



## Case Series

## Emergency orthopaedic surgery in the pandemic era: A case series at Cipto Mangunkusumo national tertiary hospital in Jakarta, Indonesia



Achmad Fauzi Kamal<sup>a</sup>, Wahyu Widodo<sup>a</sup>, Mohamad Walid Kuncoro<sup>a</sup>,  
I. Wayan Arya Mahendra Karda<sup>a,\*</sup>, Yogi Prabowo<sup>a</sup>, Hadiki Habib<sup>b</sup>, Lies Dina Liastuti<sup>c</sup>,  
Trimartani<sup>d</sup>, Errol Untung Hutagalung<sup>a</sup>, Ifran Saleh<sup>a</sup>, Singkat Dohar A.L. Tobing<sup>a</sup>,  
Bambang Gunawan<sup>a</sup>, Ismail Hadisoebroto Dilogo<sup>a</sup>, Andri MT Lubis<sup>a</sup>, Aryadi Kurniawan<sup>a</sup>,  
Ahmad Jabir Rahyussalim<sup>a</sup>, Ihsan Oesman<sup>a</sup>, Nadia NPPS Ifran<sup>a</sup>, Wildan Latief<sup>a</sup>,  
Mohammad Triadi Wijaya<sup>a</sup>, Muhammad Deryl Ivansyah<sup>a</sup>,  
Muhammad Rizqi Adhi Primaputra<sup>a</sup>, Adisa Yusuf Reksoprodjo<sup>a</sup>, Andra Hendriarto<sup>a</sup>,  
K.M. Azka Novriandi<sup>a</sup>, Ziad Alaztha<sup>a</sup>, Anissa Feby Canintika<sup>a</sup>,  
Anita Happy Rahayu Sitanggang<sup>a</sup>

<sup>a</sup> Department of Orthopaedics and Traumatology, Faculty of Medicine Universitas Indonesia, Cipto Mangunkusumo Hospital, Jakarta, Indonesia

<sup>b</sup> Department of Internal Medicine, Faculty of Medicine Universitas Indonesia, Cipto Mangunkusumo Hospital, Jakarta, Indonesia

<sup>c</sup> Cipto Mangunkusumo Hospital, Jakarta, Indonesia

<sup>d</sup> Department of Ear, Nose, and Throat, Faculty of Medicine Universitas Indonesia, Cipto Mangunkusumo Hospital, Jakarta, Indonesia

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## ABSTRACT

**INTRODUCTION:** Every emergency surgery performed is aimed at saving lives; however, during COVID-19 pandemic, surgeries are often postponed. Many existing recommendations take into account postponing surgery during a pandemic. How these surgeries can lead to increasing infection rates has not been widely published. This study aims to investigate the relationship of emergency orthopaedic surgery and the incidence rate of COVID-19.

**PRESENTATION OF CASE:** This was a case series of 14 patients. The study was performed at the emergency department unit at a national tertiary hospital in Jakarta, Indonesia. A total of 14 patients underwent orthopaedic surgery in the emergency room of our institution. The mean age of the subjects was  $40.07 \pm 20.5$  years. Twelve (85.7%) were male patients and 2 (14.3%) were female patients. The average duration of surgery was 125 minutes. The most used type of anaesthesia was general anaesthesia for 6 operations (50%). Patients were hospitalized for an average length of 4 days. Three patients had infiltrates found on plain x-ray examination, which required further examination to determine whether the cause was COVID-19 infection or not. There was no ground glass appearance (GGO) in the three patients in further follow-up examination.

**CONCLUSIONS:** We found that emergency orthopaedic surgery was not associated with increasing number of COVID-19 cases. Factors including duration of surgery, length of stay, types of anaesthesia and comorbidities were also not associated with COVID-19 cases in this study.

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### 1. Introduction

At the beginning of 2020, the world was shocked by a major disaster that occurred throughout the world. This disaster was a biological disaster in the form of a global spread of a disease or pandemic. The pandemic was caused by the spread of a virus known as the corona virus or SARS-CoV-2 or COVID-19 [1].

\* Corresponding author at: Department of Orthopaedics and Traumatology, Faculty of Medicine Universitas Indonesia, Cipto Mangunkusumo Hospital, Jl. Diponegoro No.71, Jakarta Pusat 10430, Indonesia.

E-mail address: [arya961mahendra@gmail.com](mailto:arya961mahendra@gmail.com) (I.W.A.M. Karda).

The first case of COVID-19 appeared in Wuhan, China at the end of 2019. At 31st December 2019 the Wuhan government discovered a pneumonia case with an unknown cause. Researchers in China then identified a new virus as the cause of these cases in which there was spread between humans [1]. Three months ago, COVID-19 had spread to various countries in the world. As of 3rd April 2020, the number of COVID-19 cases in the world reached 1,030,628 cases resulting in the death of 54,137 people (death rate 5.25%) in 205 countries [2]. The first 2 cases of COVID-19 in Indonesia were found on 2nd March 2020 and had reached 1986 cases as of 3rd April 2020 with deaths reaching 181 people (9.11%), this figure was the highest in Southeast Asia [1]. Indonesia has a COVID-19 death rate above the world average. This makes issues related to spread and efforts to minimize spread are very important.

This pandemic has resulted in changes and adjustments to all aspects of hospital services starting from outpatient care, inpatient care, supporting examinations, surgical procedures, and emergency services. Emergency services including emergency surgeries have an indirect impact on this condition. Although until now there are no data regarding the effects of carrying out an emergency surgery on increasing the risk of disease spread, the related literature recommends delaying it. Correia et al. [3], stated that a hospital in a pandemic condition needs to prepare facilities and other resources in an emergency setting in order to anticipate a very fast spread. They recommended delaying surgical procedures for various reasons. The American College of Surgeon also recommends limiting surgical procedures, especially elective surgery during this pandemic, but does not provide more detailed criteria regarding the type of surgery and other related variables [4,5].

Every emergency surgery performed is of course aimed at saving lives, but in pandemic conditions the procedure should still refer to the four principles in patient management: beneficence, non-maleficence, respect for autonomy and justice [6]. Many existing recommendations take into account postponing surgery during a pandemic. How these surgeries can lead to increasing infection rates has not been widely published. This study aims to investigate the relationship of emergency orthopaedic surgery and the incidence rate of COVID-19. This paper had been written according to the PROCESS guideline [7]. This study had been registered to University hospital Medical Information Network (UMIN) with registry number UMIN000042453.

## 2. Presentation of case

This study was a case series performed at a national tertiary hospital in Jakarta, Indonesia. Subjects were patients who underwent emergency orthopaedic surgeries at our institution from April to May 2020. Those who were previously infected with COVID-19 from polymerase chain reaction (PCR) reverse transcriptase (RT) examination obtained via nasopharynx and oropharynx swab were excluded from the study. Data were collected before, during, after surgical procedure, and final evaluation a week after surgery.

Variables analyzed in this study includes age, gender, types of anaesthesia, duration of surgery, length of stay, clinical symptoms, and comorbidities. These variables were considered risk factors that may contribute to the development of COVID-19 infection.

Patients indicated for emergency orthopaedic surgery were examined preoperatively by laboratory testing (routine blood test and differential blood count) and plain chest radiograph. The patients also underwent COVID-19 screening by SARS CoV-2 Immunoglobulin G & IgM antibody test using 2019-nCoV IgG/IgM Detection Kit® (Vazyme Biotech, China). Patients who were having positive results from antibody test were undergone surgery in a high protective measure. During every surgery, preventive measures were applied according to the level of infection spread risk.

**Table 1**  
Patient demographic characteristics.

Characteristics	Value (n = 14)
Age (years)	40.07 ± 20.5
Gender	
Male	12 (85.7%)
Women	2 (14.3%)
Types of Anesthesia	
Local	4 (28%)
Spinal	2 (14%)
General	7 (50.0%)
CSE	1 (7%)
Duration of surgery	125 ± 60.70
Length of stay (LOS)	4 (1, 21) [median, (min and max)]
Comorbidities	
Diabetes	2 (14.3%)
Hypertension	1 (7.14%)
SARS CoV-2 Immunoglobulin G & IgM antibody test	
Reactive	1 (7.14%)

One week after discharge, laboratory testing (routine blood test and differential blood count) and plain chest radiograph was conducted from the Orthopaedic outpatient clinic. Diminished leukocyte count and/or increased lymphocyte percentage were considered suggestive laboratory results, while any evidence of infiltrate/ground glass appearance in the chest x-ray were considered suggestive as well. During the polyclinic visit, certain health measures were also applied by the health practitioners and the patients to minimize the spread of the virus. Multiple screening levels, social distancing, hand hygiene, utilization of protective equipment including surgical masks by both health practitioners, and the patients were all done in our polyclinic setting. Patients indicative of having COVID-19 were then consulted to the Internal Medicine Department for further workup including chest computed tomography (chest CT) or nasopharyngeal/oropharyngeal swab test.

Descriptive data were presented in frequency for categorical data and mean/median for numerical data.

A total of 14 patients underwent surgery in the emergency room of our institution. The mean age of the subjects was 40.07 ± 20.5 years, with the youngest age being 2 years and the oldest being 70 years. Twelve (85.7%) were male and 2 (14.3%) were female. The average duration of surgery was 125 min with the longest being 180 min, while the fastest surgery was 60 min. The most used type of anaesthesia was general anaesthesia for 6 surgeries (50%) and the least type of anaesthesia was combined spinal-epidural anaesthesia (CSE) (9%). Patients were hospitalized for an average length of 4 days. The longest hospitalization was 21 days and the fastest was one day. Characteristics of the subjects are presented in Table 1.

Before surgery, there was 1 (7.14%) patient who had reactive IgM results from pre-operative examinations. Patients who obtained reactive rapid test results then underwent surgical procedures using predefined preventive protocols. This patient with a suspicion of COVID-19 then underwent PCR-RT examination obtained via nasopharynx and oropharynx swab with negative results.

From 14 patients, one patient was performed chest tube thoracostomy insertion and closed reduction of fracture and immobilization using long leg cast, three patients were performed open reduction internal fixation (ORIF) plate and screw, one patient had repair stump with VY flap, four patient were performed repair of vessel and tendon of hand, one patient was performed triangular external fixator of ankle and fasciotomy of the foot, one patient was performed remove implant of ORIF distal femoral locking compression plate (DFLCP), one patient was performed debridement and immobilization using long leg cast, one patient was performed closed reduction and immobilization using hip spica cast, while another patient was performed exploration, tendon and nerve

repair of the foot. All of the surgeries were done by a team led by senior chief residents of our academic hospital with the supervision of orthopaedic Trauma consultant.

Investigations were also carried out on those 14 subjects after discharge to see if there were any suggestive signs indicative to COVID-19 infection. Blood tests that were performed include routine blood and differential count. Radiological examination in the form of a plain chest radiograph was also performed on all patients.

During a week after discharge, there were 3 patients whose infiltrates were found on plain chest radiograph, which required further examination to determine whether the cause was COVID-19 infection or not. There was no ground glass appearance (GGO) in the three patients in the follow-up examination using chest CT Scan. In this study, 2 (14.3%) subjects had a history of diabetes, and 1 (7.14%) patient had history of hypertension. From this study, none of the patients developed symptoms suggestive of COVID-19 infection or were confirmed cases.

### 3. Discussion

The general strategy preventing transmission of COVID-19 recommended by WHO is: avoiding traveling to high-risk places and contact with symptomatic individuals [8]. The route of transmission of COVID-19 is mainly through droplets and also close contact, where currently regulations that limit social gatherings and maintain distance from each other to prevent further transmission have been enforced. Some of the existing data even support that this virus may be transmitted through aerosols. This raises concerns that the virus can infect health workers working in the vicinity if they do not use complete personal protective equipment (PPE). One that requires special attention is the surgical service in the operating room [9].

In contrast to elective surgery, emergency orthopaedic surgery requires special attention due to its inability to be postponed. As a rule of thumb all elective operations are cancelled and only emergency or oncological operations are said to be allowed to continue [10].

In this pandemic, hospitals are faced with difficult choices especially in order to save important resources such as number of beds, number of ventilators, ability for transfusions and so on. This includes PPE, which during a pandemic is quite difficult to obtain. Postoperative COVID-19 infection in patients will have a negative impact on the patient's recovery. In health services, adaptation to pandemic conditions is needed. The authorities stated that non-urgent surgery should be postponed, while emergency surgery and oncology surgery with clear indications should be continued [11]. However, until now there is still limited data regarding the effect of COVID-19 on the outcome of patients undergoing emergency surgery.

Brindle et al. [12] identified key points that must be changed during the COVID-19 period: 1) preparing a surgical response including: delaying elective surgery, redesigning the operating room as a place for critical care, restructuring the workflow of surgical services, 2) develop a team-based plan to provide essential services for surgical emergencies during a pandemic, 3) ensure personal protective equipment (PPE) for operating room personnel during the COVID-19 pandemic, 4) recognizing and managing COVID-19 infection and reducing the spread of the infection, and 5) creating a special operating room for patients with positive COVID-19.

It is important to prevent transmission of COVID-19 among operating room personnel by re-distribution of the operating room personnel themselves. Two independent teams should be formed, namely a team that specifically handles routine patients in hospitals and a special team to manage COVID-19 isolation patients.



Fig. 1. Conditions for emergency surgery with highest level of PPE in our institution.

After a 2 week interval, the two teams were swapped to see if any personnel developed symptoms of COVID-19 [13].

Based on consensus, there are several clinical practical guidelines applied in our institution regarding emergency surgery in COVID-19 setting including 1) pre-operative screening should be performed in all emergency patients requiring surgery, 2) consider waiting for the results of COVID-19 screening if possible, 3) choose nonsurgical therapy if clinically possible, and 4) use a negative pressure operating room in surgery for asymptomatic and confirmed cases of COVID-19 patients [14].

Several published literatures discussed the guidelines for surgery in the emergency department. All of the guidelines agree that all acute patients who come to the emergency department are considered COVID-19 positive until proven otherwise [15,16]. In addition, it is advisable to do a deep history, especially regarding contact tracing accompanied by swabs, plain chest radiograph, abdominal and chest CT if necessary.

In this study, one patient had reactive IgM results from pre-operative examinations. In this patient, we performed surgery with highest level of PPE protocol as shown in Fig. 1. A meta-analysis conducted by Deeks et al. [17] revealed that rapid test which was the anti-SARS Cov-2 IgG/IgM serology test, regardless of the type of brand, did not have a high sensitivity as a screening test. In the article, he stated that the sensitivity of serological tests was influenced by the time since the patient had symptoms, where the best sensitivity was on the 21 st day after the onset of symptoms. The review suggests that antibody tests can have a useful role in detecting whether a person has contracted COVID-19, but the timing at which the test was used was important. An antibody test can help confirm COVID-19 infection in people who had symptoms for more than two weeks and did not have a PCR-RT test, or a negative PCR-RT test result. Camarena et al. [18] suggested creating a preparation flow chart for surgery to ensure that the patient was not infected with COVID-19. In the diagram, the serology test was used twice and the PCR-RT test. Even with a layered test according to the diagram, Camarena stated that there was still a 10% chance of patients with COVID-19 infection who will escape [18]. Our pre-operative screening protocol was certainly not completely perfect, but it was felt to be the most cost and resources effective compared to requiring a Swab as a preoperative filter.

Administration of high-flow nasal oxygen, bronchial oxygenation, suctioning, bronchoscopy, and sputum induction procedure place health care workers in close proximity to the upper respiratory tract source containing viral load, which has been associated with an increased risk of transmission of coronavirus [19]. In this study, there was no link between the type of anaesthesia used in emergency orthopaedic surgery because there were no patients who showed symptoms or were confirmed as COVID-19 cases.

The mean duration of surgery in this study was  $125 \pm 60.70$  min. The duration of emergency surgery in this study was found to be lower than in previous studies. Previous research stated that in the conditions of the COVID-19 pandemic, the duration of surgery was better shortened by measures that use minimally invasive methods [20]. However, there was no research that states that there was a relationship between the duration of surgery and COVID-19 infection.

In this study, there was no link between length of stay and the occurrence of COVID-19 infection. This could be due to the relatively short length of stay in this study 4 (1, 21) days. In previous studies, it was found that patients infected with COVID-19 had a longer postoperative length of stay than those who were not infected. [21] Previous studies have also suggested that lung infections can increase the risk of postoperative patients by increasing mortality, length of stay, and general medical costs [21]. In other study, it was stated that the length of stay after surgery, especially in the intensive care unit (ICU), needs to be kept low considering the possibility of transmission and the high need for ICU in the COVID-19 pandemic [13]. According to Iyengar et al., the length of stay in patients after orthopaedic surgery during the COVID-19 period must be minimized. Postoperative care wherever possible was carried out in the patient's home. Patient monitoring was done via telemedicine or remote consultation. Direct contact between patient and doctor is kept to a minimum [22].

In this study, the most common comorbidity was diabetes mellitus [2 patients (14.3%)]. Diabetes patients are known to have an increased risk of developing infection. However, diabetes does not increase the risk of COVID-19, although diabetes is more common in patients with severe COVID-19 infection [23]. In this study, the two patients did not show signs and symptoms towards COVID-19.

The fields of orthopaedics and traumatology play an important role in which operations performed on patients will have a lasting impact regardless of the status of COVID-19. Therefore, careful planning is required and ensure that the surgical management received is optimal. COVID-19 has an enormous impact on hospital services including emergency surgery. In a pandemic like this, there is a fast-growing academic literature every day. While COVID-19 continues to make its presence in healthcare around the world, surgeons will surely adapt to its non-surgical role in the important fight against the COVID-19 pandemic. Therefore, ongoing research is needed on COVID-19.

#### 4. Conclusions

We found that emergency orthopaedic surgery was not associated with increased COVID-19 cases. Factors including duration of surgery, length of stay, types of anaesthesia and comorbidities were also not associated with COVID-19 cases in this study. However, we did not perform nasopharyngeal/oropharyngeal swab pre-operatively to confirm the diagnosis, thus the results may not be valid. We suggest performing PCR-RT swab examination for etiological diagnosis in pre-operative settings in future studies.

#### Conflict of interests

The authors declare that there is no conflict of interest regarding publication of this paper.

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None

#### Ethical approval

This study had received ethical clearance from the Research Ethical Committee of the Faculty of Medicine, Universitas Indonesia, no: KET-808/UN2.F1/ETIK/PPM.00.02/2020, protocol no. 20-05-0560.

#### Consent

Written informed consent was obtained from the patient for publication of this case series report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

#### Author contribution

Achmad Fauzi Kamal – contributes to the conception, design, supervision, literature review, and critical review of the manuscript

Wahyu Widodo – contributes to the supervision, literature review, and critical review of the manuscript

Mohamad Walid Kuncoro – contributes to the data collection, processing, analysis, and interpretation of the data, literature review, and writing of the manuscript

I Wayan Arya Mahendra Karda – contributes to the data collection, processing, analysis, and interpretation of the data, literature review, and writing of the manuscript

Yogi Prabowo – contributes to the supervision, data collection, processing, and analysis of the manuscript

Hadiki Habib – contributes to the supervision and literature review of the manuscript

Lies Dina Liastuti – contributes to the supervision and literature review of the manuscript

Trimartani – contributes to the supervision and literature review of the manuscript

Errol Untung Hutagalung – contributes to the supervision and literature review of the manuscript

Ifran Saleh – contributes to the supervision and literature review of the manuscript

Singkat Dohar AL Tobing contributed to conceptualization, resources, supervision

Bambang Gunawan contributed to conceptualization, resources, supervision

Ismail Hadisoebroto Dilogo contributed to conceptualization, resources, supervision

Andri MT Lubis contributed to conceptualization, resources, supervision

Aryadi Kurniawan contributed to conceptualization, resources, supervision

Ahmad Jabir Rahyussalim contributed to conceptualization, resources, supervision

Ihsan Oesman contributed to conceptualization, resources, supervision

Nadia NPPS Ifran contributed to conceptualization, resources, supervision

Wildan Latief contributed to conceptualization, resources, supervision

Mohammad Triadi Wijaya contributed to validation, investigation, project administration

Muhammad Deryl Ivansyah contributed to validation, investigation, project administration

Muhammad Rizqi Adhi Primaputra contributed to validation, investigation, project administration

Adisa Yusuf Reksoprodjo contributed to validation, investigation, project administration

Andra Hendriarto contributed to validation, investigation, project administration

K M Azka Novriandi contributed to validation, investigation, formal analysis

Ziad Alaztha contributed to validation, investigation, formal analysis

Anissa Feby Canintika contributed to validation, investigation, formal analysis

Anita Happy Rahayu Sitanggang contributed to project administration

### Registration of research studies

This study is registered at UMIN Clinical Trials Registry (<https://www.umin.ac.jp/ctr/index.htm>) with UIN of UMIN000042453.

### Guarantor

Achmad Fauzi Kamal.

### Provenance and peer review

Not commissioned, externally peer-reviewed.

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