significantly higher than all of them ($p<0.001$). Knife injuries were significantly more common in all patients ($p<0.001$) (Table 2).

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Table 2. The injury types of the patients.

Injury Type	2019 (n)	2020 (n)	2021(n)	2022(n)	2023(n)	
Knife	43	53	85	74	77	332
Animal kick	2	3	12	11	8	36
Meat mincer	3	4	8	5	7	27
Fall	11	5	10	15	9	50
Entanglement in a chain	2	1	3	9	6	21
Other	12	22	19	14	21	88
Traffic accident	8	10	12	15	3	48
Human bite	3	0	4	1	0	8

When the total number of patients was evaluated in terms of injured areas where patients present to the emergency department, left-hand injuries were found to be significantly more common than injuries in other injury areas (for all $p<0.001$). When we examined the years individually, the left hand for 2019, 2020, and 2023 was significantly higher at all other injury sites (for all $p<0.001$). In 2022, there was no significant difference between left hand injury and right hand injury ($p=0.149$), significantly higher than all other injury sites (for all $p<0.001$) (Table 3).

Table 3. The injury location of the patients.

	2019 (n)	2020 (n)	2021(n)	2022(n)	2023(n)	
Left hand	60	70	76	65	73	344
Right hand	13	12	49	53	36	163
Right lower extremity	2	3	8	8	6	27
Left lower extremity	2	1	9	5	5	22
Neck	0	2	3	0	0	5
Abdomen	1	2	0	1	0	4
Head	2	3	3	2	1	11
Chest	4	5	5	10	10	34

The examination of the years individually revealed that extensor tendon laceration was significantly higher among the injury types than among other injury types ($p<0.001$ for all) (Table 4). The extansor pollicus longus (EPL) tendon was the most injured tendon among all extansor and flexor tendon injuries. The number of patients whose EPL tendon was injured alone was n=77, and the number of patients whose EPL tendon was injured together with other extensor tendons was n=27. The number of patients whose flexor pollicis longus (FPL) tendon was injured was n=63. The most

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injured tendon was the first finger flexor tendon zone 2 (n=45). As tendon injuries, the first finger tendons were most commonly injured, either alone or with other fingers (n=167). There were no tendon injury at 5th finger zone 1 extensor tendon, 1st finger zone 4 flexor tendon and 5th finger zone 1 flexor tendon. The mapping of the extensor and flexor tendon injury sites on the left hand is shown in Figure 1. It showed only isolated finger injuries. The figure did not show 23 patients (7,4%) with injuries to both the 1st and 2nd finger extensor tendons, four patients (1,2%) with injuries to the 1st, 2nd and 3rd finger extensor tendons, seven patients (2,2%) with injuries to the 2nd, 3rd and 4th finger extensor tendons, and eight patients (2,5%) with injuries to both the 4th and 5th finger extensor tendons. In addition, 16 patients (8,8%) with flexor tendon zone injuries of both 2nd and 3rd finger flexor tendons were not shown on the map.

Figure 1. The map of left hand tendon lacerations of isolated each finger. The figure on the left shows the numbers of patients who had flexor tendon injuries according to flexor tendon zones. The figure on the right shows the numbers of patients who had extensor tendon injuries according to extensor tendon zones. Each finger was painted in its own color.

Table 4. The injured body parts of the patients.

	2019 (n)	2020 (n)	2021(n)	2022(n)	2023(n)	
Only skin laceration	12	15	26	22	32	107
Flexor tendon injury	12	20	31	31	22	116
Extansor tendon injury	50	54	75	69	61	309
Flexor tendon injury with nerve and vessel injury	5	12	15	15	17	64
Fingertip	4	3	7	7	5	26

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amputation						
Finger amputation	3	2	4	7	2	18
Hand amputation	1	0	1	2	1	5
Maxillofacial trauma	2	4	5	6	8	25

Patients with maxillofacial trauma after examination are listed in Table 5. Orbital floor fractures were the most common type of injuries.

Table 5. The injured maxillofacial trauma of the patients.

Zone of maxillofacial injury	2019 (n)	2020 (n)	2021(n)	2022(n)	2023(n)
Orbital floor	1	1	2	2	4
Zygoma	-	1	2	1	1
Maxilla	1	1	1	1	2
Mandible	-	1	-	2	1

The anesthesia technique we preferred for the patients was mostly local anesthesia(n=267). The number of wide awake anesthesia no tourniquet (WALANT anesthesia) was 227 and the general anesthesia was was 96.

4. Discussion

Injuries or other diseases can have terrible consequences and can change the mood of peaceful festivals into agony. For instance, during Halloween and Easter in Canada, an increased risk of anaphylaxis is induced by unknown nuts and peanuts [7]. Notably, Eid al-Adha is also an example. Based on the number of patients admitted to our hospital, the increasing trend in the number of injuries continued to be statistically significant. The female-to-male ratio in our study was 1:7, and is approximately 1:4 in the literature [8,9]. Similar to the literature, we observed that the proportion of males ranged from 77.2% to 88.8%.

Several hand injuries occur during the sacrificing and processing of meat, and reports of injuries ranging from 3 to 67 years of age have been published in the literature [8,10]. Only the first three days of the four-day sacrifice feast are available for sacrifice. As this is a traditional act, men often carry out the sacrifice. Women typically perform slicing. In our study, men who were admitted to the hospital on the first day did so at a significantly higher rate than men who applied on subsequent days. However, upon analyzing each day separately, we found that there were still significantly more men than women. We also found that there were significantly higher numbers of individuals in this age range (30–40 and 40–50 years) than in any other age group. No change was observed in the age group distribution over the years. This can also be considered as a traditional behavior.

In our study, extensor tendon injury was the most common type of injury, consistent with the literature in which it varied from 47% to 68.9% [11,12]. We also found that a left-handed injury with a knife was the most common anatomical location and mechanism (Figure 2). It is believed that the nondominant hand sustains more cuts from knives [13]. Our mapping in Figure 1 clearly showed that the left hand dorsum 1st finger extensor tendon zones 3 and 4 are the most commonly injured extensor tendon zone areas. In isolated finger injuries, zone 2 flexor tendon injury of the first finger

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was also the most common injury. The map also showed that 5th finger zone 1 extensor tendon injury, 1st finger zone 4 flexor tendon injury and 5th finger zone 1 flexor tendon injury were never seen. The mapping showed that the first finger was the finger most affected by tendon injuries while the fourth finger was the least affected. This data is not only first tendon zone mapping on this festival in the literature, but also the first mapping on hand injuries in the literature.

Figure 2. A 35-year old male suffered from knife injury to his extensor pollicis longus tendon. This case belonged to the most common patient and injury type.

As plastic surgeons, we observed that there were not only hand injuries, but also maxillofacial traumas other than cuts in other body parts. During the Eid al-Adha period, the number of people traveling between cities increased, which led to an increase in traffic accidents. In the literature, it was also discovered that vacation played a role in crash severity [14]. We had 25 patients with maxillofacial trauma who were enrolled. Notably, 40% of the patients had orbital floor fractures, which are the most common injury type (Figure 3). This fracture was caused by the impact of an injuring agent incapable of transitory deformation, such as traffic accidents, and the body part of the animal that we encountered in two patients. Two out of thirty-six cases of animal kickings resulted in orbital fractures, which is a significant number and something that emergency services should take into consideration during this festival. Diplopia caused by compression of the inferior rectus muscle requires surgery in a short time. In four patients, the maxillofacial trauma type was a mandibular fracture due to traffic accidents.

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Figure 3. A 38-year old male suffered from animal kick to his face. The CT scan showed left sided orbital floor fracture.

Only 96 of 610 patients required general anesthesia. Local anesthesia and the WALANT anesthesia technique, which has become widespread in recent years, can provide a rapid solution to the patient load. WALANT can be used successfully for most hand procedures that are frequently performed [15]. One of the indications of WALANT include limited access to healthcare. Ambulatory surgical care can be provided in rural or underdeveloped areas without the requirement for an operating room or an anesthetic team [16,17]. WALANT has been shown to be consistently cheaper and more efficient than the operating room when applicable [18]. We recommend during Eid al-Adha that the WALANT technique should be widespread in addition to the indications in the literature in patients where local anesthesia will be insufficient.

One of the limitations of this study is that it was conducted in a single hospital. However, it is the one of the largest hospitals in a country with a population of over 80 million. Additionally, the educational status of patients was not included in the study. Although we did our research on injury sites and anesthesia techniques, we did not include the treatment and long-term outcomes. Although our mapping may guide reoperative interventions, we do not have any data.

Considering that this festival will continue in the future, it may make sense to develop protective equipment based on the injury results of our mapping. In addition, in our study, we drew attention to the fact that Eid al-Adha is a period when maxillofacial injuries may also occur rather than the perception that it is a period when only hand injuries increase.

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5. Conclusions

Specialists with sacrificial cutting qualifications should perform the sacrifice. Butchers should also be consulted for the preparation of the meat in the following process. Intercity mobility during holidays can also lead to traffic accidents. Intercity mobility during the holidays can also lead to traffic accidents. Therefore, it is very important to obey traffic rules. Emergency departments in hospitals must have sufficient people and equipment to handle the growing number of injuries that occur during Eid al-Adha. Left hand injuries are significantly more common. The EPL tendon was the most commonly injured extensor tendon and zones 3 and 4 are the most commonly affected. The FPL tendon was the most commonly injured flexor tendon in zone 2. According to our large case series, during this period, the patients may need not only hand surgery, but also maxillofacial surgery in plastic surgery. Maxillofacial injuries are a possible type of injury both in traffic accidents and during animal sacrifice. In order to prevent the health system from being busy with such a patient load during the Eid al-Adha period, WALANT technique is preferable.

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