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Correspondence

Perioperative management of patients with hip fractures and COVID-19: A single institution's early experiences



Dear editor,

The COVID-19 pandemic caused the cancellation of all elective surgeries in New York State; nevertheless, non-elective surgeries still needed to be performed. The mortality and morbidity associated with a hip fracture is reduced if repair occurs within 48 h of admission [1]. Two international case series demonstrated elevated risk for perioperative morbidity and mortality following hip fracture repair in coronavirus patients [2,3]. On the contrary, we describe the successful management of five COVID-19 patients who underwent surgery.

After institutional review board (#2020-11706) approval at Montefiore Medical Center, a retrospective case series of patients undergoing surgical repair of a hip fracture between March 19, 2020 and April 30, 2020 was performed. *Written consent to publish the case was obtained from patients.*

Four patients presented with intertrochanteric (IT) fractures and one patient had a femoral neck fracture. Demographic information and a description of the surgical management are detailed in Table 1. All five patients presented with mild to moderate COVID-19 symptoms with some elevation of inflammatory markers (Ferritin in patients #2 and #3 and C-reactive protein in patients #2, #3, and #5). Hypercoagulability was demonstrated by an elevated D-dimer on the day of surgery in four patients. Prior to admission patient #5 was on Clopidogrel for peripheral vascular disease which was converted to therapeutic Enoxaparin on hospital admission and then continued postoperatively. The remaining three patients were started on Enoxaparin daily preoperatively and continued postoperatively. On postoperative day 5, patient #3 required dialysis and Enoxaparin was converted to Apixiban as per Hematology COVID-19 guidelines at our institution. Hemoglobin levels were maintained above $8 \times 10^9/L$. Treatment of the hypercoagulable state with heparin has been shown to improve overall survival [4]. Patients should be placed on chemoprophylaxis if not contraindicated preoperatively and resumed on postoperatively. Low molecular weight heparin is preferred. In situations where heparin is contraindicated, non-heparin anticoagulation agents should be used.

Regional anesthesia has been shown to be safe in COVID-19 patients [5]. Spinal anesthesia was utilized in order to decrease the risk of viral aerosolization. Short cephalomedullary nail was used in three of the four patients with IT fracture to decrease surgery time and blood loss; subtrochanteric extension prevented its use in the fourth patient. The femoral neck fracture patient underwent uncemented hemiarthroplasty

to reduce the risk of cardiopulmonary complications. General anesthesia was used due to heparin drip. Furthermore, early mobilization and rehabilitation of the post-surgical COVID-19 patient is recommended to improve functional status.

Tranexamic acid (TXA) is commonly used to limit blood loss for elective hip surgeries. Its efficacy and safety have been demonstrated in many studies on patients with minimal comorbidities, but there is limited data on patients at high-risk for thromboembolic events with COVID-19 infection. Thus, the routine use of TXA for this population is not recommended. Postoperative delirium is associated with poor surgical outcomes, underscoring the importance of multimodal analgesia for pain. The clinical presentation of patients with COVID-19 can vary from asymptomatic to critically ill. The severity of infection correlates with the elevation of biological markers. Based on our experiences, surgical repair should be reserved for patients with either mild or moderate symptoms.

Hip fractures typically occur in the elderly population and are complicated by multiple comorbidities. Active COVID-19 infection places these patients at increased risk for morbidity and mortality. Timely repair is preferable; however, in this case series we have shown that delayed surgical repair can also result in good surgical outcomes. Further research is needed to better establish surgical guidelines in the care of COVID-19 patients presenting with hip fractures, including how the surgical plan should be altered based on the severity of infection.

Contributions

Iyabo O. Muse, M.D.: The corresponding author. This author contributed to writing significant portions of the manuscript and revising the manuscript.

Elilary Montilla, M.D.: This author wrote the anesthesia portion and revision of the manuscript.

Konrad Gruson, M.D.: This author wrote the surgical portion of the manuscript.

Jay Berger, M.D., Ph.D.: This author wrote the disease effect on organ dysfunction section and revising significant portions in the paper.

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Table 1
Clinical characteristics and outcomes of COVID-19 positive patients with hip fractures.

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Clinical characteristics					
Age (years), sex	76, F	67, M	80, F	89, F	83, F
BMI (kg/m ²)	32	28	22	24	24
Orthopedic diagnosis	Femoral neck fracture	Intertrochanteric fracture	Intertrochanteric fracture	Intertrochanteric fracture	Intertrochanteric fracture w/ subtrochanteric extension
Type of surgery	Uncemented hip HA	Short IMN	Short IMN	Short IMN	Long IMN
Type of anesthesia	General anesthesia	Spinal	Spinal	Spinal	Spinal
Comorbidities					
Diabetes	Yes	Yes	No	Yes	No
HTN	Yes	Yes	Yes	Yes	Yes
Obesity (> 30 BMI)	Yes	No	No	Yes	No
Low ejection fraction (< 50%)	No	No	No	Yes	No
Heart disease (CAD, Pacemaker, dysrhythmia)	Yes	No	No	Yes	No
Dementia	Yes	No	No	No	Yes
Renal disease	Yes	No	Yes, on HD	Yes	No
Anemia	Yes	Yes	Yes	Yes	Yes
COPD	No	Yes	No	Yes	No
Asthma	Yes	No	No	Yes	No
Anticoagulation	Yes - Apixaban & Heparin drip	No	No	No	Yes - Clopidogrel
Smoking	No	Yes	No	Yes	No
Psychiatric issues	No	Yes	No	Yes	Yes
Peripheral vascular disease	Yes	No	No	Yes	Yes
Stroke	No	No	No	No	Yes
Signs and Symptoms					
Fever	Yes	No	No	No	No
Cough	No	No	No	No	No
Low oxygenation (< 95%)	Yes	Yes	Yes	No	Yes
Dyspnea	No	No	No	No	No
Laboratory test results					
White blood cell count (X10 ⁹ /L)	10.8	9.4	14.1 (↑)	8.5	8.2
Red blood cell count (x10 ⁹ /L)	3.13 (↓)	3.58 (↓)	2.85 (↓)	3.41 (↓)	4.48
Neutrophil count (x10 ⁹ /L)	6.3	7.2	11.4 (↑)	8.1	5.6
Hemoglobin ^a (x10 ⁹ /L)	9.0 (↓)	10.0 (↓)	8.2 (↓)	9.3 (↓)	8.6 (↓)
Platelet count (x10 ⁹ /L)	380	187	111 (↓)	354	228
PT (s)	16.4 (↑)	14.9 (↑)	14.3	14	15.5 (↑)
PTT (s)	32.7	37	39.7	29.6	33.9
INR (ratio)	1.3	1.1	1.1	1.1	1.2
D-dimer ^b (µg/mL)	N/A	7.76 (↑)	5.92 (↑)	9.42 (↑)	4.46 (↑)
Lactic dehydrogenase (U/L)	253 (↑)	242 (↑)	396 (↑)	247 (↑)	273 (↑)
BUN (mmol/L)	25 (↑)	23 (↑)	38 (↑)	49 (↑)	12
Creatinine (µmol/L)	1.02	1.05	5.85 (↑)	1.2	0.45
C-reactive protein (mg/dL)	N/A	8.8 (↑)	3.5 (↑)	0.1	10.4 (↑)
Procalcitonin (ng/mL)	N/A	0.2 (↑)	0.9 (↑)	0.1	0.2 (↑)
Ferritin (ng/ml)	159	1725 (↑)	508 (↑)	146	173
Evidence of COVID-19					
SARS-COV-2 quantitative RT-PCR	Positive	Positive	Positive	Positive	Positive
Chest x-ray	Bilateral opacities	Bilateral opacities	Bilateral opacities/lung mets	No opacities	No opacities
Treatments					
Oxygen therapy (NC, BIPAP)	Yes	Yes	No	No	Yes
Antibiotics	Yes	No	No	No	No
Anticoagulation	Yes - Apixaban	Yes - LMWH	Yes - LMWH & Apixaban	Yes - LMWH	Yes - LMWH
Hydrochloroquine	Yes	No	No	No	No
Antiviral therapy	No	No	No	No	No
Glucocorticoid therapy	No	No	No	No	No
Dialysis	No	No	Yes	No	No
Mechanical ventilation	No	No	No	No	No
Complications post-surgery					
Co-bacterial pneumonia/infection	No	No	No	No	No
Thrombotic event	No	No	No	No	No
Need for PRBC transfusion	Yes	Yes	Yes	Yes	Yes
Death	No	No	No	No	No

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Table 1 (continued)

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Time of surgery post admission (hours)	48	24	> 72	24	> 72
Length of hospitalization (days)	15	9	11	8	11
Discharged from hospital (days)	Yes - SAR	Yes - SAR	Yes - SAR	Yes - SAR	Yes - NH

HA = hemiarthroplasty, IMN = intramedullary nail, BMI = body mass index, HTN = hypertension, COPD = chronic obstructive pulmonary disease, CAD = coronary artery disease, HD = hemodialysis, BUN = blood urea nitrogen, N/A = not available, Ferritin: normal range 25-270 ng/ml, SARS-COV-2 = severe acute respiratory syndrome coronavirus 2, RT-PCR = reverse transcription polymerase chain reaction, NC = nasal cannula, BIPAP = bilevel positive airway pressure, PRBC = packed red blood cells, PT = prothrombin time, PTT = partial thromboplastin time, INR = international normalized ratio, LMWH = low molecular weight heparin, SAR = subacute rehab, NH = nursing home.

^a Hemoglobin: normal range 12.2-15.3g/dl.

^b D-dimer: normal range 0.0-0.5µg/ml.

Declaration of competing interest

The authors declare no competing interests.

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