ORIGINAL ARTICLE

The impact of COVID-19 pandemic in the first 100 days on orthopedic trauma surgery practice, the experience of a university hospital in Istanbul

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ABSTRACT

BACKGROUND: With the rapid and effective change created by the COVID-19 pandemic in all medical practice, we aimed to evaluate the impact of the first 100 days of the COVID-19 pandemic on the operations performed in a reference university hospital in the field of orthopedics and traumatology. Compare the results with the same period of the previous year and aim to evaluate importance of restrictions.

METHODS: The operations performed in orthopedics and traumatology clinic between March 18, 2020 (the day we stopped the elective surgeries), and July 1, 2020 (when the normalization process began), were collected from the electronic archive to compare with the same period of 2019.

RESULTS: Comparing the same periods of the year, it was seen that 102 surgeries were performed in the 2020 COVID-19 period compared to 380 operations performed in 2019. Although most of the operations performed during the COVID-19 period were traumas, the comparison revealed that trauma cases decreased by 25% from 73 to 58 ($p<0.001$). Among trauma patients operated in the restraint period, decrease in the pediatric group and the increase in patients over 65 years of age had seen statistically significant. Compared to the same period of the previous year, 50% increase seen in amputation cases related to diabetic foot ($p<0.001$).

CONCLUSION: The postponement of elective cases due to the COVID-19 pandemic enabled us to manage trauma cases despite decreasing capacity utilization. In addition, it was observed that the transition of schools to online education and the implementation of curfews significantly reduced the number of trauma in the pediatric group. Separation of operating rooms and wards had a huge effect on protection of non-COVID patients. We hope that, in light of this study, we can guide health policies and help other colleagues to manage the possible new waves of the pandemic process or similar processes that may occur in the future.

Keywords: Coronavirus; COVID-19; fracture; orthopedic surgery; orthopedic trauma; pandemic; SARS-COV-2.

INTRODUCTION

The new coronavirus disease (COVID-19) SARS-CoV-2,[1] which was first identified in Wuhan Province of China, in December 2019, has become the priority of the entire healthcare sector in the world and also in Turkey after its acceptance as a pandemic by the World Health Organization on March 11, 2020. The countries have determined their unique policies against this pandemic. Although many countries have implemented preventive health policies with lockdown, several countries have acted with a community immunity policy. The first patient affected by a coronavirus in Turkey was reported on March 10, 2020, officially, then lockdown and restrictions were put into effect. With the original policy implemented by the Turkish Ministry of Health, the lockdown was introduced for individuals over 65 years old and then individuals under the age of 20. The pandemic was also tried to be kept under control by applying general quarantine on weekends in the metropolitan cities. Primary schools, high schools, and universities were closed, education and training activities were

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moved to online platforms. Moreover, to secure the effective use of hospitals and prevent nosocomial transmission, it was decided to stop the elective surgery with the recommendation of the Turkish Ministry of Health. The hospitals with specialists from at least two disciplines amongst of the infectious diseases and clinical microbiology, chest diseases, and internal medicine areas are considered as pandemic hospital. Besides, our hospital became a pandemic hospital and all health-care personnel were reallocated for the shifts in COVID-19 wards. The daily practice of the orthopedics and traumatology department has also been changed compulsorily. The elective surgeries were stopped. Only trauma, acute infection, and oncology cases were evaluated for surgery with the suggestions of the Turkish Society of Orthopedics and Traumatology, our hospital's scientific committee, and global orthopedic societies.[2] The number of outpatient appointments was reduced to minimize the risk of possible virus transmission and provide the effective use of health-care personnel. At the beginning of July 2020, there were more than 200,000 confirmed cases seen in Turkey. Istanbul is the biggest city in Turkey, with approximately 16 million population. The fact that 60% of COVID-19 cases occurred in Istanbul shows that the number of cases in this single city was higher than the number of cases in 193 countries, according to the latest data in July. In this intense pandemic period, our daily orthopedic routine and case variety were changed remarkably compared to previous years. We aimed to evaluate the impact of the first 100 days (15 weeks) of the COVID-19 pandemic which included obvious social restrictions, on the operations performed in the field of orthopedics and traumatology in a reference university hospital located in Istanbul and compare it with the same period of the previous year. We believe that these results will help us to react more properly during possible future pandemics and new waves of COVID-19.

MATERIALS AND METHODS

Hospital and Reorganization of Orthopedics and Traumatology Department

This study was carried out in a reference university hospital in Istanbul which is one of the leading university hospitals in Turkey serving more than 200 years. The ethical approval was obtained from the local institutional review board (no: A-66, date: August 4, 2020). Hospital is the orthopedics and traumatology clinic of the university which is one of the most prestigious clinics in Turkey, in which more than 1500 operations are being performed in a year. After the declaration of the situation as pandemic, the hospital administration gave immediate response to overcome the increase of the intensive care unit (ICU) patients. The general operating rooms were turned into ICUs. As a result of this response, the number of ICU beds increased to the 117 which were 37 before. Due to the old structure of the hospital, the hospital has separate buildings with their own operating rooms and ICUs. A clean building was established without COVID-19 patients. Therefore, orthopedics and traumatology clinic worked in a separate building with clean operating rooms and separate ICUs to prevent transmission for non-infected patients. This building was shared by orthopedics and traumatology, neurology, neurosurgery, and cardiovascular surgery clinics. In this time period, although the elective surgeries were postponed most of the ward and ICU beds were used by our clinic, since the trauma patients still referring to the hospital despite the decrease in their number.

As the orthopedics and traumatology practice was rearranged during the pandemic period, our bed capacity decreased by 75% and the number of operation rooms also decreased from 3 to 1. As a result, we started to serve only for emergency-urgency trauma, musculoskeletal infection, and orthopedic oncology cases. To ensure the maintenance of the sections called clean, nasopharyngeal swab tests were taken from each patient for PCR evaluation and thorax radiological imaging was also evaluated before the hospitalization. According to the results of these examinations, the wards that patients will be hospitalized and the operating rooms where they will be operated were determined. Cases requiring emergent operation were performed in COVID-19 operating theaters without waiting for the swab test result. In the pandemic period, outpatient services have been provided to 170,000 patients throughout our hospital, and 1244 patients have been treated inpatient with the diagnosis of COVID-19.

Data Collection

The operations between March 18, 2020 (the day which the elective surgeries were stopped), and July 1, 2020 (when the normalization process began), were collected from the electronic archive to compare with the same period of 2019. The operations were divided into eight subgroups: Trauma, infection, arthroplasty, sports medicine, orthopedic oncology, pediatric orthopedics, spine surgery, and others (amputations, implant removal, carpal tunnel release, etc.). Age, gender, and trauma mechanism features of the trauma patients were retrospectively analyzed. The collected data wee compared to the same period of the previous year to determine the differences in orthopedic practice.

Statistical Analysis

Data analysis was performed using SPSS software (version 24.0, SPSS Inc., Chicago, IL). Data analysis involved descriptive statistics, including percentage, mean, and standard deviation. The differences between categorical data were analyzed by the Chi-square test. The mean values were compared by independent samples t-test. $P<0.05$ was considered statistically significant.

RESULTS

When the total outpatient clinic admissions to orthopedics and traumatology department were evaluated, it was ob-

served that there were 2141 admissions with a 79% decrease in 2020 (COVID-19 pandemic) compared to 9947 admissions in 2019. When the surgical interventions were evaluated, it was observed that 102 operations were carried out in the same period of 2020 (COVID-19 pandemic), compared to 380 operations performed in 2019. Out of 102 cases, 58 were trauma, 18 were infection, five were orthopedic oncology, two were arthroplasty, and 19 were other cases. In the comparison made with the same period of the previous year, trauma cases were decreased by 25% from 73 to 58 (p<0.001). The decrease in elective cases was almost 100% (Fig. 1). It was observed that 15 of the 19 cases included in the other cases section had a major amputation of the lower limbs. Compared to the same period of the previous year, 50% increase in amputation cases attracted attention (p<0.001). None of the surgeries were postponed due to the lack of ICU or ward beds with the help of the reorganization of the hospital, and the cancelation of the elective surgeries. Two patients were known to be COVID-19 positive and operated 6 times in the COVID-19 operating room. The first patient was operated due to the compartment syndrome of the lower leg, she had fasciotomy of the anterior and the both posterior compartments, and underwent recurrent debridement for 5 times. The second COVID-19 patient was operated due to a stab wound which caused the injury of thigh adductors. All of the other cases were the patients whose COVID-19 swab tests and thorax screenings were negative before the operation and their operations were performed in non-COVID operating theaters. Five patients died in the early post-operative period. The first of these patients was operated due to the development of compartment syndrome in the left cruris and was diagnosed with COVID-19, septic shock was the reason cause of death. The second patient who died was underwent bilateral transtibial amputation in two different sessions due to circulatory disorder and died in the intensive care unit during the post-operative period because of the multiple organ failure. The third patient was operated due to a proximal femur fracture and he died at home after discharge from the hospital due to myocardial

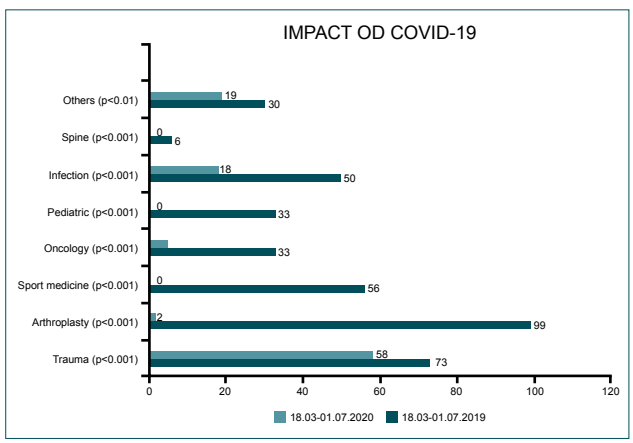

Figure 1. The comparison of operation subgroups and numbers between 2020 (COVID-19) and the same time period of 2019.

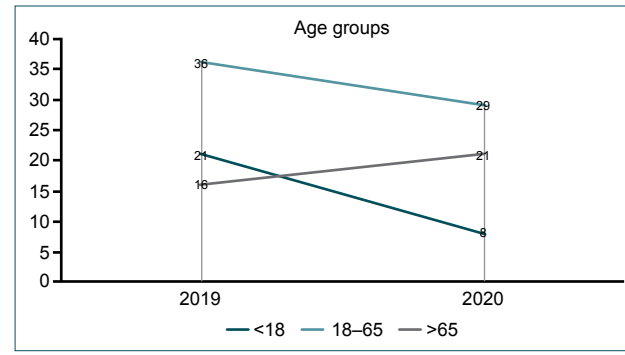

Figure 2. Distribution of trauma patients by age groups in 2019–2020 (COVID-19).

infarction. The other two patients died due to cardiovascular failure after discharge. The post-operative information was collected by phone calls on the 1st, 2nd, and 3rd weeks after discharge. The patients and their relatives did not report any coronavirus infection symptoms after the discharge.

Analysis of Trauma Patients

Fifty-eight trauma operations were performed in 2020 COVID-19 study period with a 25% decrease compared to 73 operations performed in 2019 (p<0.001). While 73 cases in 2019 consisted of 60.3% of male (n=44) and 39.7% (n=29) of female patients, 2020 cases were 44.8% male (n=26) and 55.2% (n=32). The average age of the patients was 39.21±27.25 in 2019 and 52.98±27.74 in 2020 (p=0.005).

When the distribution of patients by age groups was examined, it was found that eight patients under 18 years old were operated in 2020 study period, compared to 21 patients who were operated in 2019, with a decrease rate of 62% (p<0.001). A relatively low decrease was observed in the 18–65 age range with 20% (Table 1). Finally, when the population above 65 years old was evaluated, the number of operated patients was 16 in 2019 and 21 in 2020 (p=0.07). The patients were also grouped according to the trauma mechanism (Table 1 and Fig. 2). About 83% decrease in sports injuries was noted.

DISCUSSION

Although similar studies have been reported from several countries, this is the first study from Turkey analyzing surgical practices during restriction period of COVID-19 pandemics in the field of orthopedics and traumatology. Besides, while the studies reported from other countries generally evaluated the first 4–8 weeks of the pandemic, we analyzed a longer duration which included the 15 weeks when the pandemic restrictions were applied.

When the available data were evaluated, there was a significant decrease in the number of operations performed during the COVID-19 pandemic. Although this decrease was found close to 100% in elective surgeries due to the health system policies applied, the significant reduction in trauma-related

Table 1. Detailed comparison of operated trauma patients regarding the mechanism of injury between 2019 and 2020 (COVID-19)

Injury mechanism	<18		18–65		>65		Total	
	2019	2020	2019	2020	2019	2020	2019	2020
Fall from ground level	14	5	24	20	16	21	54	46
Motorcycle collision	3	2	3	3	–	–	6	5
Car collision	1	1	2	2	–	–	3	3
Assault	1	–	2	1	–	–	3	1
Sport injury	2	–	4	1	–	–	6	1
Gun shot	–	–	1	2	–	–	1	2
Total	21	8	36	29	16	21	73	58
P-value	(p=0.04)		(p=0.93)		(p=0.07)			

surgeries also suggests that the restrictions had another positive effect. These results were consistent with the results from Italy and England.[3–6]

When trauma patients were examined in detail, it is noteworthy that the operations performed on pediatric patients were significantly reduced. We think the reason behind this is the fact that schools were switched to online education and the lockdown was applied to people under 20 years of age. Although similar studies have shown that there has been a decrease in pediatric fractures, the decrease in our study was more significant.[3–6] However, we should also take into account that the tendency toward more conservative treatment in traumatic patients, especially in children, may have caused this decrease.

It should be emphasized that the increase in trauma patients over 65-years-old population is a remarkable result. Theoretically, the lockdown applied to the population over the age of 65 can cause an increase in osteoporotic fractures as a result of immobilization and diminished sun exposure, due to a possible decline in Vitamin D levels.[7] The increased proportion of this age group also caused an increase in the average age of trauma patients during a pandemic, which is also consistent with the literature.[8] The lack of decrease in hip fracture number is another result supporting the literature.[3–6] Furthermore, it should be taken into consideration that the majority of individuals in this group may experience malnutrition and delays in the appropriate management of their pathology. Future studies evaluating the older age group more in detail can provide valuable data to ensure that necessary precautions are taken to prevent the possible adverse effect of the prolonged pandemic process on elderly individuals.

Despite the significant decrease in the number of cases, the decrease in the age range of 18–65 was expected to be less than the other groups. Because this group was not affected by the quarantine applied to specific age groups in Turkey, and they kept almost pre-pandemic levels of activity.

Besides, the increased rate of female patients operated due to trauma in the COVID-19 period was also a noteworthy result that should be investigated further. This was also observed in a study reported from England, albeit at a lower rate.[6] The possible reason behind this result can be the increased rate of osteoporosis in females more affected by staying at home.[9] However, another study from China did not find any statistically significant difference according to the gender.[8]

The decrease in orthopedic oncology cases suggests that patients do not apply to hospitals due to fear of virus transmission, and this issue should be emphasized seriously in the future. The decrease of oncology cases in our study appears to be higher than the reported decline rates.[4] It is possible to assume that the lesions which could be treated at the early stage can progress and present in the late stages causing increased mortality and morbidity. We think that it will be beneficial to organize effective telemedicine and family medicine follow-up systems for these patients.

The 50% increase in amputations due to lower limb circulatory failure in diabetic patients also attracts attention, although the number of patients is low. The rapid progress of uncontrolled blood glucose levels and simple wounds that patients could not manage by themselves can develop due to the fear of hospital admission and the risk of virus transmission. The fact that diabetic patients are known to have a worse prognosis in the previous coronavirus outbreak supports this hypothesis.[10] It would be beneficial to carry out multidisciplinary studies with larger patient numbers for diabetic patients.

The absence of sports injuries was considered as an indicator of the compliance of society to the restrictions. As a result of postponing the professional and amateur sports competitions, the significant decrease in the number of patients operated due to sport-related injuries seems to be compatible with similar studies in the literature.[3,6,11]

The separation of the operating rooms and wards as COVID and non-COVID was essential. This separation protects both patients and health care workers. None of the post-operative patients were infected with COVID-19 to our knowledge. This result supports the accuracy of the suggestions made.[12]

The policies implemented in our country helped the hospitals to keep the occupancy rates of the wards and intensive care beds always low and to ensure the sustainability of the health system. Although these applications seem to be successful in pandemic management, it can be predicted that elective operations delayed in orthopedics and other branches may cause prolonged waiting times and long waiting lists in the future.

The most important limitation of this study is the retrospective design. However, since the pandemic process is not a predictable period, it is difficult to create prospective study designs. The fact that our hospital is a university hospital serving in every branch creates a relative limitation in the number of cases compared to the hospitals serving only in the field of orthopedics and traumatology. Despite this, the effect of the health policies implemented was significantly reflected in the results.

This study observed the change in orthopedic surgery practice during the restrictions period of the COVID-19 pandemic. In addition, the change in surgical time, the complications experienced and the relationship of these complications with the pandemic process could give a chance for a more detailed evaluation. Unfortunately, we can mention this as another limitation of the study, as we do not have detailed surgical time and complication data for the previous year.

As a result of our experience, it is observed that the precautions taken during this challenging pandemic process can have positive and negative effects. It is possible to conclude that individuals over 65 years old and the female population can be negatively affected. In children, trauma-related injuries which were decreased significantly can be evaluated as a positive effect of the precautions taken during the pandemic process. Adequate treatment of orthopedic trauma patients has been provided despite the reduced capacity in hospitals. Separation of operating rooms and wards had a huge effect on the protection of non-COVID patients. We hope that, in light of this study, we can guide health policies and help other colleagues to manage the possible new waves of the pandemic process or similar processes that may occur in the future.

Ethics Committee Approval: This study was approved by the Cerrahpasa Faculty of Medicine Clinical Research Ethics Committee (Approval number: A-66, date: 04.08.2020).

Peer-review: Internally peer-reviewed.

Authorship Contributions: Concept: N.A.; Design: N.A.; Supervision: N.A.; Materials: G.U.D.; Data: G.U.D.; Analysis: M.K.Ö.; Literature search: G.U.D.; Writing: G.U.D.; Critical revision: M.K.Ö., N.A.

Conflict of Interest: None declared.

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ORİJİNAL ÇALIŞMA - *ÖZ*

COVID-19 pandemisinin ilk 100 gününde ortopedik travma cerrahisi pratiğine etkisi: İstanbul'da bir üniversite hastanesinin deneyimi

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AMAÇ: Covid-19 pandemisinin tüm tıbbi uygulamalarda yarattığı hızlı ve etkili değişim ile travma cerrahisi pratiği de etkilendi. Pandeminin ilk 100 gününün ortopedi ve travmatoloji alanında referans üniversite hastanesinde yapılan operasyonlara olan etkisini bir önceki yılın aynı dönemiyle karşılaştırarak değerlendirmeyi ve uygulanan kısıtlamaların önemini göstermeyi amaçladık.

GEREÇ VE YÖNTEM: 18 Mart 2020 (elektif ameliyatları durdurduğumuz gün) ile 1 Temmuz 2020 (normalleşme sürecinin başladığı gün) arasında hastanemiz ortopedi ve travmatoloji kliniğinde gerçekleştirilen ameliyatlar, 2019 yılının aynı dönemiyle karşılaştırılmak üzere elektronik arşivden çıkarıldı.

BULGULAR: 2020 yılı Covid-19 kısıtlamalarının uygulandığı zaman aralığında yapılan 102 ameliyata karşı, 2019 yılının aynı döneminde 380 ameliyat yapıldığı görüldü. Covid-19 döneminde yapılan ameliyatların büyük bölümünü travma olguları oluşturmasına rağmen, bu olgu grubunda %25 oranında azalma ile 73'den 58'e düştüğü değerlendirildi ($p<0.001$). Kısıtlama döneminde ameliyat edilen travma hastaları arasında pediatrik gruptaki azalma ($p<0.04$) ve 65 yaş üstü hastalarda artış istatistiksel olarak anlamlı görülmüştür. Geçen yılın aynı dönemine göre diyabetik ayağa bağlı amputasyon olgularında %50 artış olduğu görüldü ($p<0.001$).

TARTIŞMA: Covid-19 salgını nedeniyle elektif olguların ertelenmesi, kapasite kullanımının azalmasına rağmen travma olgularının yeterli yönetimini sağladı. Ayrıca, okulların online eğitime geçmesi ve sokağa çıkma kısıtlamaları uygulanması pediatrik grubun travma sayılarında belirgin azalma sağladığı görüldü. Ameliyathane ve servislerin ayrılması, Covid-19 dışı hastaların korunmasında çok büyük bir etkiye sahip olduğu görüldü. Bu çalışmanın ışığında, sağlık politikalarına rehberlik edebileceğimizi ve diğer meslektaşlarımızın pandemi sürecinin olası yeni dalgalarını veya gelecekte meydana gelebilecek benzer süreçleri yönetmelerine yardımcı olabileceğimizi umuyoruz.

Anahtar sözcükler: Coronavirus; COVID-19; kırık; ortopedik cerrahi; ortopedik travma; pandemic; Sars-Cov-2.

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