Updates in Emergency Medicine

Research Article

# A narration of Orthopedic Surgery Experiences in COVID-19 Patients: Case Series of Early Complications

Milad Ghadery<sup>1</sup>, Fatemeh Taslimi<sup>2</sup>, Meysam Hamel Darbandi<sup>3</sup>, Ali Shabbak<sup>4</sup>, Tannaz Ranjbarian<sup>5</sup>, Marvie Hamel Darbandi<sup>6</sup>, Erfan Ghanbarzadeh<sup>9</sup>, Amir Rigi<sup>8</sup>, Aliasghar Tabatabaei Mohammadi<sup>9</sup>

- 1 Tehran university of medical sciences, Universal Scientific Education and Research Network (USERN).
- 2 Mazandaran University of Medical Sciences, Sari, Iran.
- 3 Chairman Department of Biochemistry and Molecular Biology, Gullas College of Medicine, University of the Visayas, Cebu, Philippines.
- 4 Gilan University of Medical Sciences, Rasht, Iran.
- 5 Tehran university of medical sciences, Universal Scientific Education and Research Network (USERN).
- 6 Chairman Department of Physiology, Gullas College of Medicine, University of The Visayas, Cebu, Philippines.
- 7 Gilan university of medical sciences, Universal Scientific Education and Research Network (USERN).
- 8 Department of Nursing, Young Researchers and Elite Club, Zahedan Branch, Islamic Azad University, Zahedan, Iran.
- 9 Urmia University of Medical Sciences, Urmia, Iran.

**Corresponding Author:** Erfan Ghanbarzadeh. Gilan university of medical sciences, Universal Scientific Education and Research Network (USERN). Imerfan2017@gmail.com.

#### Abstract:

**Introduction:** The most effective ways to combat the outbreak of COVID-19 include early detection of pathways of viral spread and controlling its spread through isolation and disinfection. We aimed to study the necessary measures at the time of hospitalization and to evaluate the early complications in patients in need of orthopedic surgery, who are afflicted with COVID-19.

**Method:** The present research was a case-series study conducted on a COVID-19 outbreak in February and March 2020, in Iran. Patients' data, including age, gender, mechanism and type of fracture, a simultaneous injury, and the surgical approach were collected. Moreover, the possible complications of the surgical treatment were noted through follow-up. In the last visit, patients' pain relief was evaluated based on the VAS questionnaire.

**Result:** Total number of ten patients with COVID-19 were operated on during the two months of the COVID-19 outbreak. Two of the patients were intubated and transported to the intensive care unit (ICU) after the surgery; both of the patients had an O2 saturation (SAT) of 92-96 % during the operation. In our study, four patients (40%) had post-surgical infections. Two of the patients (20%) developed deep vein thrombosis (DVT) in the external iliac vein of the right lower limb during the hospital stay. The mean score of the visual analog scale (VAS) questionnaire was  $4.7 \pm 1.94$  for patients.

**Conclusion:** The results of our study showed that the specific algorithm and special care protocol are essential for COVID-19 patients since several postoperative complications, such as DVT, surgical site infection (SSI), and pain are more common in these patients compared to other non-infected trauma patients.

Keywords: COVID-19, Trauma, Surgery, Orthopedic

Citation: Ghadery, M., Taslimi, F., Hamel Darbandi, M., Shabbak, A., Tranjbarian, T., Hamel Darbandi, M., Ghanbarzadeh, E., A., &z Tabatabaie rigi, Mohammadi, A. (2022). Narration of Orthopedic Surgerv Experiences in COVID-19 Patients: Case Series of Early Complications . Updates in Emergency Medicine, 2(1), ahead of print. Retrieved from https://uiemjournal.com/index.ph p/main/article/view/22

Received: January 20, 2022 Reviewed: August 3, 2022 Accepted: August 27, 2022 Published: August 28, 2022



**Copyright:** © 2021 by the UEM journal.

under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licens es/by/4.0/).

#### Introduction

A new coronavirus infection occurred in Wuhan, Hubei Province, China, in December 2019. The novel coronavirus was identified in January 2020 and named 2019-nCOV. Coronaviruses are enveloped RNA viruses that cause common respiratory, intestinal, hepatic, and neurological diseases among birds, humans, and other mammals. Bats are highly thought to be the source of the novel coronavirus. Six types of coronaviruses cause human infection (1-3).

The four common types cause flu-like symptoms (3). The other two types are the severe acute respiratory syndrome-related coronavirus (SARS-CoV) and the Middle East respiratory syndrome-related coronavirus (MERS-CoV) (4). These two types are zoonotic and cause fatal diseases. Although the mortality risk of COVID-19 is lower than that of SARS-CoV and

MERS-CoV, the number of COVID-19 confirmed cases has significantly increased (5). As of April 3rd, 2020, more than 82800 new COVID-19 cases and 3331 death tolls have been reported in China. More than 972300 COVID-19 cases and 50321 deaths have been reported over the world (1).

The most effective ways to combat the outbreak of COVID-19 include early detection of pathways of viral spread and controlling its spread through isolation and disinfection (6). Due to the high prevalence of COVID-19 in Iran, the health centers applied different treatment guidelines for the patients (5). One of the health systems challenges different countries are faced is providing a particular guideline for patients referred to hospitals with comorbidities who are diagnosed with COVID-19 at the time of hospitalization or during the treatment period(3).

Due to the high prevalence of trauma and fractures in patients, we aimed to study the necessary measures at the time of hospitalization and to evaluate the early complications in patients in need of orthopedic surgery, who are afflicted with COVID-19, in two health centers in two cities with a high prevalence of COVID-19 in Iran, namely the Imam Hossein Hospital in Tehran and the Poursina Hospital in Rasht.

#### Methods

The present research was a case-series study conducted after the coronavirus outbreak in February and March 2020, in Iran. All the trauma patients referred to the emergency department of the two centers underwent computerized tomography (CT) scan after the primary survey and were hospitalized in two separate sections depending on whether they were suspected of COVID-19.

Patients admitted to the COVID-19 section were simultaneously examined by the Infectious Department. The patients' companions were prohibited from entering the section, all the medical personnel was fully protected, and patients were provided with masks for further protection of the staff. All the patients underwent a PCR test. According to the primary symptoms and the lung involvement in the CT scan, patients were kept in the section until the end of the treatment period regardless of their polymerase chain reaction (PCR) result. The patients underwent surgery two to ten days after the hospitalization, according to the fracture site. One of the patients who had developed respiratory distress and severe COVID-19 symptoms was transported to the COVID-19 ICU and underwent surgery eight to ten days after hospitalization. The surgery was performed by a team of experts, including an anesthesiologist or a senior anesthesiology resident, an anesthetic technician, two circulators, an orthopedic surgeon, and one or two senior orthopedic residents. The surgery team was provided with full protective

clothing. The patients were directly transported from the operating room into the COVID-19 ICU after the surgery, and the decision to extubate them was evaluated. The patients were kept in the COVID-19 ICU for one to three days; then, they were transported to the COVID-19 section at the discretion of the treatment team and depending on their respiratory status. They were then discharged from the hospital with the approval of an infectious specialist at the end of the treatment period.

Patients' data, including age, gender, mechanism and type of fracture, a simultaneous injury, and the surgical approach were registered in а questionnaire. Moreover, the possible complications of the surgical treatment, i.e., neurological complications, thromboembolism, wound infection, and failure in bone healing was noted through follow-up. Low molecular weight heparin (LMWH) prophylactic treatment was subcutaneously applied to all patients 12 hours before the surgery to prevent thromboembolism. Patients received indomethacin for four to six weeks to prevent failure in bone healing and received a dose of Keflin before and a dose of Keflin and gentamicin 48-72 hours after the surgery to prevent the pre-and post-surgical infection.

The orthopedic resident instructed the patients on the physiotherapy type, and the therapy was performed again with full protection in the presence of a physiotherapist two days after the surgery, before the discharge. Due to their presence in the hospital, patients were advised to isolate themselves for two weeks, and then they came for a visit with full protection. During the first visit, a PCR test was requested for the patients, one of which was positive and was advised to pay a visit in two weeks. Moreover, the patients were instructed on how to perform physiotherapy at home. In the third visit, the patient was tested for PCR, which was negative, and then received treatment like the other patients. The patients were followed up first biweekly and then monthly for three months. In the last visit, patients' pain relief was evaluated based on the VAS questionnaire. No analytical statics were performed. Expression of continuous variables was performed by mean and standard deviation. Binary data were expressed as numbers and percentages. Microsoft Excel was used for descriptive statistics.

#### Results

The present study was comprised of ten participants; seven were male (70%), and three were female (30%). The most common mechanism of trauma was a motorcycle accident with 5 cases (50%). Two patients had fever and cough at the time of hospitalization, and the other eight patients did not have any of the related symptoms and were diagnosed with COVID-19 by the CT scan diagnostic protocol. The mean age of patients was  $53.20 \pm 13.66$ . The mean time of hospital arrival was  $2.45 \pm 1.12$ hours. Ten patients were stable at the time of hospitalization and had a GCS of 15. Six patients were referred to the hospital by ambulance, and the other four visited the hospital in person. One of the patients with a fracture of the acetabulum had a hip dislocation, for whom urgent reduction was performed and the surgery was operated on after eight days. During the operation, all the patients were anesthetized generally. The mean time of operation time was  $3.56 \pm 1.14$  in these patients. The minimum time of operation belonged to the distal radius fracture cases with one hour, and the maximum time of operation belonged to concurrent fractures of the acetabulum and distal radius with 4.5 hours. Two of the patients were intubated and transported to the ICU after the surgery; both of the patients had an O2 SAT of 92-96 % during the operation. Ultimately, one of the two patients was extubated on day 2 after the operation, and the other patient, who was an intertrochanteric fracture case, expired on day 3 due to acute respiratory distress syndrome (ARDS).

In our study, four patients (40%) had post-surgical infections. All four patients were treated with oral antibiotics, and the infection was resolved in the last follow-up. Two of the patients (20%) developed DVT in the external iliac vein of the right lower limb during the hospital stay after the operation. Both patients were treated with Clexane. Patients were evaluated for pain with the VAS questionnaire after ten weeks in the last follow-up. The mean score of the VAS questionnaire was  $4.7 \pm 1.94$  for patients. All these events are summarized in figure 1.



**Figure 1.** Our experience of orthopedic surgery on COVID-19 patients

## Discussion

Outcome of orthopedic surgery; the techniques used in this type of surgery; and measures taken before, during, and after the surgery have always been controversial topics of interest. With the spread of COVID-19, healthcare systems in the involved countries are faced with the serious issue of dealing with COVID-19 patients who require orthopedic surgery as well. Thus, a number of important considerations should be taken into account due to the unknown nature of COVID-19 at the moment (4).

Firstly, how to initially screen for COVID-19 in patients who have sustained fractures should be addressed in order to separate them from other patients and to provide the involved healthcare professionals with the necessary personal protective equipment in dealing with suspected COVID-19 cases.

Secondly, how to take necessary concurrent measures aimed at treating both COVID-19 and fracture patients should be specified. Moreover, specific measures taken before, during, and after surgery should be defined due to the current situation.

Based on the present study, it was revealed that the following medical procedures were carried out by two public healthcare centers in two cities with high numbers of COVID-19 cases: 1- while the public healthcare centers assume the entire cost, patients undergo a free-of-charge thoracic CT scan before hospitalization. 2-based on the CT scan result, suspected COVID-19 cases are transferred to a specifically designed ward for COVID-19 patients. 3- In order to confirm a COVID-19 case, Polymerase Chain Reaction (PCR) testing of suspected COVID-19 cases is conducted, however, patients remain in this specifically designed ward until the end of their treatment period based on the thoracic CT scan images, even if the PCR test result turns out negative. 4- Patients are then treated by infectious disease specialists and necessary measures are taken.

In the present study that was conducted for two months, ten patients who had a definite indication for surgical intervention based on the type of fracture were evaluated. Based on the specified protocols, necessary measures during surgery include using a separate room from other patients. Moreover, patients who participated in the study were directly transferred from the specifically designed ward to the operating room. The surgical team and a healthcare worker wore full personal protective equipment during the entire surgical procedure and never left the room until the end of the operation. Once the surgical procedure was ended and the patient was transferred out of the room, the surgical team changed their clothes without leaving the room. Subsequently, radiation was used for the sterilization of the operating room. Moreover, an expert surgical team, including the anesthesiology team, was chosen to perform the surgery in an effort to minimize the exposure time of the team in the contaminated area.

In the present study, the mean duration of surgery in the participating patients was 3.56±1.14 hours. While a minimum duration of one hour was recorded for a distal radius fracture surgery, the maximum duration of surgery was recorded at 4.5 hours for a patient with acetabulum and distal radius fractures (both fractures were treated in a single operation). Two patients remained intubated while being transferred to the ICU. Moreover, oxygen saturation levels were at 92-96% during surgery. Eventually, one of the patients was extubated in the ICU the following day while the other patient with an intertrochanteric fracture expired following ARDS on the third day.

During the postoperative recovery period, two cases of infection and two cases of Deep Vein Thrombosis (DVT) were reported. In addition, two patients developed a surgical site wound problem after discharge. It can be concluded that a postoperative infection rate of 20% is a statistically significant finding.

As a reason for this infection rate, one can mention the underlying mechanisms of COVID-19, which requires further research using a much larger sample size. On the other hand, this high infection rate can be attributed to a lack of proper changing of the surgical wound dressing and cleaning of the surgical site by the healthcare professionals due to a fear of contracting the disease. Furthermore, DVT was developed in 20% of participating patients(7-8).

As the evidence on the nature of the virus is developing, it is reported that kidney damage, liver dysfunction, heart diseases, and more recently blood clotting disorders such as DVT can be observed in COVID-19 patients. It is estimated that these systemic conditions can increase the mortality rate in these patients. Recently, the right leg of Nick Cordero, a Canadian actor who was nominated for the Tony Award and Broadway, was amputated in the ICU on April 12 as a result of DVT due to COVID-19(7).

The incidence of DVT developing during the ICU stay ranged from 5% to 15% (8). It is of note to mention that Covid-19 highly increases the inflammatory response in the body, which, in turn, causes injury to endothelial cells. This leads to increased coagulation, impairment of fibrinolysis, endothelial barrier dysfunction, and loss of physiological antithrombotic factors (7), which can significantly increase the risk of DVT.

The American Society of Hematology (ASH) recommends monitoring the platelet counts, Partial Thromboplastin Time (PTT), activated partial (aPTT), D-dimer, thromboplastin time and fibrinogen in COVID-19 patients (3). Moreover, deterioration in any of these parameters may be a consequence of severe infection, which requires aggressive critical care management. The American Society of Hematology also recommends a preventive dose of Low-Molecular-Weight Heparin (LMWH) for Covid-19 inpatients, despite observing abnormalities in the coagulation tests without active bleeding. Furthermore, patients should stop receiving the recommended doses if the platelet count is below 25\*109/L or fibrinogen is less than 0.5g/L (3). It should be noted that if pharmacological

prophylaxis is contraindicated, mechanical methods of thromboprophylaxis can be safely used (3).

The VAS score was used in the present study to measure the patient's worst level of pain. Moreover, the mean pain scores, obtained after ten weeks, were relatively higher compared to that of similar studies (9). This can be attributed to a number of reasons, including a delay in physiotherapy, prolongation of hospital stay, and attempts to treat the COVID-19 infection either before surgery.

## Conclusion

The results of our study showed that trauma patients with fractures who are referred to different healthcare centers need a brand-new algorithm for the optimization of the referral-to-treatment waiting time so as to safeguard the healthcare professionals and non-infected patients at risk of contracting the disease from infected patients. On the other hand, a number of necessary measures should be defined during and after surgery due to the underlying infectious disease which, in turn, requires different care from other patients.

Furthermore, the specific algorithm and special care protocol are essential for COVID-19 patients since a number of postoperative complications, such as DVT, SSI, and pain are more common in these patients compared to other non-infected trauma patients.

#### Funding: None.

**Authors' contributions:** MG, FT, MHD, AS, and TT collected data of patients. MHD, EG, AR, and ATM drafted the manuscript. All authors confirmed the final version and participated in revisions.

Acknowledgments: None.

Conflicts of interest: None.

#### **References**:

1. Lei S. Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection. Clin Med. 2020;21 doi: 10.1016/j.eclinm.2020.100331.

2. Placella G., Salvato D., Delmastro E., Bettinelli G., Salini V. CoViD-19 and ortho and trauma surgery: the Italian experience. Injury. 2020 Apr 15 doi: 10.1016/j.injury.2020.04.012.

3. American Society of Hematology. COVID-19 and coagulopathy: frequently asked questions. Available at: https://hematology.org/covid-19/covid-19-and-coagulopathy . Updated April 14, 2020. Accessed April 23, 2020.

4. Centers for disease control and prevention . 2019. Novel Coronavirus (2019-nCoV) Situation Summary.https://www.cdc.gov/coronavirus/2019ncov/cases-updates/summary

10. Public Health England . 2020. COVID-19: Infection Prevention and Control (IPC)https://www.gov.uk/government/publications /wuhan-novel-coronavirus-infection-preventionand-control.

6. Tang N, Bai H, Chen X, Gong J, Li D, Sun Z. Anticoagulant treatment is associated with decreased mortality in severe coronavirus disease 2019 patients with coagulopathy. J Thromb Haemost. 2020. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1111/jth. 14817 . Published March 27, 2020. Accessed April 23, 2020.

7. Marchione M. Nationwide study finds malaria drug touted by President Trump leads to more deaths, no benefits in coronavirus patients. Time. Available at:

https://time.com/5825398/hydroxychloroquinestudy-coronavirus/ . Published April 22, 2020. Accessed April 28, 2020.

8. Schrezenmeier E, Dörner T. Mechanisms of action of hydroxychloroquine and chloroquine: implications for rheumatology. Nat Rev Rheumatol. 2020;16(3):155–166.

9. Briggs M, Closs JS. A descriptive study of the use of visual analogue scales and verbal rating scales for the assessment of postoperative pain in orthopedic patients. J Pain Symptom Manage 1999:18: 438-446.