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Original Article

COVID-19 Infection Diagnosis Incidentally in Orthopedic Trauma Patients: Report of Six Cases

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Abstract

The outbreak of coronavirus disease-2019 (COVID-19) began in Wuhan, Hubei Province, China, and has spread worldwide rapidly. In this case series study, we evaluated orthopedic patients who referred to the orthopedic trauma ward of Imam Hossein Hospital, Tehran, Iran, as a central hospital for both orthopedic trauma and COVID-19 patients from the beginning of the outbreak of COVID-19 in Iran. We incidentally detected six cases of COVID-19 infection during work-up for trauma management. These patients were managed and treated for both COVID-19 infection and trauma.

Keywords: Coronavirus pandemic, COVID-19, Orthopedic trauma surgery

Introduction

New coronavirus infection (COVID-19) that involves the lower respiratory tract, has been spreading in China, particularly in the city of Wuhan since December 2019.[1] On March 11, 2020, the World Health Organization (WHO) declared the first pandemic of the coronavirus family, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[2] In Iran, the first cases of definitive COVID-19 were reported between 19 and 23 February 2020, and soon Iran was identified as one of the most affected countries by the outbreak of COVID-19.[3,4] People who are in close contact with places such as supermarkets, public transportation and hospitals have been reported to be at higher risk to get infected with COVID-19 .[5] It is now evident that most cases of COVID-19 disease develop mild respiratory and constitutional symptoms such as fever, cough, dyspnea, myalgia, and fatigue.[6] A considerable number of COVID-19 patients are asymptomatic, but they can transmit the disease to others, especially healthcare workers.[7] COVID-19 is highly contagious even during the incubation period. Furthermore, an asymptomatic carrier of SARS-CoV-2 may potentially transmit the virus during the incubation time.[8] In this study, we evaluated orthopedic patients who came to the orthopedic trauma ward of Imam Hossein Hospital, Tehran, Iran, as a central hospital for both orthopedic trauma and COVID-19 from the beginning of the outbreak of COVID-19 in our region, which was examined based on their history, physical examination, and imaging studies including plain chest X-ray and chest CT scan if necessary. We incidentally detected six cases of COVID-19 during work-up for trauma management. This case series study is a report of six patients who were diagnosed with COVID-19 after hospitalization. These patients were managed and treated for both COVID-19 and trauma.

Case presentation

Case 1

A 94 years old female patient with a past medical history of diabetes mellitus, hypertension, and hypothyroidism was admitted to our ER with a right side comminuted intertrochanteric fracture after falling down. After admission, she was evaluated for cardiopulmonary condition by a cardiologist and internist before anesthesia and fixation of the fracture. For more evaluation, CXR and spiral chest CT-Scan were performed. Although this patient had no signs and symptoms of COVID-19 at admission time. Spiral chest CT-Scan revealed parenchymal involvement and mild fibrotic changes in the subpleural area of the right lung in favor of COVID-19. Furthermore, in her laboratory test she had severe lymphopenia (11%) despite normal leukocyte

count (9200/mm3) and a high level of acute-phase reactants including ESR, CRP, and positive PCR for COVID-19. After consultation with an infectious disease specialist according to chest CT-Scan and lab tests, she received oral hydroxychloroquine, oseltamivir, azithromycin, and oxygen therapy. After the assessment of cardiopulmonary status, the fracture was fixed with Gamma nail on the fracture table after closed reduction under general anesthesia and the surgery was conducted by an experienced orthopedic surgeon to minimize intraoperative complication and operation time. All members of the anesthesiology and surgery team were protected with an N95 face mask, antiviral hood, and guan in the operation room. After the surgery, the patient presented with stable hemodynamic and good cardiopulmonary condition but she was transferred to the ICU for one day as a precaution, due to her advanced age. She was out of bed using a wheelchair for two days after the surgery and then discharged with a good general condition according to the opinion of a pulmonologist and infectious disease specialist after 10 days of hospital stay. The patient had no surgical complications.

Case 2

A 24 years old male patient after a car accident was admitted to our ER with a right knee injury. He had a large laceration on the anterior of the right knee joint. He was evaluated for open joint injury by saline test. The saline test was positive and he had been labeled for open knee joint injury and prepared for operation room (OR). Preoperative routine lab test and plain chest X-ray (CXR) was done and his CXR revealed reticulonodular changes. His vital signs were measured. Hemodynamic was stable and Spo2 also demonstrated no desaturation without a mask at the emergency room. For more evaluation, he had undergone a Spiral chest CT-Scan and it revealed round patchy ground-glass opacity of upper lobe of the right lung with bilateral minimal pleural effusion in favor of COVID-19. After consultation with an infectious disease specialist, RT-PCR checked for him and the result was positive. Laboratory data revealed an elevation in both ESR and CRP. He was treated with oral hydroxychloroquine and oseltamivir and supplemental oxygen therapy. Then irrigation and debridement of the knee joint and intravenous antibiotic therapy were performed for him urgently and drain was removed after 48 hours. He was treated with IV antibiotics for up to six days and then discharged with a good general condition without any desaturation after nine days of hospitalization.

Case 3

An 83-year-old female patient after falling down with no past medical history was presented to our ER with left hip pain and she was unable to weight-bear. AP pelvic X-ray tests revealed an acetabular fracture in the left side. Ischiopubis ramus, iliopectineal and ilioischial lines were disrupted and the gull-wing sign was obvious on AP pelvic X-ray. So, the type of acetabular fracture was an anterior column and posterior hemitransverse. At the admission time, she had O2 desaturation and shortness of breath, weakness, anorexia, and dry cough. She was evaluated with a spiral chest CT-Scan for COVID-19. The CT--Scan test revealed parahillar and juxtacentral opacity in favor of COVID-19 pneumonia. Laboratory test demonstrated severe lymphopenia (7%) and a high level of ESR, CRP and positive PCR. After consultation with an infectious disease specialist, she was treated with oral hydroxychloroquine, oseltamivir, azithromycin, and supplemental oxygen therapy. The cardiopulmonary condition of the patient was evaluated for risk assessment before surgery. The risk of surgery and anesthesia was high after consultation with a cardiologist, internist, and infectious disease specialist. Non-operative treatment was selected for her fracture and she was treated by complete bed rest, anticoagulant therapy, and bedsore care. Ten days after hospitalization, she had no respiratory symptoms and her hip pain relieved. Finally, she was discharged with the good general condition and advised for close follow up in order to undergo future arthroplasty.

Case 4

A healthy 25-year-old man was brought to the emergency department by the emergency medical service after a motor vehicle accident. Required radiographs and CT-Scan were conceded. He had a right femoral shaft open fracture and a right 2nd metatarsal fracture. He was admitted to the orthopedic ward. CXR and spiral chest CT-Scan as routine assessments in multiple trauma patients were conducted and revealed that the peripheral ground-glass opacities were highly suspected of having COVID-19 infection and lung contusion according to the radiologist report. Laboratory data revealed a high ESR, CRP, and leukocytosis with a high

body temperature and blood oxygen saturation of about 92%. Therefore, we isolated the patient and due to the urgent need of the patient urgent for surgery, after consultation with pulmonologist and anesthesiologist, an RT-PCR test was conducted. In this regard, the treatment was started with oral hydroxychloroquine and nasal supplementary oxygen therapy. Then, the patient was transferred to the operating room. Irrigation, Debridement plus reduction and intramedullary nailing were performed for him under spinal anesthesia with the highest level of protection. The operation was completed in fifty minutes as a short operation time, which is associated with a lower risk of contamination. After surgery the patient's general condition was good. The patient was tested positive for COVID-19 via RT-PCRT. The metatarsal fracture was treated non-operatively. The patient was mobilized and finally discharged from the hospital after 10 days of hospitalization with a good general condition.

Case 5

A 55-year-old man without any past medical history brought to the emergency room. The patient was injured by a direct trauma mechanism due to a wooden board falling on his body. Displaced femoral neck and pelvic ring fractures were diagnosed after radiological evaluations. Due to the fact the patient had a trauma to the chest, he was visited by the surgeon, and the CXR and chest CT-Scan were conducted. The tests showed patchy ground-glass infiltrates in the right lower lobe in favor of COVID-19 according to the radiology report. In this regard, after consultation with an infectious disease specialist, the patient was tested positive via PCR for COVID-19 infection. The results of laboratory tests also shown lymphopenia and elevation in ESR and CRP levels. The patient was transferred to a ward dedicated to COVID-19 patients. Blood oxygen saturation was in the normal range. The patient had no clinical symptoms of COVID-19, but one day after admission, the patient developed with cough and fever. The treatment was started with hydroxychloroquine, lopinavir, and azithromycin. The patient needed urgent surgery because of a femoral neck fracture and after consulting with a pulmonologist to anesthetize the patient, he was transferred to the operating room. Appropriate personal protective equipment (PPE) was used by all staff in the operating room. Three parallel 6.5 mm cannulated screws were used to fix his femoral neck following a successful closed reduction. Pelvic fracture treated non-operatively. The patient was completely bedridden and received a daily prophylactic subcutaneous dose of low molecular weight heparin. According to the infectious disease specialist opinion, eight days after hospitalization, the patient discharged with the good general condition, while he was advised to be under close observation.

Case 6

A 61-year-old female patient with a past medical history of hypertension and ischemic heart disease was admitted to the trauma ward following a simple fall at home. The patient had complained of left leg and ankle pain. X-rays on admission revealed distal tibia diaphyseal and Chaput tubercle fracture. At the time of admission, she had mild symptoms in favor of COVID-19 infection such as fever, cough and myalgia that was started two days before hospitalization. Blood oxygen saturation was about 93%. For more evaluation, CXR and CT-Scan were performed and their results indicated a parenchymal involvement and ground glass appearance according to the radiology report, indicating coronavirus infection. In this regard, after consulting with an infectious disease specialist and pulmonologist, a PCR test was performed. Surprisingly, the test was negative once and positive for the second time. Laboratory data revealed an elevation in both ESR and CRP. She was admitted to the ward dedicated to the COVID-19 patients. For this reason, the patient received supplementary nasal oxygen therapy, oral hydroxychloroquine and azithromycin. Then, after two days, the pulmonologist and anesthesiologist allowed the patient to be anesthetized for required surgery. She subsequently underwent surgical fixation with intramedullary nailing and percutaneous screw fixation of Chaput tubercle. Appropriate personal protective equipment (PPE) was used by all staff. Postoperative the patient mobilized non-weight bearing. The patient's condition was good. According to the opinion of an infectious disease specialist eight days after hospitalization, the patient was discharged with appropriate follow-up.

Results

Clinical characteristics of 6 patients with orthopedic trauma injury are presented in Table-1. Axial chest CT scans of 6 patients without contrast are presented in Figure-1. Preoperative and postoperative radiographs for all 6 patients are presented in Figure-2.

Table-1. Clinical characteristics of 6 patients with orthopedic trauma injury

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Gender	Female	Male	Female	Male	Male	Female
Age	94	24	83	25	55	61
comorbidity	Yes	No	No	No	No	Yes
COVID-19 sign & symptom at admission	No	No	Yes	Yes	No	Yes
Chest CT	suggestive	suggestive	suggestive	suggestive	suggestive	Suggestive
trauma injury	Intertrochanteric Fx	Open knee joint	Acetabular Fx	Femoral shaft open Fx+ metatarsal fracture	Femoral neck Fx + pelvic ring Fx	distal tibia diaphyseal and Chaput tubercle Fx
Side of Injury	Right	Right	Left	Right	Right	Left
Mechanism of trauma injury	Falling down	Motor vehicle accident	Falling down	Motor vehicle accident	Direct trauma	Falling down
COVID-19 treatment	Hydroxychloro-quine Oseltamivir Azithromycin	Hydroxychloro-quine Oseltamivir	Hydroxychloro-quine oseltamivir azithromycin	Hydroxychloro-quine	Hydroxychloro-quine Lopinavir Azithromycin	Hydroxychloro-quine Azithromycin
O_2 Supplementary	Yes	Yes	Yes	Yes	Yes	Yes
trauma injury treatment	CRIF with Gamma nail	I&D + IV ABx therapy	Non-operative	I&D + IM nailing	CRIF with cannulated screws + non-operative	IM Nailing and percutaneous screw fixation
days of hospital stay	10	9	10	10	8	8
Clinical outcome	Discharged with good condition	Discharged with good condition	Discharged with good condition	Discharged with good condition	Discharged with good condition	Discharged with good condition
Lymphopenia	Yes	No	Yes	No	Yes	No
RT-PCR	Positive	Positive	Positive	Positive	Positive	Positive
ESR	43	67	63	55	30	28
CRP	44	64	71	64	45	37

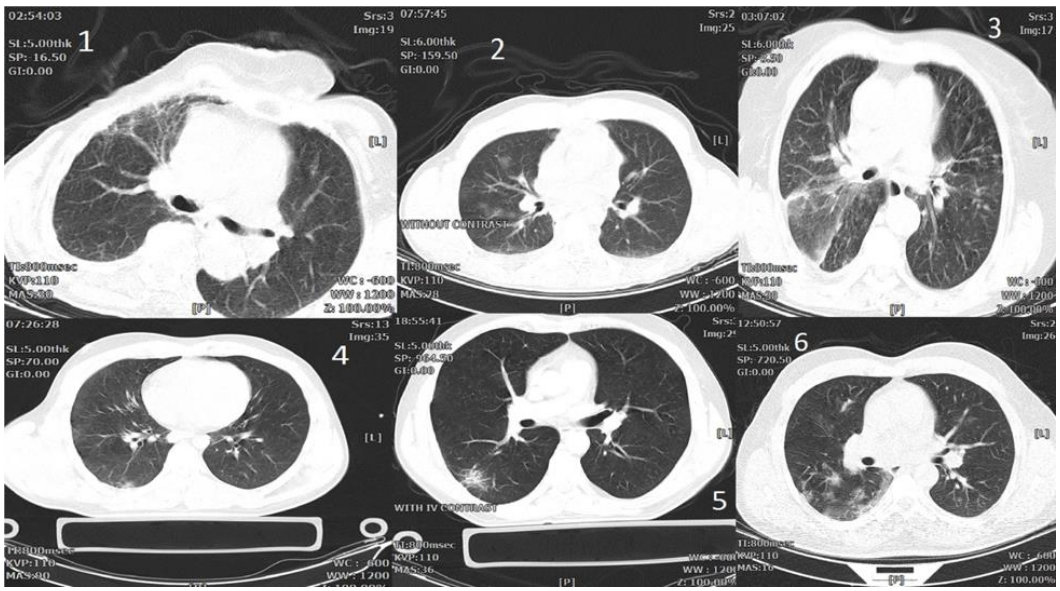

Figure-1. Axial chest CT scans of 6 patients without contrast. **Fig. 1-1** Case1. **Fig. 1-2** Case 2. **Fig. 1-3** Case 3. **Fig. 1-4** Case 4. **Fig. 1-5** Case 5. **Fig. 1-6** Case 6.

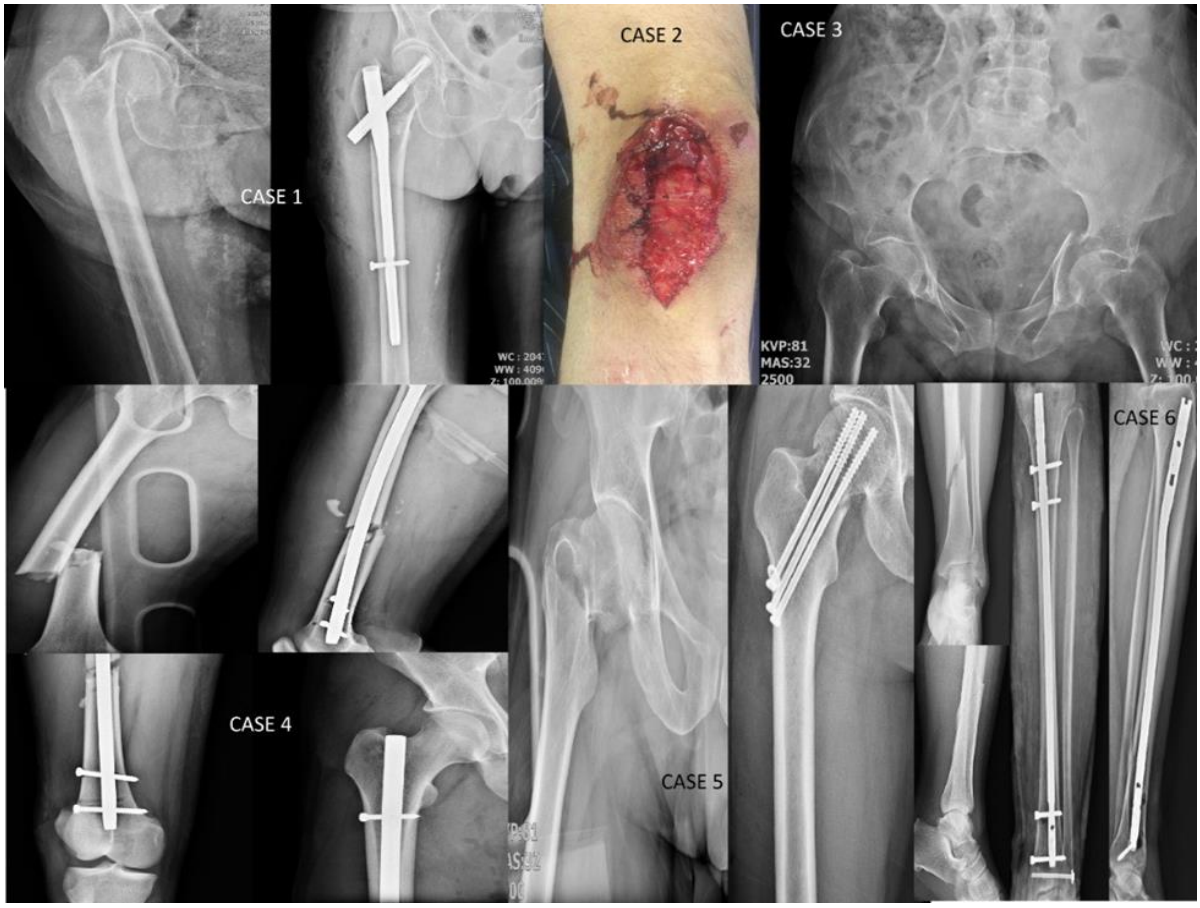

Figure-2. Preoperative and postoperative radiographs for all 6 patients. **Case 1.** showing a right intertrochanteric fracture CRIF with Gamma nail. **Case 2.** Showing right open knee joint injury. **Case 3.** Pelvic AP radiograph with left acetabular Fx. **Case 4.** showing a right femoral shaft fracture CRIF with IM nailing. **Case 5.** Showing right femoral neck fracture CRIF with cannulated screws. **Case 6.** Showing left distal tibia diaphyseal and Chaput tubercle fracture CRIF with IM nailing and percutaneous screw fixation.
*CRIF = Close Reduction Internal fixation, IM naling = IntraMedullary nailing, Fx= Fracture

Discussion

COVID-19 infection as a global crisis has affected all members of the health care systems as well as orthopedic surgeons in trauma centers since December 2019.[9] A patient with COVID-19 infection can transmit the disease through small respiratory droplets to others when there is direct contact with their mucous membranes. Also, it can occur by touching the infected surfaces.[10] However, it is evident that the incubation period for COVID-19 is commonly around five days after exposure but can range from 1 to 14 days. In this period, the patients can transmit the disease to others.[11]

We admitted 205 patients with orthopedic trauma injury and fractures in our center since February 2020 that the spread of COVID-19 infection was warned in Iran up to May 2020. COVID-19 patients were hospitalized in our centers as tertiary centers. Among 205 patients admitted to our center with orthopedic trauma injury and fractures, six patients had suspicious clinical and radiological signs and symptoms in favor of COVID-19 infection. Our study presented the clinical data of six patients with orthopedic trauma injury and suspicious for COVID-19, which were confirmed by the diagnostic test.

Based on the results, the incidence rate of COVID-19 infection in patients with acute orthopedic trauma injury was approximately 3 per 100 cases from February 2020 up to May 2020.

In the present study, five out of six patients with a fracture or orthopedic trauma injury underwent surgical treatment and only one patient was treated non-operatively. The patients were admitted to the hospital ward dedicated to COVID-19 patients. All cases were finally discharged with good general conditions during the short close follow up. It is essential for orthopedic surgeons to select the best treatment option based on the advantages and strategies for decision making, which should be flexible during a global crisis like the current pandemic.[12]

In our study, 50% of the patients developed with only mild symptoms, and the rest of the cases experienced no signs and symptoms. As the patients with COVID-19 infection may be in the incubation period or develop mild signs and symptoms, in accordance to this study it is important for orthopedic surgeons as a member of health care systems, especially in tertiary centers to use personal protective equipment not only during visiting the patients but also during operation time to prevent the spread of COVID-19.

We believe that future studies are essential on the clinical characteristics of COVID-19 patients with orthopedic trauma injuries to provide guidance for the treatment of these rare cases.

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Authors' Contribution

All authors pass the four criteria for authorship contribution based on the International Committee of Medical Journal Editors (ICMJE) recommendations.

Conflict of Interests

Authors declare that they have no conflict of interest.

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References

1. Guan W-j, Ni Z-y, Hu Y, Liang W-h, Ou C-q, He J-x, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. New England Journal of Medicine. 2020;382(18):1708-20. doi:10.1056/NEJMoa2002032
2. Mahase E. Covid-19: WHO declares pandemic because of "alarming levels" of spread, severity, and inaction. BMJ (Clinical research ed). 2020. doi:10.1136/bmj.m1036
3. Mahdavi A, Khalili N, Davarpanah AH, Faghihi T, Mahdavi A, Haseli S, et al. Radiologic Management of COVID-19: Preliminary Experience of the Iranian Society of Radiology COVID-19 Consultant Group (ISRCC). Iran J Radiol. 2020;17(2):e102324. doi:10.5812/iranjradiol.102324
4. National Committee on C-E. Daily Situation Report on Coronavirus disease (COVID-19) in Iran; March 13, 2020. Archives of Academic Emergency Medicine. 1970;8(1):e23.
5. Rothe C, Schunk M, Sothmann P, Bretzel G, Froeschl G, Wallrauch C, et al. Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany. New England Journal of Medicine. 2020;382. doi:10.1056/NEJMc2001468
6. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. JAMA. 2020;323(13):1239-42. doi:10.1001/jama.2020.2648
7. Yang Y, Lu Q-B, Liu M-J, Wang Y-X, Zhang A-R, Jalali N, et al. Epidemiological and clinical features of the 2019 novel coronavirus outbreak in China. medRxiv; 2020. doi:10.1101/2020.02.10.20021675
8. Lei S, Jiang F, Su W, Chen C, Chen J, Mei W, et al. Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection. EClinicalMedicine. 2020;21:100331. doi:10.1016/j.eclinm.2020.100331
9. Mavrogenis AF, Quaile A, Scarlat MM. The virus crisis affects Orthopaedic surgery and scientific activities worldwide. Int Orthop. 2020;44(5):813-7. doi:10.1007/s00264-020-04557-2
10. Samsami M, Zebarjadi Bagherpour J, Nematihonar B, Tahmasbi H. COVID-19 Infection In Asymptomatic Trauma Patients: Report Of 8 Cases. Archives of Academic Emergency Medicine. 2020;8(1):e46.
11. Chan J, Yuan S, Kok K-H, To K, Chu H, Yang J, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. The Lancet. 2020;395. doi:10.1016/S0140-6736(20)30154-9
12. Ambrosio L, Vadala G, Russo F, Papalia R, Denaro V. The role of the orthopaedic surgeon in the COVID-19 era: cautions and perspectives. Journal of Experimental Orthopaedics. 2020;7. doi:10.1186/s40634-020-00255-5