Case Report: 100-year-old COVID-positive Hip Fracture Patient for Hemiarthroplasty Under Spinal Anesthesia

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Abstract
Elderly patients undergoing hip fracture surgery represent a myriad of perioperative challenges and risks. The arrival of the global pandemic of novel coronavirus disease 2019 (COVID-19) adds an unprecedented challenge to the management of hip fracture patients. We describe the unique experience and favorable outcome of a 100-year-old COVID-positive hip fracture patient that underwent spinal anesthesia for hemiarthroplasty and subsequent hydroxychloroquine (HCQ) therapy. Multiple factors of varying known benefit may have contributed to our outcome, including preoperative medical consultation and assessment, early surgical intervention, regional anesthesia with little to no sedation, early mobilization and HCQ therapy.

Keywords
COVID-19, spinal anesthesia, elderly, hydroxychloroquine, hemiarthroplasty

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Introduction
Elderly patients undergoing hip fracture surgery represent a myriad of perioperative challenges and risks. The risk for mortality has been reported to be up to 15-fold higher than that associated with elective hip replacement (Cram et al., 2011). It is well established that comorbidities and advanced age increase the vulnerability of patients after hip fracture (Boddaert et al., 2014). The arrival of the global pandemic of novel coronavirus disease 2019 (COVID-19) adds an unprecedented challenge to the management of hip fracture patients. While it remains debated to what degree COVID-19 contributes to the perioperative risk of surgery, already clinicians are faced with new perioperative logistical problems encompassing the issues of airway management and related safety to intrathecal injection of drugs in a population whose disease has been suggested to include central nervous system involvement (Asadi-Pooya & Simani, 2020; Au Yong & Chen, 2020). This new challenge is exacerbated by the absence of randomized clinical trials (RCTs) demonstrating a therapy to improve outcome in cases of confirmed or suspected COVID-19 (Sanders et al., 2020). In this setting, we describe the unique experience and favorable outcome of a 100-year-old COVID-positive hip fracture patient that underwent spinal anesthesia for hemiarthroplasty and subsequent hydroxychloroquine (HCQ) therapy. Written HIPAA authorization was obtained from the patient’s healthcare proxy for publication of this report.

Case Description
A 100-year-old female (weight 49 kg, American Society of Anesthesiologists physical status II) living in an assisted living facility was admitted after a fall, resulting in a displaced fracture of the left femoral neck. She tested positive for novel COVID-19 in the emergency room (ER) prior to transfer to our hospital that same day. Her past medical history was notable for a 30-year prior cerebrovascular accident secondary to arteriovenous malformation, Parkinson’s disease, suprapubic catheter placement and seizure disorder. She normally ambulated with a walker. Her baseline exercise tolerance was < 4 metabolic equivalents (METs). At the time

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of admission, she complained of a mild headache, but denied shortness of breath, cough, fever, or chills.

Preoperative internal medicine consultation was obtained and the patient was also assessed by an anesthesiologist in the COVID-positive inpatient ward. Medications included carbidopa-levodopa, gabapentin, phenobarbital, and hydrocodone/acetaminophen as needed. She had no history of problems with anesthesia, and previously underwent general anesthesia for lumbar spine surgery 6 years prior without complications. On initial examination, the patient was afebrile with a blood pressure of 134/81 mm Hg. Preoperative peripheral nerve blockade was considered to optimize analgesia and reduce opioid risks, but was determined to be unnecessary as the patient reported satisfactory analgesia with minimal opioid use. Preoperative laboratory findings included hematocrit 39.7% and creatinine 0.6 mg/dL. The electrocardiogram showed sinus rhythm at 83 beats per minute. Her chest x-ray taken at the ER revealed emphysematous changes without opacities.

Consent was obtained for surgery after discussion with the patient and her son (a physician and health care proxy). Wearing a surgical face mask, she was brought to an operating room (OR) designated for COVID-positive patients by operating room personnel wearing N95 masks, medical goggles, impermeable disposable gowns, shoe covers, and double caps. The anesthesiologist was also equipped with a powered air-purifying respirator (MAXAIR® Controlled Air Purifying Respirator). The existing anteroom had designated donning and doffing stations for personal protective equipment (PPE). The OR was a positive-pressure laminar airflow environment with 25 air changes per hour (ACH), without recirculation of air. In addition, a portable High-Efficiency Particulate Air (HEPA) 550 cubic feet per minute air scrubber (BD-A5550) was placed near the head of the bed, with outtake flexible ducting (intended to minimize disruption of laminar flow) to the OR wall air return grille.

Routine monitors and a radial arterial catheter were placed. The initial oxygen saturation was 99% on 2L/min oxygen via nasal cannula. Pre-induction vital signs included arterial blood pressure of 173/89 mm Hg, and a heart rate of 80. Without sedation, the patient was carefully placed in a right lateral decubitus position. Communication was continually maintained with the awake patient to minimize discomfort. Spinal anesthesia was performed using sterile technique at the L4/5 level with bupivacaine (preservative free) 0.5%, 2.5 mL. The electrocardiogram showed sinus rhythm at 83 beats per minute. Her chest x-ray taken at the ER revealed emphysematous changes without opacities.

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Postoperatively, analgesia was provided with tramadol (25–50 mg every 8 hr as needed) and oral acetaminophen (650 mg every 6 hr). A lidocaine patch was added on postoperative day (POD) 1 for a highest recorded pain level of Numeric Rating Scale (NRS) 9. Subsequent pain scores ranged from NRS 2-8. A sequential compression device (PlexiPulse®) and enoxaparin (30 mg daily) were used for deep vein thrombosis (DVT) prophylaxis. Blood products were not administered and the lowest hematocrit of 26.1% was noted on POD 7. Onset of cough without dyspnea was noted on POD 2, generating concern for progression of COVID-19. Fortunately, oxygen requirements never exceeded 3L/min oxygen via nasal cannula resulting in an SpO2 93% to 99%. Additional laboratory findings at that time included elevated lactate dehydrogenase (554 unit/L), ferritin (414.8 mg/mL), D-dimer (607 mg/mL), C-reactive protein (41.5 mg/dL), procalcitonin (0.44 mg/mL), and erythrocyte sedimentation rate (83 mm/hr). After internal medicine consultation, HCQ therapy was initiated (600 mg twice daily for two doses, then 400 mg daily for four additional days). An electrocardiogram was obtained for QTc interval monitoring (417 ms). The patient remained afebrile (maximum recorded temperature of 37.9°C) throughout the hospitalization, without significant prolongation of the QTc interval (range: 417–447 ms). Oxygen was weaned to room air by POD 4, with symptomatic improvement in cough and SpO2 97%. These findings are summarized in Table 1.

Physical therapy progressed from transferring to the edge of bed on POD 1, completing sit-to-stand transfer and marching in place on POD 2, to walking with moderate assistance six steps to bedside at the time of discharge to a rehabilitation facility on POD 7. One month following surgery, the patient was continuing rehabilitation.

Discussion

Functional outcomes and survival among patients in nursing homes suffering from hip fracture has been observed to be poor, especially among the extremely elderly (Neuman et al., 2014). The superimposition of
perioperative COVID in the elderly most likely increases the mortality rate even higher. To our knowledge, this is the oldest COVID-positive patient surviving hemiarthroplasty surgery and hospitalization. Overlaying the risk of COVID-19 infection in this setting presents a daunting clinical scenario; however, this case is suggestive that the additive risk of asymptomatic or mild COVID-19 disease may not be prohibitive for the consideration of operative management of hip fracture. Multiple factors of varying known benefit may have contributed to our outcome, including preoperative medical consultation and assessment, early surgical intervention, regional anesthesia with little to no sedation, early mobilization and HCQ therapy.

Increased wait time for hip fracture surgery greater than 24 hr may expose patients to higher complication and mortality rates (Pincus et al., 2017), and in this case 19 hr elapsed from hospital admission to surgery. In addition to early surgery, regional anesthesia may be associated with better outcomes in hip fracture surgery. In-hospital mortality and pulmonary complications were noted to be lower with regional versus general anesthesia in a large database analysis (Neuman et al., 2012). Spinal anesthesia in this case facilitated awake surgery, minimized opioid exposure, and potentially reduced the postoperative utilization of limited ventilator resources.

It is unclear whether early administration of HCQ contributed to a favorable outcome. Increased perioperative cardiac risk has been a common concern due to the potential for prolonged QTc induced arrhythmias. At the time of manuscript submission, however, there is no high-quality evidence supporting HCQ use for prophylaxis or treatment of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Sanders et al., 2020).

In conclusion, asymptomatic or mild COVID-19 infection may not present a prohibitive additional risk to operative hip fracture management among patients at otherwise high risk for perioperative complications. Decisions regarding operative versus non-operative management will continue to be heavily influenced by the dynamic state of healthcare resource utilization during the COVID-19 crisis.

Author Contributions
Jonathan C. Beathe: This author obtained written consent from patient’s health proxy and wrote the case report.
Stavros G. Memtsoudis: This author helped write and edit the case report.

Declaration of Conflicting Interests
The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Jonathan C. Beathe has no conflicts. Stavros G. Memtsoudis is a director on the boards of the American Society of Regional Anesthesia and Pain Medicine (ASRA) and the Society of Anesthesia and Sleep Medicine (SASM). He is a one-time consultant for Sandoz Inc. and Teikoku and is currently on the medical advisory board of HATH. He has a US Patent application for a Multicatheter Infusion System. US-2017-0361063. He is the owner of SGM Consulting, LLC and co-owner of FC Monmouth, LLC. None of the above relations influences the conduct of the present study.

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