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Perspective

Early clinical outcomes of surgically management unstable pelvic fractures in covid-19 patients in the North West of Iran

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Abstract

Background: Unstable pelvic ring fracture during these challenging times for the global communities as they battle the COVID-19 pandemic is a management dilemma for orthopedic practices. The purpose of this study was to evaluate early clinical characteristics and outcomes of covid-19 patients with unstable pelvic ring fractures who undergo open reduction and internal fixation during the covid-19 outbreak in Iran.

Methods: In this prospective cohort study, 50 covid-19 patients with unstable pelvic fractures were treated in our institution by Open Reduction and Internal Fixation (ORIF) during the covid-19 outbreak from February to March 2021 at two educational hospitals. We investigate the patient's clinical characteristics and early postoperative outcomes.

Results: All patients were positive for SARS-CoV-2 based on the quantitative Reverse Transcription-Polymerase Chain Reaction (RT-PCR) of throat swab samples. Thirty-eight patients were asymptomatic at admission time. Twelve cases suffered from hypoxia (blood oxygen saturation <93%) preoperatively. All patients underwent ORIF surgery within 48 hours to 72 hours after injury. Eighteen hypoxia patients elevated oxygen demands beyond 3 days to 5 days postoperatively. None of the patients used mechanical ventilation. The mean start mobilization was 4.6 days. Respiratory failure was the most common postoperative complication. (16%) The older age of male patients died due to pulmonary embolism on postoperative days 10. The mean surgical period was 67.5 minutes. The mean period to start mobilization was 4.6 days. The mean of hospital length stays for the patient discharged was 5.4 days. The following of patients is going.

Conclusion: Covid-19 had devastating effects on orthopedic practices during the covid-19 outbreak in Iran. Still, orthopedic practice guidelines for patients with unstable pelvic fractures remained unchanged. Our results suggest that early pelvic fracture fixation in patients who suffer from asymptomatic or mild covid-19 infection could be safe undergoing multidisciplinary institutional protocol.

Keywords: Covid-19 Coronavirus, Unstable pelvic fracture

INTRODUCTION

Covid-19 (Corona Virus Disease 2019) is an infectious disease caused by a strain of coronavirus [1]. In December 2019, a novel coronavirus was identified as the cause of many viral pneumonia cases in China and eventually declared a pandemic as the virus spread globally. Up to now, few studies published on the outcome of surgical procedures in diagnosing asymptomatic Covid-19 patients [2-4]. Pelvic ring disruption is an uncommon injury occurring in 3% to 8.2% [5,6]. Unstable pelvic fracture is a high-risk population for severe Covid-19 symptoms often associated with other injuries high risk of mortality and complications. The in-hospital mortality rate in patients with an unstable pelvic fracture is 8.3% and is 7.2% of closed fracture. The in-hospital mortality rate was higher in older male patients [7]. Medical practice has significantly changed since March 2020 because of the Covid-19 pandemic, and orthopedic practices are no exception [8]. Among patients undergoing hip fracture surgery, the increased wait time was associated with a greater risk of 30-day mortality and associated with prolonged immobilization and delayed care [9-11]. There have been no studies specifically examining clinical outcomes in Covid-19 patients with traumatic unstable pelvic ring fractures who undergo ORIF surgery in Iran. Most patients require urgent hospital admission and urgent surgical management. Efficient treatment is essential to avoid prolonged hospital stays both before and after surgery in Covid-19 pandemic. Although during the Covid-19 pandemic, the entire population appears to be at risk for Covid-19 infection, surgeons face increasingly urgent decisions for appropriate medical optimization. However, surgery elevated the risk of some complications and even mortality rate in Covid-19 patients [12]. The purpose of this study was to highlight early clinical characteristics and outcomes of Covid-19 patients with unstable pelvic ring fractures who undergo ORIF surgery during the Covid-19 outbreak in Iran.

MATERIALS AND METHODS

SURGICAL COHORT

A prospective surgical cohort study was conducted on 50 covid-19 positive patients with a primary unstable pelvic fracture those candidates for ORIF surgery at the trauma center of two educational hospitals from February to March 2021. Covid-19 pandemic in Iran is part of the worldwide pandemic of corona virus disease [13]. The study approved the local ethics committee of hospitals. The written consent obtained for using data for scientific purposes or at follow-up when possible.

DATA COLLECTION

All patients with primary unstable pelvic ring fractures admitted into the regional trauma center of our institute, unstable fractures of the pelvic ring after blunt trauma identified from the trauma registry. Older age patients (≥ 70 years age), patients with comorbidity, and those hospitalized within seven days recently excluded. The diagnosis of Covid-19 made on a positive Reverse Transcription-Polymerase Chain Reaction (RT-PCR) test report. This work reported in line with the "Strengthening the Reporting of Cohort Studies in Surgery (STROCSS)" criteria [14].

SURGICAL PROCEDURE

All cases underwent Open Reduction and Internal Fixation (ORIF) technique. All patients had surgery within 48 hours to 72 hours after injury. We have 20 cases (40%) with an anterior pelvic wall fracture, 26 cases (52%) with a posterior pelvic wall fracture, and 4 cases (8%) with combined anterior and a posterior pelvic wall fracture. With the iliofemoral approach, anterior plaque fixation using for symphyseal disruption for anterior pelvic wall fracture. The sacroiliac surface fixed by two numbers of four-hole plaques with a 90° angle to each other by the Kocher-Lange beck approach for posterior pelvic wall

fracture. In two cases with combined pelvic wall fractures, the anterior pelvic wall stabilization done at first, and then posterior pelvic wall stabilization performed. Oxygen therapy with a nasal cannula used in cases with hypoxia (blood oxygen saturation $\leq 93\%$ on room air), and ventilators used when necessary. Antiretroviral therapy medicines were available, including Kaletra (lopinavir/ritonavir), associated with hydroxychloroquine, and azithromycin particularly for patients who had respiratory failure and/or persistent rising levels of acute inflammatory biomarkers such as C Reactive Protein (CRP), ESR, and Interleukin-6 (IL-6). Our purpose in this study was to report clinical characteristics and outcomes after pelvic bone fixation of unstable pelvic fractures during the Covid-19 outbreak in the North West of Iran.

THEORY/CALCULATION

We used SPSS software (Version 22.0. IBM, Armonk, NY, USA) for statistical analysis of the data. The results are presented as descriptive statistics, describing the categorical variables by absolute values and percentages. The quantitative variables are presented by their measures of central tendency (mean).

RESULTS

Fifty patients were included in the studies. There were 32 males (64%), and 18 females (36%). The male to female ratio was 1.7. The mean age was 52.4 years (range, 43-69). The causes of injuries were road traffic accidents in 34 cases (68%) and falls from standing height in 16 cases (32%). According to Tile's classification of pelvic injuries, there were 34 cases (68%) with a type B pelvic fracture and 16 cases (32%) with type C.

Clinical characteristics in 50 patients with Covid-19 who underwent unstable pelvic ring fracture surgery. Road Accident (RA), Multifocal Atypical Pneumonia (MAP), Unremarkable (Ur). At admission, 38 (76%) of the 50 patients were positive for SARS-CoV-2 based on quantitative RT-PCR of throat swab samples, whereas the remaining 12 patients (24%) had a positive Covid-19 test within 3 to 7 days of admission. 38 patients (64%) did not exhibit any clinical symptoms of Covid-19 infection on admission. Twelve patients (24%) presented with fever, chills, cough, and dyspnea with mild hypoxia (blood oxygen saturation of $<93\%$ on room air) that 4 of them have clear evidence of Covid-19 infection on chest CT scans and received supplemental oxygen (2 L per minute) with a nasal cannula. None of the patients put on mechanical ventilation preoperatively. Four patients (8%) presented with fever, chills, fatigue, and gastrointestinal problems such as nausea, vomiting, and diarrhoea.

Laboratory test values on admission in 50 patients with covid-19 who underwent unstable pelvic ring fracture surgery. Liver Function Test (LFT), Kidney Function Test (KFT), Interleukin 6 (IL-6), Normal (N), High (H). Laboratory test values on admission showed leukopenia in 8 patients (16%), significant anemia with Hgb < 8 g/dL in 4 patients (8%). PT and INR were mildly elevated in 6 patients (12%), none of the patients had abnormal PTT, D-dimer values. C-Reactive Protein (CRP) value associated with ESR elevated in 18 patients (36%). Also, Interleukin 6 (IL6) elevated in 14 cases (28%) out of 18 cases that suffered from high CRP and ESR. Liver and kidney function tests associated with CPK-MB and troponin were in the range of normal in all patients. Four patients (8%) that had clear chest imaging at admission, received covid-19 specific medical therapy (hydroxychloroquine and/or Kaletra (lopinavir/ritonavir) associated with azithromycin). The mean surgical period was 67.5 minutes. 18 (36%) out of the 50 patients required supplemental oxygen (4 cases were preoperation, and 14 new cases were postoperation). Eight of those patients successfully weaned off the nasal cannula after postoperative day 3, four patients after postoperative day 4, and the other six patients had persistently increased oxygen demands

and requiring prolonged administration of supplemental oxygen beyond postoperative day 7.

The most common postoperative complication was respiratory failure (8 cases) following by deep wound infection (4 cases) and pulmonary thromboembolism (4 cases). There were no cardiac complications, neural dysfunction, sexual and urinary dysfunctions, or implant failure. Those patients had respiratory failure successfully treated by supplementary oxygen therapy and covid-19 specific medical therapy (hydroxychloroquine and/or Kaletra (lopinavir/ritonavir associated with azithromycin). Those patients who had deep surgical site infections were successfully treated by oral antibiotics. Three of four patients developed pulmonary thromboembolism treated successfully, and the other one died nine days after surgery. The total percent of complications was 32% (16 cases).

One of the patients died during hospitalization. Our mortality rate was 4% (1 case). The mean total hospital stay was 5.4 days (range 4 to 10). The mean period to onset mobilization after surgical stabilization was 4.6 days (range 3 to 10). The mean follow-up time for all patients was 2.5 months (range 1 to 4).

DISCUSSION

In this prospective cohort study, we reported the clinical characteristics and early clinical outcomes of 50 covid-19 patients with an unstable pelvic fracture who underwent Open Reduction and Internal Fixation (ORIF) management during the covid-19 outbreak in the North West of Iran. Clinically, covid-19 has a reported incubation period of approximately 5-6 days, and symptoms last for about two weeks on average [15]. Symptoms of covid-19 can range from mild illness to acute respiratory pneumonia [16]. Researchers have been working to reach more about the epidemiological and clinical characteristics of the disease. Fracture of the pelvic ring is a relatively rare type of fracture, accounting for 1.5%-3% of cases and usually related to high energy trauma [17,18]. Unstable pelvic fractures sustained during high-energy incidents may result in significant complications, including severe bleeding, internal organ damage, and infection. If these injuries addressed successfully, the fracture usually heals well [19]. Even though the unstable pelvic ring fracture is an emergency condition, early surgical intervention contributes to a better prognosis, sets the patients at a lower risk of morbidity and mortality. Several studies revealed that unstable hemodynamic conditions, advanced age (>70 years), prolonged period to operative pelvic fixation, and higher Injury Severity Score (ISS) led to worse long-term functional outcomes in patients with unstable pelvic ring fracture [19,20].

In unstable pelvic fracture, internal bone fixation may need to postpone acute respiratory failure secondary to covid-19 infection can provide a contraindication to surgery in covid-19 patients. Therefore, postoperative complications may put the patients at a higher risk of morbidity and mortality. Previous studies estimated that the incidence of surgical complications in covid-19 patients could be approximate 4%-9% [21,22]. In ORIF surgery, anti-thromboembolic therapy, anti-infective prophylaxis, pain control, pulmonary tract condition, and early mobilization postoperatively improve functional outcomes [23]. At our institution, the decision to operate guided by clinical judgment alone. The result of covid-19 diagnostic testing should be ascertained (positive or negative) before undertaking the transfer of the patient to the operating room within 48 hours of the procedure. Patients with proven covid-19 disease should be assessed in isolation and then transported directly to a covid-19 specific operating room. Surgeons and other staff should protect by appropriate personal protective equipment such as N-95 respirator masks, face shields, gowns, and gloves. After surgery, covid positive patients remained in the operating room for post-anesthesia care and recovery. There has been limited information available on the presenting characteristics and outcomes of covid-19 positive patients with pelvic ring fractures during this

urgent condition. Cheung et al. published the early outcomes after hip fracture surgery in ten covid-19 elderly patients in New York City. Five out of the ten patients who presented with hypoxia- subsequently required supplemental oxygen preoperatively. Two patients had persistently elevated oxygen demands requiring postoperatively. Two patients died due to venous thromboembolism and respiratory failure postoperatively. The average length of hospital stay was 7.8 days [24]. LeBrun et al. studied 59 consecutive patients of advanced age treated for a hip fracture, during the covid-19 pandemic. Ten patients tested positive for covid-19 preoperatively in the primary hospitalization. They reported that inpatient mortality significantly increased in the covid-19 positive patients ($P=0.001$). The covid-19 patient with hip fractures had a worse prognosis and have a higher mortality rate compared to those patients without covid-19 infection significantly ($P=0.001$) [25]. Hall et al. published the effects of covid-19 on 30-day mortality for patients with a hip fracture. They reported that covid-19 infection was independently associated with an increased 30-day mortality rate for patients with a hip fracture. Also, it noted that platelet counts as an indicator of the risk of covid-19 infection. These findings make the implications of performing preoperative covid-19 testing before hip fracture surgery [26]. Egol et al. compared two cohort study groups; 17 approved covid-19 positive patients and 14 patients suspected of having had the virus but never tested. Notably, there were increased mortality and complication rates in the covid-19 positive group postoperatively [24]. Early stabilization of pelvic ring injuries has demonstrated improved outcomes in patients with pelvic fractures. Biffl et al. noted the decreased length of operation and hospital stays for patients treated within 24 hours of hospital admission improved outcomes [27].

In our study, the average length of hospital stay among discharged patients was 5.4 days. This result is near to the average length of hospital stay after hip fracture surgery reported in previous studies, which has ranged between 5 and 6 days [28,29]. But Ismail et al. noted that the mean period between admission and discharge was 31 days in patients with an unstable pelvic fracture [30]. However, the differences could be related to their sample size and period of follow-up.

Three of our cases who had the length of hospital stay ≥ 7 days had increased oxygen demands postoperatively. Four of our cases who had a postoperative pulmonary embolism stayed at the hospital for about eight days, six patients discharged after ten days, and one of those died. These postoperative complications likely contributed to the increased length of hospital stay. Our mortality rate was about 4% (1 case) due to a postoperative pulmonary embolism.

CONCLUSION

This study described the clinical characteristics and early outcomes after pelvic fracture surgery in 50 patients who suffered from asymptomatic or mild covid-19 infection in the North West of Iran. We observed that 36% of our patients subsequently had increased oxygen demand therapy postoperatively. However, all of those patients successfully weaned off oxygen therapy within an average of 4.6 days after surgery. Notably, a postoperative complication in our cases was near to previous studies. Furthermore, the mortality rate in the early postoperative period in our series was only 4%, which is in contrast to the higher mortality rates reported from studies in China and Europe. However, covid-19 had devastating effects on orthopedic practices during the covid-19 outbreak in Iran. Our results suggest that early surgical treatment of patients with an unstable pelvic fracture who suffered from asymptomatic or mild covid-19 infection requires careful, individualized decision making and thereby sees this as the main idea regarding unstable pelvic fractures during covid-19 outbreak.

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