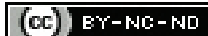


Delayed Fixation of Hip Fractures and Short-term Outcome in Coronavirus Positive Patients: A Prospective Cohort Study

GHULAM NABI DAR¹, MOHD IQBAL WANI², MOHD UMAR MUMTAZ³, ALTAF AHMAD KAWOOSA⁴, NADEEM ALI⁵

ABSTRACT

Introduction: Coronavirus Disease-19 (COVID-19) affected the healthcare system worldwide. The golden rules of fracture fixation and early mobilisation of patients was not strictly followed, because of fear of spread of the disease among the patients and healthcare workers. Early surgery and prompt postoperative ambulation improves outcomes for patients with hip fractures, but the morbidity and mortality were high in the patients who were operated upon, when having an active infection of COVID-19 virus.

Aim: To study the short-term outcome of delayed fixation of hip fractures in coronavirus positive patient in terms of postoperative infection, union at the fracture, deep vein thrombosis and mortality.

Materials and Methods: This was a prospective cohort study carried out in Government Medical College, Srinagar, Kashmir, India from April 2020 to September 2020. Delayed surgery using different methods of fixation was performed in patients with hip fractures who had active COVID-19 infection. The patients were followed for a period of six months. Short-term mortality and complications if any were recorded. Results were expressed in

terms of frequency and percentages and analysed by Microsoft Excel 2016.

Results: Among the 24 operated patients, males were 9 (37.5%) and females were 15 (62.5%). Of the total, 14 (58.33%) were intertrochanteric fractures, 6 (25%) were femoral neck fractures and 4 (16.67%) were subtrochanteric fractures. Dynamic hip screw was used to treat 15 (62.5%) patients. Age ranged from 39 to 82 years mean age was 51.04 years. Majority of patients, 16 (66.67%) sustained hip fractures after a low velocity fall from standing height. Delay in surgery was 15 to 21 days (Average-18.25 days). Two elderly patients died after 14 weeks of follow-up due to causes else than respiratory failure. Three patients developed superficial infection which settled with oral antibiotics. No case of deep venous thrombosis, pulmonary thrombo embolism was observed in the present study.

Conclusion: Despite the delay, the mortality rate in the early postoperative period was less. The present study findings suggest that hip fracture patients who present with COVID-19 infection can safely undergo delayed surgical intervention after appropriate medical optimisation.

Keywords: Coronavirus disease-19, Dynamic hip screw, Mortality, Pandemic

INTRODUCTION

Coronavirus disease-19 drastically affected the healthcare system worldwide and the orthopaedic field is no exception [1]. With the pandemic, there is a shortage of doctors, supportive staff and orthopaedic devices. Orthopaedic residents are being redeployed to medical wards and Intensive Care Units (ICU) for treatment of COVID-19 patients. Orthopaedic surgeons have faced challenges in the management of patients who presented to the trauma centers. The golden rules of fracture fixation and early mobilisation of patients was not strictly followed, because of fear of spread of the disease among the patients and healthcare workers.

Hip fractures occur in old and very old people and account for about 20% of all fractures in people aged 50 years and older [2]. There is compelling evidence that early surgery and prompt postoperative ambulation improves outcome for patients with hip fractures, hence all the patients with hip fracture are hospitalised for early surgical treatment [2-4]. There are some accounts in the literature which address the early fixation of hip fractures in patients with active infection of COVID-19 virus. The morbidity and mortality were high in the patients who were operated up on, when having an active infection of COVID-19 virus [5,6]. Our hospital followed a protocol of delayed fixation of all the patients with hip fractures with COVID-19 infection, unless an orthopaedic emergency. The aim of present study was to evaluate the results of delayed fixation of fractures in COVID-19 patients having hip fractures in terms of postoperative infection, union at the fracture, deep vein thrombosis and mortality within first six months of surgery.

MATERIALS AND METHODS

This was a prospective cohort study involving the COVID-19 patients with hip fractures admitted in Government Medical College, Srinagar, Kashmir, India, from April 2020 to September 2020. Delayed surgery using different methods of fixation was performed and the patients were further followed for a minimum period of 24 weeks (six months). Short-term mortality and complications if any were recorded.

Due to COVID-19 pandemic, the ethical committee meetings were not held so an approval from the ethical committee was not sought. Informed consent from the patient was obtained before performing surgery.

Inclusion criteria: All patients having fracture around the hip with a positive real-time Reverse Transcription Polymerase Chain Reaction (RT-PCR) and operated up on were included in the study.

Exclusion criteria: Seven patients who did not report back to the hospital after discharge from COVID-19 center, among which two died because of respiratory failure and five patients preferred private hospitals for treatment of their fracture were excluded from the study. The attendants of a patient with intertrochanteric fracture refused to give a high-risk consent for the procedure and was discharged on below knee skin traction was excluded. Out of the re-admitted patients, four (two intertrochanteric and two femoral neck fractures) left against medical advice and were also excluded.

The hospital was segregated in to red and green zones with no overlap of staff, equipment and patients. All the patients who reported to the hospital with hip fracture were admitted in the Emergency Ward which was labelled as red zone. The patients who were hospitalised

underwent COVID-19 diagnostic testing with a real-time RT-PCR assay for the qualitative detection of nucleic acid from SARS-CoV-2 in nasopharyngeal swabs. Patients were looked for clinical signs and symptoms of COVID-19 infection including a chest radiograph. Patients whose RT-PCR was negative and who had no clinical evidence of COVID-19 infection were shifted to green zone and were operated as early as possible. Our hospital being a non COVID-19 center did not operate up on any patient who had an active infection of COVID-19 virus. The patients who tested positive for COVID-19 were shifted to a nearby COVID-19 hospital for strict isolation and management of COVID-19 disease with appropriate splintage as desired. The COVID-19 center where authors shifted the patients had a facility of supervision of these patients for any orthopaedic complication but, unfortunately had no facility to carry out orthopaedic trauma surgeries. These patients were admitted in an orthopaedic isolation ward and were managed for COVID-19 symptoms for a period of 10 to 15 days. The patients were referred back to our hospital for the management of orthopaedic injuries once their nasopharyngeal swabs turned negative for real-time RT-PCR. Patients were received and shifted directly in the green zone area and prepared for fixation of fractures.

Age, gender, mechanism of injury, fracture type and medical co-morbidities if any were noted. Laboratory testing included complete blood count, kidney function tests, liver function tests, Prothrombin Time (PT), International Normalised Ratio (INR), Partial Thromboplastin Time (PTT). Thrombo prophylaxis with low molecular weight heparin was continued in all patients and stopped 12 hours before surgery. Medical co-morbidities were taken care off and patients were optimised for surgery. The technique and type of anaesthesia was left to the team of anaesthetists and all patients were operated under spinal or epidural anaesthesia. Patients were mobilised on first or second postoperative day and all efforts were made to discharge the patient within 3rd postoperative day to clear the beds. Low molecular weight heparin was continued for two weeks postsurgery in all patients and was shifted to oral rivaroxaban 10 mg daily for a period of four weeks. Patients were asked to strictly follow the directions of ambulation, weight bearing as advised, chest physiotherapy, ankle pumps, quadriceps strengthening exercises and range of motion exercises to prevent the chances of thromboembolic episodes and joint contractures.

Patients were asked to visit the Outpatient Department weekly for first three weeks and then monthly for six months. Appropriate radiographs were taken at three weeks, eight weeks, 12 weeks and 20 weeks for assessment of union and any displacement or back out of implant. A comprehensive follow-up with chest medicine specialist was made mandatory in these patients' postsurgery. Modalities of surgery performed, intraoperative and postoperative complications if any were recorded.

STATISTICAL ANALYSIS

Results were expressed in terms of frequency and percentages and analysed by Microsoft Excel version 2106.

RESULTS

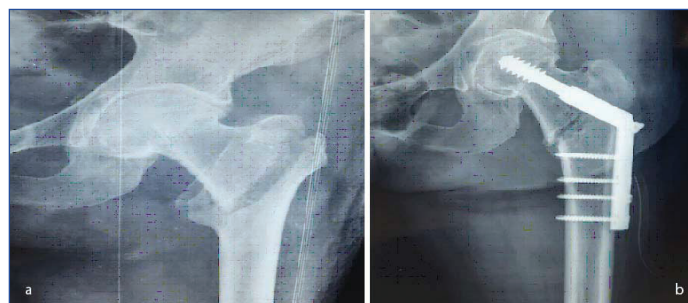
From April 2020 to September 2020, total of 36 patients with hip fractures who were positive for COVID-19 were admitted and sent to COVID-19 center for isolation and treatment of COVID-19 symptoms. Two patients died in COVID-19 center, five were lost in the transition, four left our hospital after re-admission and one was treated conservatively. Twenty-four patients were operated after their samples turned negative for COVID-19 virus [Table/Fig-1]. Age ranged from 39 to 82 years (Mean age was 51.04 years). Males were 9 (37.5%) and 15 (62.5%) were female patients. Right sided fractures were 11 (45.83%) and 13 (54.17%) were left sided fractures. Intertrochanteric fracture were 14 (58.33%), femoral neck fractures were 6 (25%) and 4 (16.67%) were subtrochanteric fractures. Majority of patients, 16 (66.67%) sustained hip fractures after a low velocity fall from standing height. Eight (33.33%) had suffered moderate to

high energy trauma like fall from height and road traffic accidents. Diabetes mellitus with hypertension was found in 3 (12.5%). Isolated hypothyroidism was found in 2 (8.33%) and isolated hypertension in 4 (16.66%) patients. Delay in surgery was 15 to 21 days (Average was 18.25 days). Most of surgeons are well versed with the technique of using dynamic hip screw, so it was done in majority of patients to minimise the duration of surgical procedure. Out of 14 trochanteric fractures, 12 (85.71%) underwent dynamic hip screw fixation [Table/Fig-1,2 a,b]. Dynamic hip screw using biological technique was used in 3 (12.5%) patients with subtrochanteric fracture [Table/Fig-1,3 a,b].

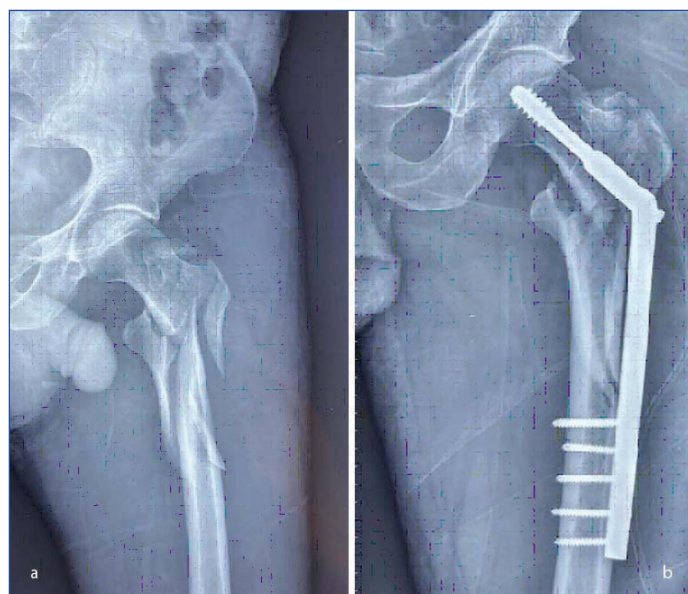
Parameter	Total	IT-FX	ST FX	NOF-FX
No. of positive patients	36	20	05	11
Died in COVID-19 hospital	02	01	0	01
Lost in transition	05	02	01	02
Conservative treatment	01	01	0	0
Left against medical advice	04	02	0	02
Operated	24	14	04	06
Dynamic hip screw	15	12	03	0
Proximal femoral nail	03	02	01	0
Hemiarthroplasty	05	0	0	05
Cannulated screw fixation	01	0	0	01
Total hip arthroplasty	0	0	0	0
Infection				
Superficial Infection	03	01	0	02
Deep Infection	0	0	0	0
Deep vein thrombosis/Pulmonary thromboembolism	0	0	0	0
Mortality	02	01	0	01

[Table/Fig-1]: Showing number of patients, fracture types, surgical procedure performed and complications.

IT-Fx: Intertrochanteric fracture; NOF-FX: Neck of femur fractures; ST Fx: Subtrochanteric fracture

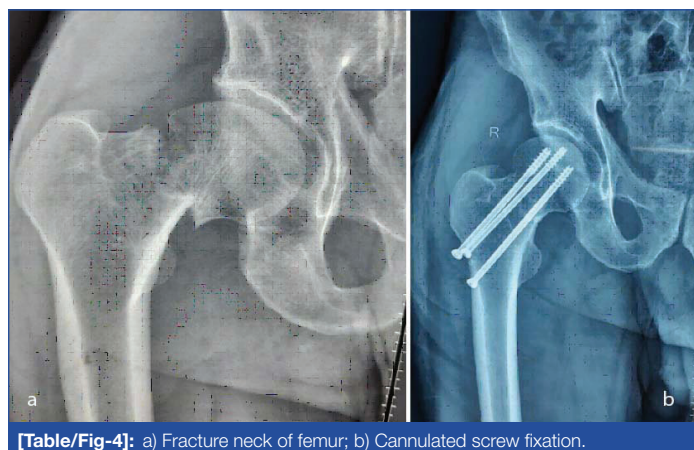


[Table/Fig-2]: a) Intertrochanteric fracture; b) Dynamic hip screw fixation.



[Table/Fig-3]: a) Subtrochanteric fracture; b) Dynamic hip screw fixation.

Proximal femoral nailing was done in 3 (12.5%) patients, two with intertrochanteric and one patient with subtrochanteric fracture. In one patient with femoral neck fracture, close reduction and cannulated screw fixation was done in view of overall poor general condition [Table/Fig-1,4 a,b]. Out of six femoral neck fractures, 5 (83.33%) underwent modular bipolar hemiarthroplasty [Table/Fig-1,5 a,b]. All intertrochanteric, subtrochanteric and femoral neck fractures which were internally fixed united without complications. Two patients, one intertrochanteric fracture with dynamic hip screw fixation and one femoral neck fractures with hemiarthroplasty died after 14 weeks of follow-up due to causes else than respiratory failure.



[Table/Fig-4]: a) Fracture neck of femur; b) Cannulated screw fixation.



[Table/Fig-5]: a) Fracture neck of femur; b) Modular bipolar hemiarthroplasty.

Three (12.5%) patients (two femoral neck fracture with hemiarthroplasty and one intertrochanteric fracture with dynamic hip screw fixation) developed superficial infection which settled with oral antibiotics. No case of deep venous thrombosis, pulmonary thromboembolism was observed in the present study.

DISCUSSION

Coronavirus disease-19 exposed the ill prepared world to pandemic situations and drastically affected medical practice, the scenario in the orthopaedic field is no exception [7]. A massive breakdown in orthopaedic fracture surgeries has been noticed in the world during the COVID-19 pandemic. The main approach of most orthopaedic surgeons was to save the hospital resources, to decrease the risks of COVID-19 infection and to protect their staff and colleagues [8].

During the COVID-19 pandemic, geriatric population comprised 57.42% of trauma cases with middle age people, young adults and paediatric trauma forming the remaining cases. Among trauma attended during pandemic, hip fractures were the most common [7]. A substantial decrease in motor vehicle accidents due to imposed quarantine has led to reduction in the number of patients visiting the emergency trauma centres. Recent articles demonstrated that despite the decreased frequency of trauma due to COVID-19 outbreak, the number of hip fractures remained stable [9-11]. As of December 2020, there have been some accounts in the literature which have addressed orthopaedic trauma surgeries in COVID-19 pandemic, but hip fracture has been a focus of very few authors. To the authors' knowledge, there have been no studies specifically examining early

outcome of delayed fixation in patients who had a hip fracture and an active infection of COVID-19 virus. Mi B et al., published one of the first reports on the characteristics and early prognosis of patients with a fracture and COVID-19 infection in China [12]. In their series of 10 patients, six had sustained hip fractures and only three underwent surgery. One of the three patients died on postoperative day 11, while the other two patients remained in the hospital for further treatment. Catellani F et al., reported on a series of 16 COVID-19 positive patients with proximal femoral fractures in Northern Italy, of which 13 underwent surgical treatment [5]. The majority of patients in this study demonstrated significant improvements in oxygen saturation and respiratory function following surgery. However, four out of the 13 patients (30.8%) died within the first week after surgery. High early mortality rates in COVID-19 positive hip fracture patients were also reported in Italy by Maniscalco P et al., [13]. In this cohort, 32 COVID-19 positive hip patients were treated surgically, and there was a 43.8% (14/320 mortality rate within 21 days [13].

Malik-Tabassum K et al., presented a series of 242 patients with hip fractures. The highest proportion of patients sustained intracapsular neck of femur fractures, the most frequently performed procedure was a cemented hemiarthroplasty. About 76% of patients with hip fractures were tested for COVID-19 and only one patient tested positive, who was medically unfit for surgery and died four days following admission. There was a 26% reduction in the total number of operative trauma cases during COVID-19 pandemic compared to pre COVID-19 period. However, the proportion of operations for hip fractures was similar in both periods [14].

Cheung ZB and Forsh DA reported clinical characteristics and early postoperative outcome in a series of 10 patients with a hip fracture with COVID-19 infection who underwent surgical treatment within two days of admission. There was single death and they suggested that hip fracture patients with mild COVID-19 infection can undergo early surgical intervention after appropriate medical optimisation [15]. Bobin MI et al., collected data of 145 patients with hip fractures from 24 different hospitals. Of the 145 hip fracture patients 108 received delayed surgery and 37 received nonoperative therapy. The median time from hip fracture injury to surgery was 33 days in the delayed surgery group. Both Visual Analogue Scale (VAS) score and Harris Hip Score were superior in the delayed surgery group and the percentage of complications was higher in the non operative group [16].

Tripathy SK et al., published a systemic review and meta-analysis comparing 30 day mortality during COVID-19 pandemic and pre pandemic periods in patients with hip fractures. The pooled data of eight studies revealed no significant difference in 30 day mortality rate between the hip fracture patients treated during COVID-19 pandemic and pre-pandemic periods. A significant difference in mortality rate was observed between COVID-19 positive and COVID-19 negative patients [17]. Saleem JS and Fazal MA presented a series of thirty-five patients with fragility hip fracture [6]. Three patients died prior to being operated on. About 48% of patients were operated on within the national 36-hour target. The 30 day all-cause mortality from the date of presentation of injury was 20% [6].

During COVID-19 pandemic, almost all elective surgeries including various orthopaedic subspecialties were cancelled or postponed, leading to a drastic reduction in the number of non urgent orthopaedic procedures. But, fracture around the hip is an exception where alternative methods of conservative treatment are not recommended. Hip fracture patients represent a high-risk population, as they are generally older with multiple medical co-morbidities. Extensive literature has consistently demonstrated the benefits of early hip fracture surgery for elderly patients, which include reducing bed rest, promoting early mobilisation, controlling pain, improving function, and reducing mortality [3,4]. However, severe respiratory dysfunction and pneumonia secondary to COVID-19 infection may represent a contraindication to early hip fracture surgery in COVID-19 positive patients.

There was a reduction of length of inpatient stay during pandemic. Extensive efforts were made by the integrated discharge teams to ensure timely discharges to minimise patients' risk of acquiring COVID-19, and to create bed capacity for the trauma patients. Despite this, our institution experienced similar challenges to the ones faced by hospitals from other regions of the globe, such as staff sickness, redeployment and uncertainties surrounding COVID-19 related guidance and protocols [14-17].

This study showed that despite severe disruptions to the orthopaedic services, the standard of care for hip fracture patients was maintained in our institution. The COVID-9 pandemic has not completed yet and there is uncertainty about its course in future, the orthopaedic surgeons must resort to the procedures with which they are well versed, are not time consuming.

Limitation(s)

The study was conducted during the lockdown period of the pandemic, therefore the long-term outcomes of patients admitted during this period are unknown. The study did not include any group of patients in pre COVID-19 period for comparison. The present study is single observational evidence involving a short series of 24 patients, further studies involving large number of cases and comparative studies need to be carried out to formulate a protocol for the patients having an active COVID-19 infection and suffer from a hip fracture.

CONCLUSION(S)

The study described the clinical characteristics and early outcomes after a delayed hip fracture surgery in patients who presented with COVID-19 infection. Despite the delay, the mortality rate in the early postoperative period in this case series was less. The present findings suggest that hip fracture patients who present with COVID-19 infection can safely undergo delayed surgical intervention after appropriate medical optimisation.

REFERENCES

[1] Haleem A, Javaid M, Vaishya R, Vaish A. Effects of COVID-19 pandemic in the field of orthopaedics. *Journal of Clinical Orthopaedics and Trauma*. 2020;11(3):498-99.

- [2] Kannus P, Parkkarie J, Sievänen A, Varninen VJ. The epidemiology of hip fractures. *The Bone*. 1996;18(1 Suppl):57S-63S.
- [3] Ryan DJ, Yoshihara H, Yoneoka D, Egol KA, Zuckerman JD. Delay in hip fracture surgery: an analysis of patient-specific and hospital-specific risk factors. *J Orthop Trauma*. 2015;29(8):343-48.
- [4] Pincus D, Ravi B, Wasserstein D, Huang A, Paterson JM, Nathens AB, et al. Association between wait time and 30-day mortality in adults undergoing hip fracture surgery. *J Am Med Assoc*. 2017;318(20):1994-2003.
- [5] Catellani F, Coscione A, D'Ambrosi R, Usai L, Roscitano C, Fiorentino G. Treatment of proximal femoral fragility fractures in patients with COVID-19 during the SARS-CoV-2 outbreak in northern Italy. *J Bone Joint Surg Am*. 2020 Apr 28 Epub ahead of print, JBJS. 20.0061.
- [6] Saleem JS, Fazal MA. Fragility hip fractures in the COVID-19 pandemic: A local experience in the United Kingdom *International Journal of Orthopaedic and Trauma Nursing*. 2021;41:100817.
- [7] Thirunarayanan V, Cheralathan S, Harish T. Impact of COVID-19 pandemic on orthopaedic practice-results from a COVID-19 hospital in India. *Clin Pract*. 2020;17(4):1516-21.
- [8] Jain VK, Lal H, Patralekh MK, Vaishya R. Fracture management during COVID-19 pandemic. A systematic review. *Journal of Clinical Orthopaedics and Trauma*. 2020;(11):S431-41.
- [9] Liu J, Mi B, Hu L, Xiong Y, Xue H, Zhou W, et al. Preventive strategy for the clinical treatment of hip fractures in the elderly during the COVID-19 outbreak: Wuhan's experience. *Aging (Albany NY)*. 2020;12(9):7619-25.
- [10] Zhu Y, Chen W, Xin X, Hu J, Lv H, Li W, et al. Epidemiologic characteristics of traumatic fractures in elderly patients during the outbreak of coronavirus disease 2019 in China. *Int Orthop*. 2020;44(8):1565-70.
- [11] Giorgi PD, Villa F, Gallazzi E, Debernardi A, Schirò GR, Crisà FM, et al. The management of emergency spinal surgery during the COVID-19 pandemic in Italy. *Bone Joint J*. 2020;102-B(6):671-76.
- [12] Mi B, Chen L, Xiong Y, Xue H, Zhou W, Liu G. Characteristics and early prognosis of COVID-19 infection in fracture patients. *J Bone Joint Surg Am*. 2020;102(9):750-58.
- [13] Maniscalco P, Poggiali E, Quattrini F, Ciatti C, Magnacavallo A, Vercelli A, et al. Proximal femur fractures in COVID-19 emergency: The experience of two orthopaedics and traumatology departments in the first eight weeks of the Italian epidemic. *Acta Biomed*. 2020;91(2):89-96.
- [14] Malik-Tabassum K, Crooks M, Robertson A, To C, Maling L, Selmon G. Management of hip fractures during the COVID-19 pandemic at a high-volume hip fracture unit in the United Kingdom. *Journal of Orthopaedics*. 2020;20:332-37.
- [15] Cheung ZB, Forsh DA. Early outcomes after hip fracture surgery in COVID-19 patients in New York City. *Journal of Orthopaedics*. 2020;21:291-96.
- [16] Mi B, Chen L, Tong D, Panayi AC, Ji F, Guo J et al. Delayed surgery versus nonoperative treatment for hip fractures in post-COVID-19 arena. A retrospective study of 145 patients. *Acta Orthopaedica*. 2020;91(6):639-43.
- [17] Tripathy SK, Saini R, Sudes P, Dhillon MS, Gill SS, Sen RK, et al. Application of the Ponseti principle for deformity correction in neglected and relapsed clubfoot using the Ilizarov fixator. *J Paediatric Orthop B*. 2011;20(1):26-32.

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