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Original Research Article

Comparison of orthopedic fractures operated during the COVID-19 pandemic with the pre-pandemic period

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ABSTRACT

Objective: The duration of staying at home increased during the coronavirus pandemic due to the people's instincts to protect themselves and lock down. The aim of this study is to compare the changes in orthopedic trauma patients operated in the same term of the coronavirus disease 2019 (Covid-19) pandemic and pre-pandemic periods.

Materials and Methods: This retrospective study was conducted with data obtained from Malatya Training and Research Hospital and compared the Covid-19 pandemic and pre-pandemic period. Orthopedic trauma patients who were operated in the Orthopedics and Traumatology clinic between 24 March-1 July, 2020 and 24 March-1 July, 2019 were included in the study. The patients' demographic characteristics (age and sex) and trauma-related information (type and site of the fracture, osteoporotic fracture, injury mechanism and treatment modality) were compared between two groups.

Discussion: There were statistically significant differences between the groups in terms of the rates of osteoporotic fractures. We are in the opinion that arrangements for individuals with a high risk of osteoporotic fracture should be made where they can practice physical activities such as walking and exercising at certain times, when there is a lock down during the pandemic. Additionally, detailed studies on traumas that may occur due to increasing stress during such pandemics should be conducted.

Conclusion: A total of 439 patients were included in the study. The traffic accidents were significantly lower in the pandemic group than the pre-pandemic group, simple falls were significantly higher in the pandemic group than the pre-pandemic group ($P<0.05$). Additionally, fractures induced by hitting a hard surface and gunshot wounds significantly increased in the pandemic group compared to the pre-pandemic group ($P<0.05$).

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1. Introduction

Coronavirus disease (Covid-19) is an infectious disease induced by the SAR-CoV-2 microorganism that emerged in Wuhan, China in 2019 and its effects are still ongoing.^{1,2} After a short time the first case of Covid-19 was detected in 10 March 2020 in Turkey, Malatya Training and Research Hospital started to provide services as a "pandemic hospital." The spread of Covid-19 has been

shattering. The World Health Organization declared that Covid-19 is a pandemic in 11 March 2020. As of 8 July 2020, there are 11.635.939 positive cases and 539.026 deaths in the world, and this number is still increasing day by day.³ As of the same date, the number of positive cases in Turkey has become 208.938 while the number of deaths has become 5.282.⁴ Manpower and hospital resources need to be re-planned to meet hospital service needs during the pandemic. According to the recommendations from various sources including special guidance in orthopedics, there was a decrease in the number of elective operations to transfer

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the available labor force in clinics where elective and emergency operations are performed such as orthopedics and traumatology to necessary specialties fighting against Covid-19 and to maximize the hospital bed capacity and available sources.^{5,6} The operations are limited to only emergency indications. Thus, unnecessary exposure and contamination measures became protective both for patients and healthcare professionals. These changes in clinics and rescheduling patients cause serious discomfort for patients due to delayed diagnosis and treatment. This condition poses as a potential risk, but it is a must to do considering the severity of the current situation.⁷ The elective cases between 24 March and 1 July 2020 were postponed and only emergency trauma patients were operated. During this time, we updated both our operation room and post-surgery patient follow-up procedures in line with the pandemic period. There has been growing concern that older people may have a higher risk of simple falls and associated fractures in the home due to widespread osteopenia and osteoporosis due to immobilization.⁸ The time spent inside homes increased due to the personal measures taken and lock downs during the Covid-19 pandemic. Thus, it is thought that fractures due to domestic simple falls, low-energy traumas, may occur. The aim of this study was to compare the data and epidemiological characteristics of emergency orthopedic trauma patients who were operated between 24 March and 1 July 2020 with the data of the orthopedic trauma patients who were admitted to emergency department and operated between 24 March and 1 July 2019. We believe that the current study will provide a reference especially in terms of orthopedic trauma surgery to prevent and guide similar injuries that may occur in situations such as pandemics.

2. Materials and Methods

All data were obtained from the Malatya Training and Research Hospital unit of statistics. Necessary approvals for this study were obtained from the clinical studies ethical committee of İnönü University and the Ministry of Health Covid-19 academic study committee. Our study was conducted in accordance with the Helsinki declaration 2008. Consent was waived for its retrospective nature

2.1. Inclusion and exclusion criteria

All patients who were operated due to a fracture in the Orthopedics and Traumatology clinic in Malatya Training and Research Hospital between 24 March-1 July 2019 and 24 March-July 2020 were included in the study. Patients with pathological (metastatic) fractures, nonunion, periprosthetic fractures and lacking data were excluded from the study.

2.2. Data collection and groups

Data obtained included the demographic characteristics (sex, age), body part where the fracture occurred, the occurrence mechanism of the osteoporotic fracture, injury and the treatment method. All medical data and radiographies of the patients evaluated were assessed by two orthopedic surgeon and were handled with discussion in case of inconsistency.

All patients were divided into two groups: The pandemic group (operated between 24 March and 1 July 2020) and the pre-pandemic group (operated between 24 March and 1 July 2019). All patients were divided into four subgroups based on their age: Old patients (aged 65 and older), middle aged patients (aged between 45 and 64), young patients (aged between 15 and 44) and children (aged 14 or younger). The sites of fracture were femur, tibia-fibula, humerus, ulna-radius, pelvis fractures, and the sites of fractures for hand and foot were recorded as hand-foot fractures. Wrist, foot and ankle fractures were examined. Distal radius, proximal humerus and proximal femur fractures induced by low-energy in patients aged 65 and older were regarded as osteoporotic fractures.⁹⁻¹²

Injury mechanisms were determined as falling from the same standing height, falling from a low height (<1 m, e.g. bed, chair, seat), falling down from height (> 1 m, e.g. balcony or tree), bicycle injury, motor vehicle injury and other.

The types of operations were evaluated as closed reduction internal fixation (CRIF), open reduction internal fixation (ORIF), joint replacement and other fixation options.

2.3. Treatment principles for traumatic fractures during the Covid-19 pandemic

A detailed anamnesis was taken from all trauma patients to be operated during the pandemic about their current trauma. If there is a history of direct or indirect contact with any person with Covid-19 PCR test + or clinical symptoms related to Covid-19 during the 14 days before the patient was seen, then isolation measures were taken immediately. The following were regarded as the symptoms related to Covid-19; fever, cough and fatigue. Additionally, the ground-glass appearance on the lung parenchyma was an important imaging outcome after thoracic computed tomography. Then, the consultation was provided by a multidisciplinary team including an orthopedist and chest and infectious diseases doctor. During the period until these tests are completed and the patient is taken to the operating room, it has been planned to have only one patient in each room. The aim was to clarify the existence or absence of Covid-19 before the patient is operated. Considering that there may be false negativity in patients who have been eliminated from Covid-19 + and Covid-19 after the

procedures, all necessary preparations were made.

2.4. Statistics

The analyses of available data were carried out with SPSS 22 program. The conformity to normal distribution of continuous variable was assessed with Kolmogorov simirnov test. It was found that they did not conform with normal distribution ($p < 0.05$). Descriptive data are presented as numbers and percentage. The statement of Mann Whitney U Test and Pearson Chi-square test were used in the statistical analysis. The significance level was $p < 0.05$ in all statistical analyses.

3. Results

The median age of the patients in the pre-pandemic group was 59 (4-100) while the median age of the patients in the pandemic group was 53 (2-101), and the median age of the patients in 2019 was higher ($P < 0.05$). There were 220 patients of whom 137 (50.7%) were men and 83 (49.3%) were women in the pandemic group. There were 219 patients of whom 111 (50.7%) were men and 108 (49.3%) were women in the pre-pandemic group. The most common age group in the pandemic group was middle aged adults while it was old patients in the pre-pandemic group. Detailed characteristics classified by age and group are presented in Figure 1.

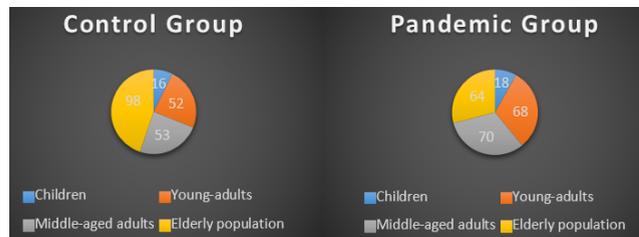


Fig. 1: The frequency distribution of the age groups of patients who were operated due to fractures between two groups

Osteoporotic fractures constituted 55% of the fractures in the pandemic group and 40.6% of the fractures in the pre-pandemic group (Table 1). The rate of osteoporotic fractures in the pandemic group was significantly higher than the pre-pandemic group ($p = 0.003$).

The fracture cases in the pre-pandemic group who were admitted to the emergency room and operated by orthopedics were due to simple falls in 127 patients (58.0%), falling down from height in 48 patients (21.9%), traffic accident in 27 patients (12.3%), hitting a hard surface in 9 patients (4.1%), occupational accident in 5 patients (2.3%), gunshot wound in 1 patient (0.5%) and other mechanisms in 2 patients (0.9%) while the fractures in the pandemic group were due to simple falls in 136 patients (61.8%), falling down from height in 44 patients (20.0%), hitting a hard

surface in 16 patients (7.3%), traffic accident in 9 patients (2.3%), gunshot wounds in 5 patients (2.3%), occupational accident in 5 patients (2.3%) and other mechanisms in 5 patients (2.3%) (Table 2). While the traffic accidents were significantly lower in the pandemic group than the pre-pandemic group, simple falls were significantly higher in the pandemic group than the pre-pandemic group ($P < 0.05$). Additionally, fractures induced by hitting a hard surface and gunshot wounds significantly increased in the pandemic group compared to the pre-pandemic group ($P < 0.05$).

Of the 219 fractures in the pre-pandemic group, 39.3% were femur, 21% were radius-ulna, 20.5% tibia-fibula, 7.8% were other fractures, 5.9% humerus, 5% were hand-foot, and 0.5% were pelvis fractures. Of the 220 fractures in the pandemic group, 33.6% were femur, 20.5% were tibia-fibula, 15% were hand-foot, 14.5% were radius-ulna, 10% were humerus, 5.9% other fractures, and 0.5% were pelvis fractures (Table 3).

Of the fractures in the pre-pandemic group, 47% were treated with ORIF, 27.4% were treated with CRIF, 21.9% were treated with joint replacement, and 3.7% were treated with other methods. Of the fractures in the pandemic group, 42.7% were treated with ORIF, 37.7% were treated with CRIF, 12.7% were treated with joint replacement and 6.8% were treated with other methods (Table 4).

4. Discussion

After the emergence of Covid-19 in Turkey, lock down restrictions were immediately provided to take isolation measures and reduce the contact of people. However, this condition was enforced more rigidly especially for older people and individuals over the age of 65 who had a high risk of osteoporotic fracture. As a result, these people's daily activities such as regular walking and exercising decreased and their sedentary life span at home increased. The number of fractures due to simple falls was significantly higher in the pandemic group (61.8%) compared to the pre-pandemic group (58.0%). The rate of osteoporotic fractures was also significantly higher in the pandemic group (55%) than the pre-pandemic group (40.6%). In a systematical review conducted within the scope of isolation measures during the pandemic, it was determined that people were diagnosed with depression, anxiety, anger, stress, post-traumatic stress disorder, social isolation, loneliness and stigmatization during the quarantine period. It was found that pandemic has caused serious negative effects on the psychosocial health of people.¹³ It was found in the present study that the number of fractures due to gunshot wound, hitting a hard surface was significantly higher in the pandemic group than the pre-pandemic group. It is considered that these fractures might have occurred as a result of increased anger, stress, anxiety and depression during the pandemic. A detailed study should be carried out on this subject.

Table 1: Osteoporotic condition

Patient groups	Osteoporotic n (%)	Non-osteoporotic n (%)	Total n
Pre-pandemic group	89 (40.6)	130 (59.4)	219
Pandemic group	121 (55)	99 (45)	220

p= 0.003

Table 2: Fracture occurrence mechanism

	Pre-pandemic group n (%)	Pandemic group n (%)	Total n
Traffic accident	27 (12.3)	9 (4.1)	36
Simple Fall	127 (58.0)	136 (61.8)	263
Falling Down From Height	48 (21.9)	44 (20.0)	92
Hitting a Hard Surface	9 (4.1)	16 (7.3)	25
Gunshot Wound	1 (0.5)	5 (2.3)	6
Occupational Accident	5 (2.3)	5 (2.3)	10
Other	2 (0.9)	5 (2.3)	7
Total	219 (100)	220 (100)	439

p= 0.014

Table 3: Site of fracture

	Pre-pandemic Group n (%)	Pandemic Group n (%)	Total n
Humerus	13 (5.9)	22 (10.0)	35
Radius-ulna	46 (21.0)	32 (14.5)	78
Femur	86 (39.3)	74 (33.6)	160
Tibia-fibula	45 (20.5)	45 (20.5)	90
Pelvis	1 (0.5)	1 (0.5)	2
Hand-foot	11 (5.0)	33 (15.0)	44
Other	17 (7.8)	13 (5.9)	30
Total	219 (100)	220 (100)	439

p= 0.006

Table 4: Treatment method

	Pre-pandemic Group n (%)	Pandemic Group n (%)	Total n
CRIF	103 (47.0)	94 (42.7)	197
CRIF	60 (27.4)	83 (37.7)	143
Joint Replacement	48 (21.9)	28 (12.7)	76
Other	8 (3.7)	15 (6.8)	23
Total	219 (100)	220 (100)	439

p= 0.009 CRIF; Closed Reduction Internal Fixation, ORIF; Open Reduction Internal Fixation.

The most important finding of this study is that the applications of patients operated for osteoporotic fractures have increased in Malatya Training and research Hospital during the Covid-19 pandemic compared to the same period of the previous year. This caused a decrease in emergency room admittances due to trauma, and occupational and traffic accidents. The emergence of the pandemic known as “Covid-19” caused severe global health problems and concerns.¹⁴ Elective cases were postponed in this time of limitations. We believe that this decision is accurate in terms of reducing the spread of Covid-19 and the operating room load.

Despite this process, healthcare systems continued to treat other emergency diseases such as fractures due to osteoporotic hip and serious traumas, and public health

problems.¹⁵ It is important to understand which conditions are less common, and which condition occur with the same or even increasing frequency while planning the remaining course of the pandemic that we are experiencing, possible future pandemic and other global emergencies.

The increase in life span around the world has resulted in aging of the population and an increase in diseases or conditions that affect mainly the elderly. This condition is osteoporosis that causes the increased risk of fractures. Especially hip fractures increase morbidity and mortality and results in great amount of healthcare costs.¹⁶ Especially after a osteoporotic hip fracture, active elderly person loses the ability to move independently, and thin and weak patients may become dependent to others in home. Thus, patients who are already thin and weak become even

weaker after pain, loss of movement and inability to meet their own needs.^{17–19} The rate of deaths within the first month after osteoporotic hip fractures is 10%, and this rate increases to 25% within the first year, and only the one third of this rate is directly related to the fracture itself.^{20–22}

Recent studies have revealed that elderly patients who have comorbid diseases such as high blood pressure and diabetes, got negatively affected by Covid-19 due to their reduced functional capacities and weak immune systems.¹ Osteoporotic fractures occur mostly around the hip, due to the simple fall of an elderly person with or without any medical problems at home. This is an organized process that involves many people from the surgeon who performs the operation to the physiotherapist who performs the exercises as well as from family relationships to the caregiver.^{23,24}

Various exercises were defined to stimulate bone growth and preserve bone mass in relevant studies. Quite positive results have been reported about the beneficial effects of exercising on hip fractures in osteoporotic people aged above 65.^{25–27} It is understood from the results obtained that lock downs during the pandemic directly affected individuals aged above 65 who have a higher risk of osteoporotic fracture. We believe that the current study will provide a reference especially in terms of orthopedic trauma surgery to prevent and guide similar injuries that may occur during the pandemic. We are in the opinion that arrangements for individuals aged above 65 who have a high risk of osteoporotic fracture should be made where they can practice physical activities such as walking and exercising at certain times during the recurrent increase periods of the current Covid-19 pandemic or in a different pandemic period.

5. Conclusion

In conclusion, the rate of osteoporotic fractures due to gunshot wounds and hitting a hard surface significantly increased in the pandemic group compared to the pre-pandemic group. Osteoporotic fractures may have increased after the elderly had a decreased range of motion at home, could not walk regularly and could not go outdoors. Additionally, it is considered that fractures due to hitting a hard surface and gunshot wounds might have occurred as a result of increased stress during the pandemic. More studies should be carried out to explain these conditions in detail.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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