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ORIGINAL STUDY

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The management of orthopedic trauma surgery during the COVID-19 pandemic in Turkey

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COVID-19 has now alarmed the whole world, putting many countries' health systems in trouble. We aimed to evaluate the affect of the new treatment strategy that shortens hospital stay in orthopedic trauma patients in pandemic.Trauma patients who underwent surgical treatment between March 15th-May 1st 2019 and 2020 were examined about time interval from admission to surgery, period from surgery to discharge and total hospital stay time. This cohort was compared to a retrospective cohort of patients admitted for the same reasons in the same period of the previous year. During COVID pandemia, 51 trauma patients operated with the mean period from admission to operation 1.45 days, faster than the previous year's same period (3.76 days). From operation day to discharge time was 1.6 days in pandemic period and 4.3 days last year. The total hospitalization period (3,05 days) was significantly shorter in pandemic than the same period of the last year (8,06 days). ($p<0.05$). No complications and mortality were observed in any of our patients with faster trauma treatment strategy in pandemic. The operation of orthopedic trauma patients requiring surgery during a pandemic in a shorter time than normal time will not increase the complication and mortality, but will also help to use the bed more effectively by reducing the hospital stay.

Keywords: Orthopaedic trauma; Covid-19; hospitalization period.

INTRODUCTION

A new coronavirus disease, COVID-19 appeared in China Wuhan, Hubei province in December 2019 and announced as a pandemic by WHO in March 2020 *(1)*. First COVID-19 case of Turkey was diagnosed in a male patient who stay in İstanbul at March 10. Afterward, the patients and the people who were contact were put under quarantine quickly. The first virus-related death in Turkey occured on March 15, 2020. Stringent precautions were taken increasing over time with the detection of the first COVID-19 case, especially in social life. As of March 13, 2020, education has been suspended in schools and universities, then online education has been started. All parks, gardens, cafes, restaurants and gymnasiums were

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closed. In Turkey, the cases were seen in İstanbul, İzmir and Ankara respectively. As more than half of the current cases are seen in Istanbul which has a population approximately 15.5 million, hospitals were rapidly transformed into a pandemic hospital in İstanbul under the coordination of the Ministry of Health.

Orthopaedic surgeons, like other front-line workers, carry the risk of getting infected during their practice, which as such is already substantially afected *(2)*. 26 orthopaedic surgeons from 8 hospitals were identifed in a recent survey of orthopaedic surgeons with COVID-19 in Wuhan *(3)*. Globally at least 22,000 health care workers have been infected at the time of this report, with Italy reporting the highest percentage (20%) *(4)*.

Orthopedics department was converted to COVID clinic as the other departments in our hospital. All surgical departments were combined into one department. Elective cases were stopped and only emergent surgeries were performed. Despite the rapidly increasing number of cases, it was planned to create an algorithm to determine the indication of ongoing surgeries and to prevent the treatment of current trauma patients from being affected by this process.

In this manuscript, we aimed to evaluate the affect of the *new treatment strategy* that shortens hospital stay in orthopedic trauma patients in pan-demic.

MATERIAL AND METHODS

Fifty-one orthopedic surgeries were performed between March 15th 2020 and May 1st 2020 at our hospital which is turned to *a pandemic hospital* and located in İstanbul. All of the patients were admitted and operated due to trauma. All data were retrieved from the institutional database, also each patient's medical records were searched. Demographics of the patients, diagnosis, type of surgery, time interval from admission to surgery, and period from surgery to discharge were evaluated. This cohort was compared to a retrospective cohort of patients admitted for the same reasons in the same period of the previous year (March 15th 2019-May 1st 2019). The transformation of our hospital into pandemic hospital and the continuing orthopedic trauma cases despite the increasing number of COVID-19 patients caused us to change our old treatment strategies. It was necessary to use each bed in a more functional way and to minimize the risk of *hospital-acquired infections* for patients without COVID-19.

Treatment algorithm

In admission of orthopedic trauma patient to the emergency department, fever and cough in terms of COVID-19 symptoms were questioned and evaluated in the triage room. While patients with COVID-19 symptoms were taken to a separate unit in the emergency room, patients who were evaluated as non-COVID were examined by X-ray, CT and/or USG after general trauma examinations, according to the type and severity of the trauma. In patients with unconsciousness or head trauma, the brain CT was scanned and a neurosurgery consultation was requested. In case of necessity whole body CT scan was performed and in cases where vascular damage was considered, CT angiography and doppler USG were performed. More detailed diagnostic and laboratory tests were requested in patients who were hemodynamically unstable. If the patient has no major trauma, they were evaluated by the emergency doctors and undergo radiological assessment about the affected body area (Fig. 1).

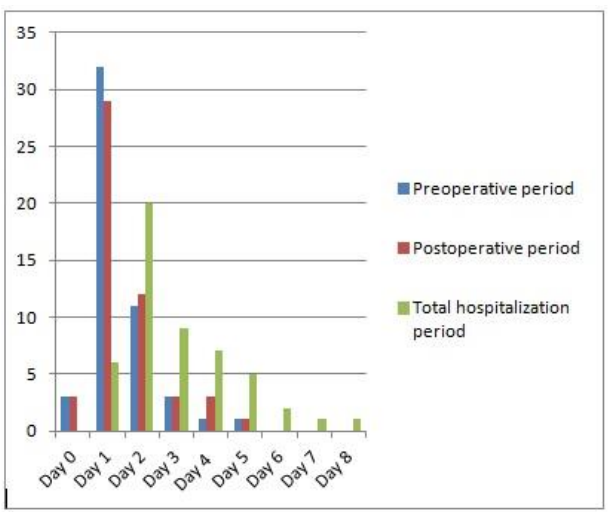

Fig. 1. — The hospitalization chart of the patients in 2020 during COVID-19 pandemic.

Although non-operative treatment was preferred as much as possible due to the more severe possibility of fracture course in patients with COVID-19 in the pandemic process, the cases requiring surgery were again evaluated in terms of COVID-19 *(5)*. If there is no risk, the patients were hospitalized in the non-COVID service. Patients with the risk of COVID-19 were consulted to the department of infectious diseases while still in the emergency room, and were placed in a single room in the COVID-19 service and isolated until the result of the PCR test was evident. Patients who had an indication for surgery and especially those with upper extremity fractures were evaluated and hospitalized on the day of surgery, with performing the pre-operative preparation outpatient if deemed appropriate.

When the patient with an indication for surgery was detected, the information was given to the anesthesia department, and the patient was hospitalized, and immediately after the preoperative laboratory tests were completed, the anesthesia department evaluated the preops and got the patient ready for surgery. As soon as preop preparations were completed, the patient was operated, and the duration of hospitalization in the preop period was aimed to be minimized.

The operating rooms are divided into as *COVID-19 and non-COVID* 19 in our hospital. COVID-19 patients were taken to the operating room as soon as possible and through a *separate door*. The *lowest* possible number of personnel in the *negative pressure surgery* room was admitted operation by wearing a three layer *surgical mask* over an N-95 mask as personal protective equipment, a goggles and overalls on the bone. A surgical mask was used also by COVID-19 patients. If possible, anesthesia methods (block, epidural-spinal anesthesia) that would minimize aerosol spread were preferred by the anesthesia department.

Non-COVID 19 patients were also taken to the operating room with a minimum number of staff with a three layer surgical mask. The surgical team was created by one primary specialist and one assistant specialist. The operating room nurse was determined as one person and continued to be the only nurse from the beginning to the end of the case. Industry representatives were not taken to the operating room as much as possible.

Postoperatively, non-COVID 19 patients were followed up by anesthetists in a separate recovery section, and after anesthetists gave their consent, the patients were taken under surveillance in the ward. Patients who need postoperative intensive care were transferred to the anesthesia department. Hemogram follow-up was performed early in the patients who were followed up in the surgical service and the next day, hemogram examination was repeated according to the type of surgery performed. When the amount of incoming drains decreased, the drain was removed. If there is no obstacle to mobilization, the patients were mobilized in the early postoperative period. According to the treatment protocol, patients who did not require supervision and whose general condition was appropriate were discharged on the *postoperative first day* after being specifically informed about home care. Only one companion was allowed to be accompanied by a patient during the hospital stay. Relatives of these patients were also evaluated in terms of COVID-19 and they were not allowed to leave the service during the hospital stay.

Statistical analysis

Statistical analysis was performed by SPSS 22.0. Independent sample test was used in evaluation of data. $p < 0.05$ was considered statistically significant.

RESULTS

During COVID pandemia between 15 March and 1 May 2020, 51 patients were operated due to trauma at our hospital. In the same timeframe last year (15 March and 1 May 2019), total 50 patients underwent orthopedic trauma surgery. The mean period from *admission to operation* was 3.76 days in 2019 and 1.45 days in 2020 pandemic, respectively. The difference was statistically significant ($p<0.05$). The mean period from *operation day to discharge* was 4.3 days in 2019, while it was 1.60 days in 2020 (Figure 1, 2). *The total hospitalization period* in last year 8,06 days (min. 1-max. 15 days) and 3,05 days (min. 1-max. 8 days) in 2020 was significantly

Table 1. — Comparison of the parameters between 2019 and 2020

	2019 (15 March-1 May)	2020 (15 March-1 May)	P value
Number of trauma patients	50	51	
Gender	21 F/ 29 M	15 F/ 36 M	
Age	48.8 (min...-max...)	37.0 (min...-max...)	
Preop time (days)	3,76	1,45	<0.05
Postop time (days)	4,3	1,60	<0.05
Total (days)	8,06	3,05	<0.05

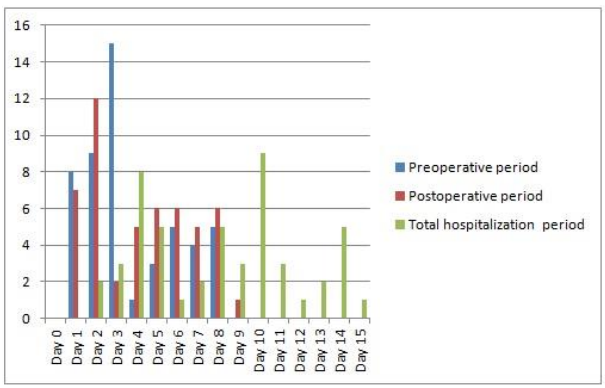

Fig. 2. — The hospitalization chart of the patients in 2019.

higher ($p<0.05$) (Table 1). *No complications and mortality* were observed in any of our patients.

In pandemic trauma surgery patients , 15 of the patients were female, 36 were male and the average age was found to be 37. (min. 1-max. 89 years old) Twenty-one of the trauma patients operated on the same period last year were female and 29 were male and the average age was 48.8 (min. 1-max. 96 years old).

The distribution of the fracture type in patients who underwent surgery was different from the last year in same period. Among the trauma patients, the highest number of admissions between 15 March and 1 May 2020 was due to hip fracture. Nine patients were operated on during this period. Other frequent surgeries were tibial shaft and malleolar fractures, respectively, with eight and seven patients. Some of the fractures of the region, which were not performed in the same period last year, were performed this year. These were the distal radius, phalanx and calcaneal fractures. A 5-fold increase was observed in pediatric supracondylar fractures who underwent operation in this year compared to last year (Table 2).

Table 2. — Distribution of the fracture types between 2019 and 2020

Fracture type	March 15th-May 1 2019 (n)	March 15th-May 1 2020 (n)
Proximal humerus	1	1
Radius-Ulna shaft	3	4
Pediatric Supracondylar Humerus	1	5
Olecranon	1	1
Distal radius	-	2
Phalanx	-	4
Hip	19	9
Femur shaft	4	5
Tibia plateu	1	2
Tibia shaft	10	8
Malleolar	10	7
Calcaneus	-	3

n: number of patients.

DISCUSSION

We significantly reduced the *length of hospitalization* compared to last year. This decrease in time did not cause any complications or an increase in mortality. This was the main finding of our study.

COVID-19 disease from asymptomatic or mild base; It has put a heavy burden on the health systems of countries, as it can progress in a wide range of severe viral pneumonias, which can result in respiratory failure and death. First studies reported patients' clinical manifestations included fever, non productive cough, dyspnea, myalgia, fatigue, normal or decreased leukocyte counts, and radiographic evidence of pneumonia. Organ dysfunction (eg, shock, acute respiratory distress syndrome [ARDS], acute cardiac injury, and acute kidney injury) and death can occur in severe cases *(6)*.

Since a definitive treatment or a protective vaccine has not been developed yet, the basic approach of countries towards pandemics has been to keep the number of patients at the level that health systems can carry. While the health system is trying to deal with all the power of the pandemic, medical emergencies such as cardiac disease, stroke and other neurological diseases, tumors, and trauma still need to be treated. This made it more important than ever to use hospital bed capacities with maximum efficiency. One of the most common emergent type of surgery is orthopedic trauma surgery. In all orthopedic trauma patients, especially in the lower extremity fractures, a risky process in terms of lung pathologies occurs with immobilization *(7)*. With the emergence of publications showing that covid-19 infection was more mortal in fractured patients, we planned to minimize the hospital-related contact of the orthopedic trauma patients by minimizing their hospital stay *(5)*.

As orthopedists, in this process, we aimed to both minimize the risk of patient transmission and use fewer beds more *effectively* by shortening the treatment period and hospital stay of trauma patients. We think that this approach will facilitate the work of orthopedists in other countries in the pandemic process and will have positive effects on patient life.

At the beginning of the pandemic, trauma patients who were not suspected of COVID-19 were admitted with a surgical mask. However, upon the detection of COVID-compatible findings in thorax CT even of patients who have no symptoms, we started to use n95 masks, glasses and shields by accepting every patient as COVID +.With the same approach, patients with COVID+ suspect who need urgent early surgery were operated as COVID-19 positive until the definitive test results are obtained. Personal protective equipments were used as recommended for orthopedic surgeons *(8)*. Patients with closed fractures should wait for surgical interventions until the COVID-19 results are out. All cases which need urgent management like an open fracture, vascular injuries, compartment syndrome or mangled limb; we cannot wait until COVID results. These patients should be managed as COVID positive patients and strict precautions should be taken to avoid transmission to caregivers or to other patients *(9)*.

The purpose of our protocol was to reduce the length of hospital stay of patients and reduce the risk of transmission by surgical intervention in the shortest possible time, while at the same time providing the bed need for COVID + patients. In order to realize this strategy, emergency department orthopedics and anesthesia departments must work in harmony. Orthopedic surgeries are surgeries with high implant requirements. It is very important for industry representatives to follow this process closely in order to supply the necessary consumables despite quarantine applications and transportation restrictions in the country and abroad. In the event of a failure in the supply of materials, even if the entire surgical team is ready, the surgery will not be performed and the hospital stay will be longer.

We preferred conservative treatment methods in fracture treatments as much as possible during the pandemic process. For example, in our normal routine, while preferring the mobilization principle by performing intramedullary nails and early load in tibia shaft fractures, we preferred the mobilization limited with circular casting and double crutches considering the age of the patient, additional health problems.

It was observed that the ranking of the first three most frequent surgeries did not change compared to the same period last year. This year, in the pandemic process, the most frequently operated patient group was patients who admitted with a hip fracture, just like last year. Interestingly, although this year, the hip fracture was in the first place, there was a decrease in number.

Before starting the study, we thought that the rate of hip fractures will not change or even increase during the pandemic. However, we observed that there was almost a half decrease compared to the same period of the previous year. We can think that it may be effective for elderly patients to spend more time with other family members in their homes.

CONCLUSION

The operation of orthopedic trauma patients requiring surgery during a pandemic in a shorter treatment protocol will not increase the complication and mortality, but will also help to use the bed more effectively by reducing the hospital stay.

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