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Epidemiological characteristics of orthopedic trauma patients admitted to emergency department in Coronavirus disease 2019 pandemic: A retrospective and comparative study

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Abstract

Aim: The aim of the present study was to compare the data and epidemiological characteristics of orthopedic trauma patients who presented to the emergency room in the period of pandemic year with the year before the pandemic.

Materials and Methods: In the present study, epidemiological characteristics of patients with orthopedic trauma who applied to the emergency department during the COVID-19 year (March 24-July 1, 2020) and the same period of the previous year (March 24-July 1, 2019) were compared. The patients were divided into two groups as pandemic period patients and pre-pandemic group patients (control group). Demographic characteristics, injury mechanisms, fracture types, fracture areas, simultaneous fractures, the locations where the fracture occurred, open fracture types, trauma scores and osteoporosis characteristics were evaluated.

Results: 15.245 patients were evaluated, and 36.5% of these patients were the ones who were admitted to our hospital in the pandemic period while 63.5% of the patients were the ones who were admitted to our hospital in the pre-pandemic period. During the pandemic period, 67.2% of the patients visited due to the low-energy traumas, 14.3% high-energy traumas. In the pre-pandemic group, on the other hand, the cause was low-energy traumas in 58.4% of the patients, high-energy traumas in 17.8%. 44% of the patients in the pre-pandemic group and 61% in the pandemic group were evaluated to have osteoporotic fractures. In the pre-pandemic group, on the other hand, 36.2% of the patients had minor, 46.4% serious and 17.4% critical injuries.

Conclusion: During the COVID-19 pandemic, because of the effects of long-term inactivity and stress factors, changes were observed in the distribution of the traumatized patients. It should be concluded that people at high risk of osteoporotic fractures should be allowed to practice their physical activities such as walking and exercising at certain time intervals during curfew times such as pandemics.

Introduction

COVID-19 is an infectious respiratory disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and it affects people very seriously, resulting in significant labor loss and death [1,2]. The disease was first identified in Wuhan town in Hubei Province of China. The disease has spread worldwide, and a global pandemic was declared by the World Health Organization on March 11, 2020 [2,3]. The first confirmed case of COVID-19 in Turkey was announced on March 11, 2020, and the first virus-related death in the country occurred on March 15, 2020 [4]. On April 1, 2020, it was announced that coronavirus cases spread throughout Turkey. In order to reduce the spreading rate of the epidemic and maintain social distancing among people, curfews were first introduced for people aged 65 and over. The restriction was later extended to include children and young people aged 20 and younger. People living in Turkey were urged not to travel outside the country and to stay indoors unless they had to.

During the pandemic, the service provided by our hospital was reorganized in terms of human and hospital resources to meet the needs of patients in the most effective way. And in this context, elective operations were restricted and support was provided to emergency and outpatient areas fighting COVID-19. By limiting surgeries to only emergency indications, a suitable environment was created for both patients and healthcare professionals [4]. During this period, there were differences in fracture types and age dis-

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tribution of patients due to curfew restrictions and flexible working hours [5].

The outbreak of COVID-19 has presented new challenges in the management of fractures and the protection of medical staff [6]. Especially in older people, the risk of fractures arising from low-energy traumas due to osteoporosis increased as a result of inactivity and poor bone quality [7-12]. Osteoporotic fragility fractures are a major public health and healthcare issue worldwide, as they are associated with high healthcare costs, morbidity and mortality [7]. An estimated 2.7 million hip fractures occurred in 2010 world-wide. In the EU, in the same year, 3.5 million new fractures were estimated to have occurred [9, 12]. There has been growing concern that stress-induced traumas such as hard surface hitting and fire arms/sharp-stabbing objects may be higher [5-18,20].

The aim of the present study was to compare the data and epidemiological characteristics of orthopedic trauma patients who presented to the emergency room between March 24 and July 1 period of 2020 pandemic year with the data of orthopedic trauma patients who applied to the emergency room between March 24 and July 1 period of 2019, the year before the pandemic. In this retrospective single-center study, we reviewed hospital records and radiologic database system.

Materials and Methods

Patients and methods

Our study was designed as a retrospective comparative study. In the present study, epidemiological characteristics of patients with orthopedic trauma who applied to the emergency department during the COVID-19 year (March 24-July 1, 2020) and the same period of the previous year (March 24-July 1, 2019) were compared.

The primary outputs were the differences between the two groups in terms of fracture type and mechanism. The secondary outputs were changes related to the pandemic period in osteoporotic fractures. The injury mechanism was evaluated as low-energy traumas (falling from the standing height or lower), high-energy traumas (falling from heights of 1 m or more), work accidents and traffic accidents. Fracture type and location was evaluated as proximal-diaphysis-distal types of upper extremity and lower extremity fractures. Open fracture type was evaluated according to Gustillo-Anderson classification in patients with open fractures. Osteoporosis criterion was distal radius, proximal humerus or proximal femur fractures caused by low energy in patients over 65 years of age. Demographic characteristics, injury mechanisms, fracture types, fracture areas, simultaneous fractures, the locations where the fracture occurred, open fracture types, trauma scores and osteoporosis characteristics were evaluated.

Patients with orthopedic trauma who applied to the emergency department during the COVID-19 year (March 24-July 1, 2020) and the same period of the previous year (March 24-July 1, 2019) were included in the study. Patients with nonunion, refracture and incomplete data were excluded from the study.

The patients were divided into two groups as pandemic period patients and pre-pandemic group patients (control group). Patients with orthopedic trauma who applied to the emergency department between March 24 and July 1, 2020 were included in the pandemic group. Patients with orthopedic trauma who applied to the emergency department between March 24 and July 1, 2019 were included in the pre-pandemic group. Patients were divided into 3 age groups: under 20 years old, between 20-65 years old and over 65 years old.

One of the researchers collected all the data. The other researcher, who was blind, compared data and the groups.

Local ethics committee approval was obtained for this study. (Malatya clinical research ethics committee approval no. 2020/210). The study was conducted in accordance with the Helsinki Declaration.

Statistical analyses

The data obtained in the study were recorded in the SPSS 26.0 (SPSS INC, Chicago, IL, USA) program and statistical analysis was made. Pearson Chi-square was used to compare independent groups with categorical variables. The p value < 0.05 was considered statistically significant.

The sample size in the study was determined by power analysis.

Approach to trauma patients

When a patient is traumatized, the primary goal is to normalize the patient's vital functions. Accordingly, for emergency trauma patients brought to the emergency room, adequate oxygenation and ventilation was provided for airway control. Then, circulation was supported, and the neurological functions of patients were evaluated. A detailed anamnesis was then taken from patients. If there was a history of direct contact with anyone who had a COVID-19 PCR test positivity or clinical symptoms related to COVID-19 during the 14 days before the patient's arrival, isolation measures were immediately taken and treatment was carried out by a multidisciplinary team including orthopedists, chest and infectious diseases doctors. Then, diagnostic examinations were requested. After appropriate treatments, patients were externated from the emergency room.

Results

During the time period of the study, 15.242 patients were evaluated, and 6.014 of these patients (36.5%) were the

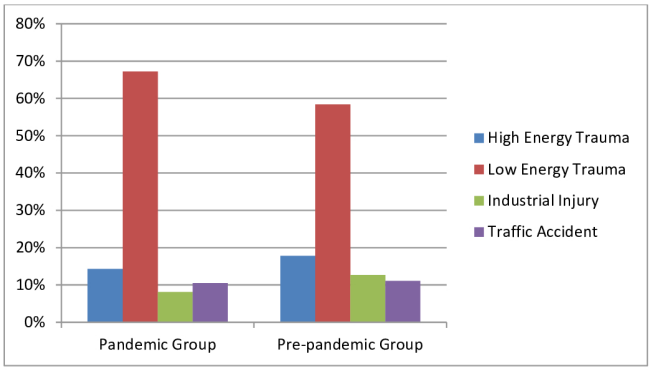

Figure 1. Injury mechanisms.

Table 1. Demographic data.

All Aage groups (n=15,245)	Pandemic group	Pre-pandemic group (control)	P value*
Male	3,259 (54.9%)	4,780 (51.8%)	0,23
Female	2,755 (45.8%)	4,448 (48.2%)	0,04
Age	49.2 (1-100)	51.4 (1-101)	
<20 age	1,710 (28.4%)	3,320 (35.0%)	0.001
20-65 age	2,440 (40.6%)	4,614 (50.0%)	0.001
>65 age	1,864 (31.0%)	1294 (15.0%)	0.001

*: Pearson chi-square test.

Table 2. Distribution of fracture locations.

Fracture location	Pandemic group	Pre- pandemic group (control)	P value*
Humerus	87 (8.2%)	89 (7.5%)	0.470
Radius-Ulna	156 (14.5%)	168 (14.5%)	0.440
Femoral	164 (15.3%)	165 (14.1%)	0.570
Tibia-Fibula	114 (10.6%)	144 (12.4%)	0.125
Tarsal-Metatarsal-Phalanx	186 (17.4%)	216 (78.6%)	0.110
Vertebra	106 (9.8%)	130 (11.2%)	0.420
Pelvis	23 (2.2%)	32 (2.8%)	0.228

*: Pearson chi-square test.

Table 3. Injury severity score distribution.

Trauma score	Pandemic group	Pre-pandemic group (control)	P value*
ISS minor-moderate	2490(40.40%)	3340(36.20%)	
ISS serious-severe	2977(49.50%)	4282(46.40%)	0.025
ISS critical -unsurvivable	607(10.10%)	1606(17.40%)	

*: Pearson chi-square test.

Table 4. The relationship between trauma and age.

Pre-pandemic	LE	HE	P value*
<20 age	2,572 (77.5%)	748 (22.5%)	0.001
20-65 age	3,645 (79.0%)	969 (21.0%)	0.001
>65 age	1177 (91.0%)	117 (9.0%)	0.001
Post-pandemic	**LE**	**HE**	**P value***
<20 age	1,269 (74.3%)	441 (25.7%)	0.001
20-65 age	1,269 (52.0%)	1,171 (48.0%)	0.001
>65 age	1,864 (99.0%)	20 (1.0%)	0.001

LE:Low-energy trauma HE:High-energy trauma. *: Pearson chi-square test.

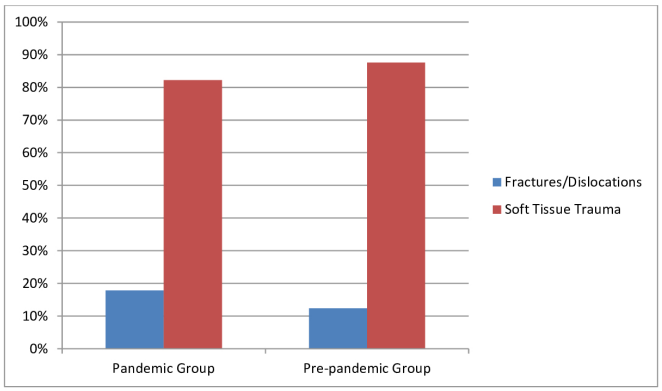

Figure 2. Distribution of the patients by diagnosis.

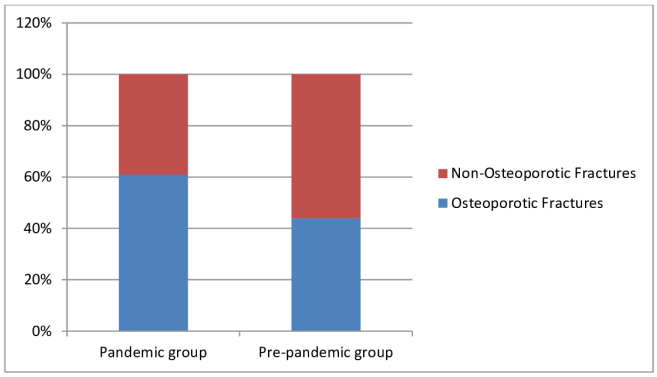

Figure 3. Osteoporotic fracture distribution.

ones who were admitted to our hospital between March 24 and July 1, 2020 (pandemic group) while 9.228 patients (63.5%) were the ones who were admitted to our hospital between March 24 and July 1, 2019 (pre-pandemic group). Demographic data are given in Table-1.

During the pandemic period, 67.2% of the patients visited due to the low-energy traumas, 14.3% high-energy traumas, 8.1% work accidents and 10.5% traffic accidents. In the pre-pandemic group, on the other hand, the cause was low-energy traumas in 58.4% of the patients, high-energy traumas in 17.8%, work accidents in 12.7% and traffic accidents in 11.1%.

In the pre-pandemic group, 87.4% of the patients developed soft tissue traumas, while 12.6% had fractures or dislocations. In the pandemic group, 82.2% had soft tissue traumas whereas 17.8% had fractures or dislocations.

The distribution depending on the location in fractures due to trauma is given in Table-2.

There were 20 patients with multiple fractures in the pre-pandemic group, which was 16 in the pandemic group.

In the pre-pandemic group, 140 patients had open fractures. Of these patients, 27.9% were type 1, 47.8% were type 2 and 24.3% were type 3 fractures. In the pandemic group, on the other hand, there were 112 open fractures, and 31.3% of them were type 1, 50.9% were type 2, and 17.8% were type 3 open fractures.

Distal radius, proximal humerus or proximal femur fractures caused by low energy in patients over 65 years of

age were evaluated as osteoporotic fractures. Accordingly, 44% of the patients in the pre-pandemic group and 61% in the pandemic group were evaluated to have osteoporotic fractures.

The trauma score was evaluated using the injury severity score. The distribution depending on the trauma score is given in Table-3.

Discussion

The COVID-19 pandemic has led to changes in both patient profiles and working patterns of hospitals. In the present study, we examined epidemiological changes in traumatized patients admitted to the orthopedics and traumatology clinics of our hospital during the COVID-19 pandemic. An increase was observed in osteoporotic fractures in elderly patients while stress related fractures replaced some of the high-energy fractures in young patients.

Males constituted 54.2% of the patients in the pandemic group and 45.8% were females. In the control group, 51.8% of the patients were male and 48.2% were female. The mean age was 49.2 years (range: 1-100) in the pandemic group and 51.4 years (range: 1-101) in the control group. No difference was found between the two groups in terms of mean gender distribution (Table 1). However, there was a difference in the age distribution of the patients. As a result of pandemic restrictions in Turkey that make it mandatory for the people under the age of 20 and over the age of 65 to stay at home, the frequency of out-of-home traumas decreased considerably in these age groups. The results of our study showed that the COVID-19 pandemic and curfews affected both genders similarly.

In the pre-pandemic group, humerus fractures were observed in 7.5% of the patients, radius-ulna fractures in 14.5%, carpal-metacarpal-phalanx fractures in 18.9%, femur fractures in 14.1%, tibia-fibula fractures 12.4%, tarsal-metatarsal-phalanx fractures in 18.6%, vertebrae fractures in 11.2% and pelvis fractures in 2.8%. In the pandemic group, on the other hand, 8.2% of the patients had humerus fractures while 15.5% had radius-ulna, 22% carpal-metacarpal-phalanx, 16.3% femur, 11.6% tibia-fibula, 17.4% tarsal-metatarsal-phalanx, 10.8% vertebrae and 2.2% pelvis fractures. The distribution of fractures was not significantly different in the groups (Table 2). In another study, trauma-induced fractures and surgical operations of these fractures were evaluated in the pandemic period. According to this study, there was a 23% reduction in surgical operations originating from fractures [21]. We obtained similar results in our study.

In terms of the fracture locations, there were increases in so-called osteoporotic fractures such as proximal humerus fracture, radius distal fracture and femur proximal fractures during the pandemic period. Fractures caused by hitting a hard surface, especially the 5th metacarpal fractures, were found to be significantly higher in the pandemic group compared to the control group. Previous studies stated that psychological factors play a role in the formation of fifth metacarpal fractures [18]. These fractures may have been caused by increased anger, stress, anxiety and depression during the pandemic period [18]. Variables related to fracture types were evaluated in another study [22]. In this study, similar to our study, an increase in osteoporotic fractures was observed during the pandemic period. Again, in this study, an increase was found in proximal humerus, wrist, and proximal femur fractures [22].

In terms of the injury severity scores of the groups, significant differences were observed in the two variable categories (Table 3). This finding indicated that the severity of the trauma experienced by the patients could be lower. Due to the association of ISS with mortality, it could be concluded that trauma-related mortality decreased. This was because of the reduced number of serious work accidents as a result of people's staying at home, not traveling for work or other purposes and closing of workplaces. We believe that this finding was due to reduced work accidents and high-energy traumas.

As a result of the pandemic restrictions, many businesses were closed and intercity transportation were carried out in a controlled manner. Accordingly, a decrease in high-energy traumas is expected. In the present study, 140 patients in the control group had open fractures. Of these patients, 28% had type 1 fractures while 48% had type 2 and 24% had type 3 fractures. In the pandemic group, 112 patients had open fractures. Of these, 32% were type 1, 51% were type 2, and 17% were type 3 open fractures. Among the open fractures, there was a decrease in type 3 open fractures. This result should be due to the reduction in work accidents and high-energy traumas. Of all patients in the pandemic group, 67.2% had low-energy traumas, 14.3% high-energy traumas, 8.1% work accidents and 10.5% traffic accidents. In the control group, 58.4% of the injuries were caused by low-energy traumas, 17.8% by high-energy traumas, 12.7% by work accidents and 11.1% by traffic accidents. There was a difference in age distribution and trauma severity between the pandemic and pre-pandemic periods (Table 4). In order to slow down the pandemic, reduce its spread to the people it could affect, and protect the social distance between people, curfew restriction was first applied to people aged 65 and older and people 20 years of age and younger. As a result, most businesses started to work from home. Age-related curfews changed the trauma distribution of patients according to age. Low-energy traumas increased during the pandemic period while lower incidence rates of work accidents and high-energy traumas were observed. This is due to the fact that people stay at home, and do not leave the house for work or travel purposes.

In order to reduce the spread of the pandemic and maintain social distancing between people, curfews were first introduced for people aged 65 and over. This restriction was later extended to include children and young people aged 20 or younger. Accordingly, most businesses started working from home. Age-related curfews resulted in changes in distribution of traumas for the age of the patients. In the present study, 44% of the patients in the control group and 61% in the pandemic group had osteoporotic fractures. There was a significant increase in osteoporotic fractures during the pandemic period. Staying at home and inactivity of those aged >65 years age during the pandemic may have increased the rates of osteoporotic fractures [5]. Especially due to the isolation of people over 65 years of age

at home, this elderly patient group moved away from their exercise and daily routines. Accordingly, the frequency of osteoporosis increased and serious injuries occurred in this patient group even with low-energy traumas. Patients should regularly receive their anti-osteoporotic treatments. In this situation, maintaining optimal vitamin D levels will support bone and muscle health especially in elderly patients [10]. We hypothesize that the different distribution observed in patients over 65 years of age may have occurred due to long periods of inactivity and stress factors [9-19].

Single section Retrospective study design, limited number of patients and short follow-up periods were among the limitations of the study. Studies with higher efficiency levels and larger patient populations are needed.

Conclusion

During the COVID-19 pandemic, changes were observed in the distribution of the traumatized patients. This difference in the distribution of trauma patients was caused by the effects of long-term inactivity and stress factors. It should be concluded that people at high risk of osteoporotic fractures should be allowed to practice their physical activities such as walking and exercising at certain time intervals during curfew times such as pandemics. In addition, we believe that detailed studies should be carried out on traumas that may occur due to increased stress in such epidemic processes. The distribution of traumatized patients may change in such worldwide problems as the pandemics. Therefore, the knowledge of fracture incidence, planning of their treatment and determination of educational priorities should be important for a more effective management of such crises.

Ethics approval

The study was conducted in accordance with the Helsinki Declaration. (Malatya Clinical Research Ethics Committee Approval no. 2020/210).

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