

# Emergency and Urgent Orthopaedic Surgeries in non-covid patients during the COVID 19 pandemic: Perspective from India



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## ABSTRACT

**Objectives:** To Evaluate the results and the protocols of our Institution for 18 Emergency and Urgent Non Covid Surgeries during the Covid 19 Pandemic

**Methods:** 18 patients underwent Emergency and Urgent Orthopaedic Surgeries at institution. The Protocol was Screening, Segregation, Selection, Isolation, theatre modification, and Online Follow.

**Results:** Two adverse events including, one death and one intensive care admission due to underlying morbidity were recorded. Average Hospital stay was 2.5 days with no patients becoming covid positive at follow up.

**Conclusion:** Strict Surgical protocols need to be followed for surgery during the Covid19 pandemic.

## 1. Introduction

The World is faced with a unique situation at this moment of time. A population of seven billion interwoven with threads of hyper connectivity have been forced physically apart due to a Pandemic.

The information we receive from various parts of world today appears fragmented and at times contradictory. We debate disjointedly, about ideas concerning optimal treatment strategy, emergency and elective surgeries. In these times till, robust data emerges we need to count on each other's experience.

Fortunately, India lagged behind most countries whose economy and health care systems faced the unprecedented impact of the COVID 19 virus which helped us to be better prepared. The slight edge we gained from having witnessed the experience of Wuhan, Italy Spain and New York helped us formulate strategies to protect health care professionals. Today this state capital city is in the midst of a crisis, with seven thousand affected patients and is almost contributing to a third of affected patients in the country. We believe that our small series from the city of Mumbai that is epicenter of this pandemic in India will offer insights to other parts of the world.

Effectively translating science into both operational and policy action is an universal challenge during an emergency. Aligning the interests of clinicians, patients, hospital and government policy makers can be especially difficult.<sup>1,2</sup> In these exceptional times, it is imperative to consider the possibility that surgical facilities become hampered by

staff sickness, reduced supply of surgical materials, limited availability of recommended operating rooms (ORs), facilities, and trained anesthesiologists for improvised intensive care unit (ICU) pods for patients with COVID-19.<sup>3</sup> Though recent literature describe specific guidelines for setting up orthopaedic operating rooms, the use of PPE and disinfection protocols, there are very few case series of being patients operated for Emergency and Urgent orthopaedic Surgeries in literature.

Previous experience of dealing with mass emergencies and man-made/natural disasters have shown the advantage of following preset guidelines and a protocolized approach. Due to the prior experience, adhering and adapting to rapidly changing scenario enabled our team to provide necessary orthopedic service to community during this pandemic. This case series describes our experience of the first 18 emergency and urgent surgeries performed at a tertiary care institute in India during the COVID 19 pandemic following the protocols set up by our centre as per government guidelines and International recommendations.

## 2. Methods

Between March 20th, 2020 and April 30th, 2020, over a span of 40 days, 18 Emergency and Urgent Orthopaedic Surgeries were performed on non COVID patients by four surgeons at our centre in the city of Mumbai, in India as per protocols set up at our institution. This tertiary

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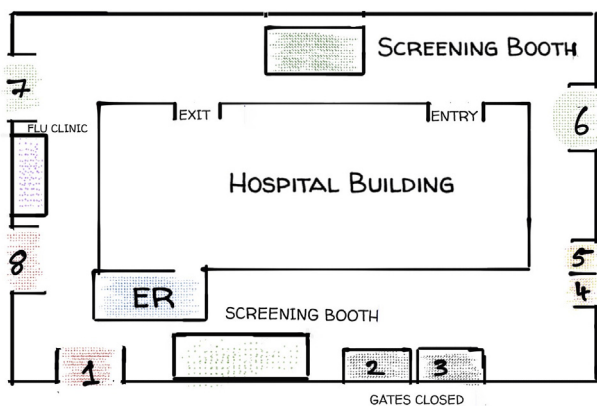


Fig. 1. A floor plan of the perimeter of the hospital.



Fig. 3. Screening Sticker for hospital Staff.

care centers caters to a population of about Forty Million and has 8 other major tertiary care private hospitals in its vicinity. In the earlier part of the pandemic, on the containment directives of the authorities, six out of these eight hospitals were locked down secondary to medical personnel testing positive for COVID 19 secondary to hospital acquired infections.

In the wake of such developments, strict protocols were set up at our centre for all patients visiting the hospital, which included stopping all outpatient services except Accident and Emergency services and all elective surgeries. All outpatient services were converted to online consultations. The Segregation was started in the Perimeter of the hospital, with dedicated gates for patients, male and female staff members, ambulances and private vehicles.

Every member of staff was screened at the staff screening booth by a team of medical personnel wearing a PPE with an N95 respirator. Every staff members who screened negative for COVID 19 symptoms was asked to place a sticker on the front pocket of their clothes (Fig. 1- 3).

Every patient coming to the ER was screened at a screening booth, located at a distance of 20 metres. The screening was done by medical staff wearing a Hazmat suits and disposable double surgical gloves. Once the preliminary thermal screening for Pyrexia and symptoms of COVID 19 was performed, the patients were directed to three different containment zones in the ER (Fig. 4).

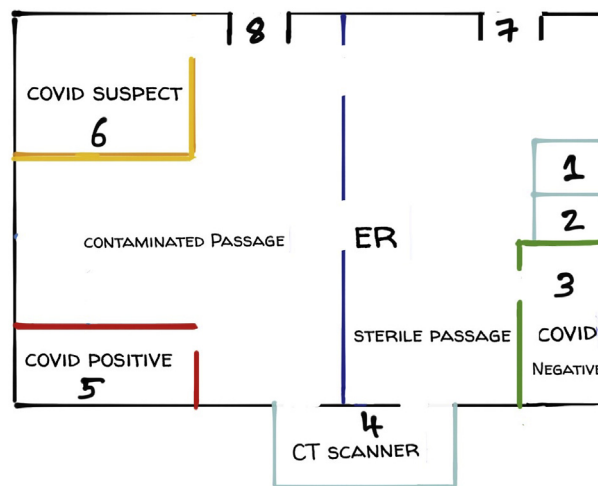


Fig. 4. A floor Plan of the Emergency Room of the Hospital divided into three zones.

- 1 - PPE Donning Room.
- 2 - PPE Doffing Room.
- 3 - Clinically Covid Negative Area.
- 4 - CT Scanner.
- 5 - Clinically Covid Positive Area.
- 6 - Clinically Covid Suspect Area.
- 7 - Entry and Exit to Covid Negative Zone.
- 8 - Entry and Exit to Covid Suspect and Covid Positive Zones.

- Zone 1: Clinically COVID positive
- Zone 2: Clinically COVID suspect
- Zone 3: Clinically COVID negative

In Zone 1 and Zone 2, the patients were examined by a team of medical personal wearing Hazmat suits and disposable double surgical

In Zone 3, patients were examined by medical personnel wearing a PPE consisting of a Disposable water impervious gown, disposable double sterile surgical gloves, an N95 respirator and disposable leg-gings.

Those that needed inpatient care for emergency and urgent sur-geries were admitted after obtaining a COVID Throat swab and an Emergency High Resolution CT Scan at the time of admission. All Emergency patients were taken up for immediate surgery. All Urgent patients were shifted to a dedicated Isolation floor in the hospital equipped with individual isolation patient suites. The medical per-sonnel on the Isolation floor donned a full Hazmat suit PPE with Leggings and disposable double surgical gloves.

The Surgical Suites of our institute are situated on two adjoining floors of the hospital and are designed to be diametrically symmetrical with negative pressure operating rooms. As per protocol they have been segregated into Non COVID and COVID Complexes. COVID positive patients or those with clinical symptoms suggestive of COVID who need to be operated on an emergency basis were directed to undergo sur-geries in a Dedicated COVID Operating room in the COVID complex

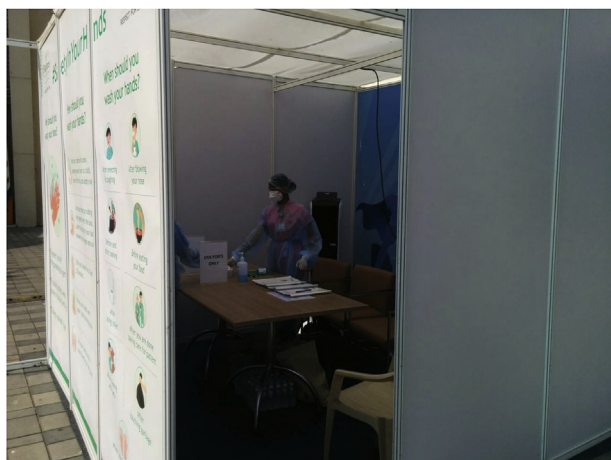


Fig. 2. The Screening booth.

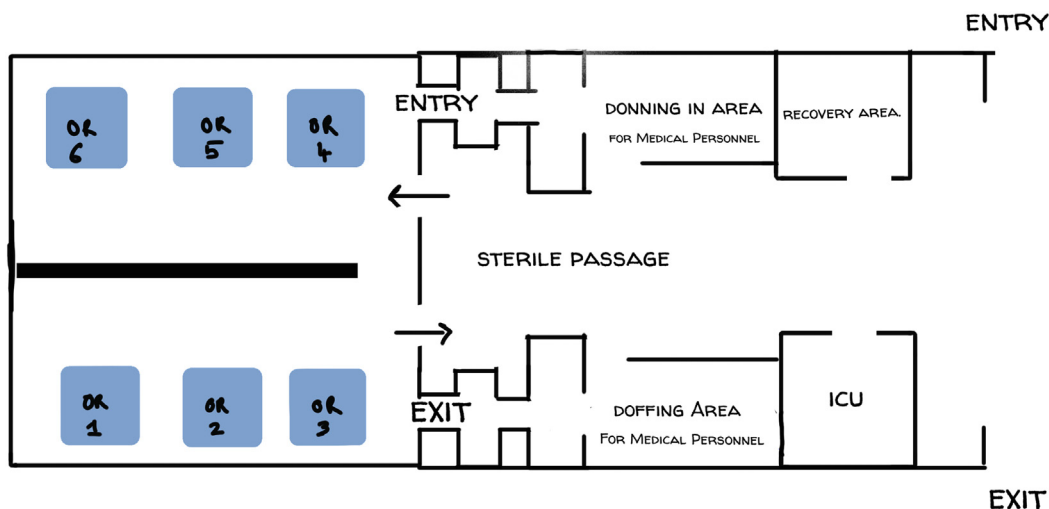


Fig. 5. A floor Plan of the OR complex.

located at a satellite unit created and refurbished for the purpose. The Non COVID complex has six operating rooms of which only three were allowed to function at any given point in time Alterations were made to the existing plan of the operating room in order to accommodate a Donning in area, a safe sterile passage and a doffing area for all medical personnel (Fig. 5).

All Emergency surgeries were performed by personnel from the surgical team, the anesthesia team and the medical support staff wearing PPE's. In the Urgent Surgeries category, if the patient was COVID negative on throat swab and had no infiltrates on the CT scan, then the member of the anesthesia team who administered anesthesia to patient had donned a full PPE. The rest of the team members including those from the surgical team and other medical personnel donned water Impervious disposable surgical gowns, disposable hoods with goggles, double sterile surgical gloves and protective leggings over foot wear (Fig. 6). As per protocol, all members of the Surgical team were asked to step outside the OR during administration of General Anesthesia.

Water impervious sterile disposable drapes were used during each surgery. The use of Power instruments was minimised, and pulsed Lavage was avoided in all cases. Absorbable suture materials were used in all cases and a transparent dressing was applied Table 1 and Table 2 mentions the details of all patients. Members of the surgical team were then asked to step out of the OR at the time of extubation. Patient were

Table 1

Table 1 Depicts the Anthropological data of patient with preexisting comorbidities, Travel and contact history and information on isolation.

Sr No	Age	Sex	Co-Morbid Condition	Contact History	Travel History	Pre Surgery Isolation
1	44	M	No	None	No	No
2	20	M	No	None	No	Yes
3	54	M	No	None	No	Yes
4	91	M	Alzheimer's Dementia	None	No	Yes
5	61	F	Diabetes, HT, E Coli Septicemia, Pyelonephritis	None	No	Yes
6	78	F	Diabetes, Post CABG	None	No	Yes
7	50	F	TB intestine	None	No	Yes
8	42	M	Post-polio residual paralysis	None	No	Yes
9	88	F	No	None	No	Yes
10	11	M	No	None	No	Yes
11	81	M	Alzheimer's Disease	None	No	Yes
12	88	M	No	None	No	Yes
13	66	F	No	None	No	Yes
14	51	F	No	None	No	Yes
15	50	F	Diabetes, hypertension	None	No	Yes
16	45	F	No	None	No	Yes
17	73	F	Post-polio residual paralysis	None	No	Yes
18	45	M	No	None	No	Yes



Fig. 6. A picture of the Surgical team wearing PPE.

observed for 30 min in the operating room and not shifted to recovery room. A period of 30 min were given for all possible aerosol to dry up after the patient is wheeled out and before the deep cleaning of the operating room is started. The operating room was shut for a period of 4 h before the second surgery was undertaken.

Key differentiators during COVID time:

1. Preoperative Anesthesia Consultation via Video consultation by a member of the anesthesia team.
2. Regular consenting and Special COVID consent as directed by the authorities.
3. Avoid Aerosol generating procedures by anesthesia team – Use blocks as necessary.
4. Follow government guideline on screening: Preferred to have 2 negative swabs and an antibody test
5. Use negative pressure room where possible.
6. Check for all the requirements before surgery: No/minimal door opening

**Table 2**

Table 2 depicts the Diagnosis, surgery performed and the length of stay in the hospital with adverse events.

Sr no	Diagnosis	Surgery	Length of stay	Adverse effects
1	Intra articular Distal radius fracture	Distal Radius Plating	4	
2	Distal 1/3rd radius and scaphoid fracture	Distal Radius Plating/closed reduction and screw fixation for scaphoid fracture	3	
3	C5-6 bifacetel dislocation with quadriplegia	C5-6 posterior fusion	15	
4	Intertrochanteric Fracture neck femur	Proximal femoral nailing	8	
5	Cauda equina syndrome	Lumbar laminectomy and interbody fusion	34	ICU, ventilator, respiratory failure
6	Intertrochanteric Fracture neck of femur	Proximal femoral nailing	5	Post Operative Death
7	Fracture neck of femur	Bipolar hemiarthroplasty	10	
8	Intracapsular neck of femur fracture	Fracture neck of femur fixation with Multiple CC Screws	4	
9	fracture neck femur	Bipolar hemiarthroplasty	5	
10	Displaced supra condylar fracture of left humerus	Closed Kirschner wire fixation	3	
11	Fracture dislocation of shoulder	closed reduction under general anesthesia	3	
12	Intracapsular neck of femur fracture	Bipolar Hemiarthroplasty	5	
13	Right proximal humerus fracture with dislocation	Fixation with multilock humeral nail for 4part proximal humerus fracture	4	
14	Both bone forearm fracture	Internal fixation with dynamic compression plates	4	
15	Non-Union Distal femur fracture with broken plate	Intramedullary nailing and primary bone grafting	5	
16	Distal 1/3rd Tibia Fibula Fracture	Minimally Invasive Plate Osteosynthesis	4	
17	Intracapsular neck of femur fracture	Bipolar Hemiarthroplasty	4	
18	Distal Radius Fracture	Distal Radius Plating	2	

- Surgical team to not enter the theatre till the time induction is being done especially, if intubation is being done.
- Minimise people in the OR. Maximum of 8 people to be there for any procedure, including anesthesia, surgical team, nursing and technicians.
- Patients should be double masked if regional anesthesia being given
- All member of surgical team to wear a N 95 mask
- Avoid aerosol generating and Splash generation methods during surgery (avoid pulse lavage, high speed burrs, Use closed suction devices)
- Use of absorbable suture materials where possible. Consider using self-locking sutures like stratafix (J&J)
- Patient should be monitored for 30 min after the end of procedure in the same operating room.
- Cleaning of the operating room begins 30 min after the patient is wheeled out to let any remaining aerosol to dry up/cleared.
- Theatre to remain closed for 4 h before the next case is taken.

### 3. Results

There were 9 females and 9 Males. The average age was 57.6 years .8 out of the 18 patients had Preexisting co-morbidities. The average length of stay was 2.5 days in Patients with no co-morbidities was 2.5 days and that in the Co Morbidities group was 7.8 days. There was one unfavorable result in the form of post-operative death on the third post-operative day due to a sudden onset cardiac event. This past had a prior history of myocardial event and had undergone a Coronary by-pass 7 years back. On 2nd post-operative surgery he had a sudden cardiac arrest, a code blue was activated but he could not be revived. One patient (P5) with pyogenic spondylodiscitis and multiple co-morbidities DM, HT, pyelonephritis, septicemia and E coli Infection, hypoalbuminemia and urinary tract infection with Candida albicans who was operated 30 days ago for cauda equina syndrome is still admitted and had to be transferred to the ICU due to respiratory failure and bilateral transudative pleural effusion and ARDS changes. She has a wound VAC for delayed healing and discharge. She was discharged with home care nursing and a wound vacuum dressing after stabilisation. The rest of the patients had an uneventful post-operative period till discharge. A wound inspection was performed only if there was a visible soakage from the dressings. All patients were instructed to follow up at approximately two weeks after surgery. Patients and their care givers

were instructed about rehabilitation protocols in the immediate post-operative period and were asked to follow up via video conferencing and tele-consultation in the period of convalescence by the primary surgeon along with the rehabilitation team.

### 4. Discussion

On March 13, 2020, the American College of Surgeons (ACS) recommended postponing or canceling elective procedures.<sup>4</sup> Understandably, national societies, both in orthopaedic surgery and in other specialties, are yet to come up with their own specific guidelines in this rapidly changing environment. Fortunately governments have stepped up to the occasion and are in process of providing either recommendations or mandates regarding the performance of semi elective and elective procedures.<sup>5</sup>

This topic of returning to normalcy in terms of being able to operate on semi elective and elective cases is particularly relevant for orthopaedic surgeons as majority of orthopaedic revenues come from elective procedures.<sup>6</sup> However, one source of information that states, hospitals, and surgeons can consult is the CMS tiered approach for surgical services 2. Tiers 1, 2, and 3 designate low, intermediate, and high-acuity procedures, respectively, whereas the designations “a” and “b” indicate healthy and unhealthy patients. CMS recommends postponing all Tier-1 operations, to consider postponing Tier-2 operations, and to continue performing Tier-3 operations. Specific orthopaedic operations that are mentioned include carpal tunnel releases (Tier 1a), “hip, knee replacement and elective spine surgery” (Tier 2a), and “most cancers” and “highly symptomatic patients” (Tier 3a).<sup>7</sup> Based on these recommendations and guidelines from the Indian Orthopaedic Association it was decided to perform only emergency and urgent surgeries which included, open fractures, cauda equina syndrome, acute epidural abscesses in the emergency category and fracture neck femurs and displaced periarticular fractures which necessitated and early surgical intervention.

Surgical patients may be classified into three risk categories for COVID-19: confirmed and suspected patients, high-risk patients, and low-risk patients.<sup>11</sup> Hence these patients need to be triaged and isolated in the emergency room as was done at our centre

Antigen testing for COVID-19 is for patients with active infection but currently reported false negative rate of between 10 and 30%. However, testing is currently restricted to patients who require hospital

admission. Hence, it is pertinent to collect a throat swab of all patients for a RT-PCR COVID-19 test. The turnaround time for RT-PCR is between 6 and 24 h, and this time lag can be a challenge in an emergency situation. Ai and colleagues<sup>1</sup> report on 1014 patients who received both RT-PCR and CT in Wuhan, China, during their epidemic. They found that 97% of cases with RT-PCR-confirmed diagnoses had CT findings of pneumonia, and conclude, “CT imaging has high sensitivity for diagnosis of COVID-19”<sup>8,10</sup> Hence a pre-hospitalisation screening may be able to detect a silent case in the incipient phase.

All suspected patients who need emergency surgery need to complete COVID-19 swab test and chest CT scan before admission; pharyngeal swab sampling should be completed before surgery. Patients should be placed in the transitional area while waiting for results.<sup>9,10</sup> Hence following a throat swab and a CT, all patients were isolated on a specially designed isolation floor. Healthcare workers should strictly follow the procedures for putting on and taking off personal protective gear, and it is forbidden to wear PPEs when one leaves the contaminated area. Sanitation and disinfection need to be implemented according to the regionalised zoning.<sup>11</sup> Hence the OR was zoned in such a way that the donning and doffing procedures were segregated to different zones while maintaining a safe sterile passage.

If the patient is not already intubated but it is necessary for surgery, intubation and extubation should be performed either in a separate dedicated room for intubation/extubation, or in the operating room without the surgical team present<sup>20–22</sup>

During the surgery, all objects that come in contact with patients including blood, secretions, and excreta should be considered as potentially contaminated. In particular, medical staff in operating theatre should avoid exposure to aerosols generated while using electrosurgical equipment. There are many examples that viruses do survive in surgical smoke created by electrosurgical instruments.<sup>12</sup> Though it is not proven that coronavirus can be transmitted via surgical smoke, it may be worthwhile to take precaution until we have evidence it does not. To reduce the hazards, surgical smoke should be minimised by suction device, and electrosurgical equipment should be used at the lowest effective power. Hence every attempt was made to minimise the surgical time.

It is strongly recommended to use absorbable suture material for all wounds to prevent revisits of patients. Transparent dressing tape has been recommended for surgeons to assess soakage of wounds to avoid unnecessary dressing<sup>(13–19)</sup>.

After a procedure on a COVID-19 suspected or confirmed patient, the operating room should be left vacant, time dependent based on air changes per hour for your operating room ventilation system, while the OR air exchangers clear any airborne contaminants that may remain<sup>20–22,27</sup>.

In view of the COVID-19 pandemic, to minimise the need for early post-operative follow-up, advisories and guidelines have been issued for using absorbable suture for skin closure when possible to eliminate the need for an early post-operative visit for suture or staple removal. In cases where sutures or staples are preferred, the patients can be sent home with a suture or staple removal kit with written instructions and links for how to do it themselves. Successful removal can be confirmed via a telehealth visit.<sup>23–26</sup> In our series of patients we followed a hospital protocol of telehealth and telerehabilitation during their convalescence.

## 5. Conclusion

The times of COVID-19 pandemic has significantly altered our methodology of treating emergency and urgent cases which need Orthopaedic care. Though guidelines, protocols and advisories are evolving, it is prudent to take utmost care while treating patients with Orthopaedic conditions during this pandemic.

## Declaration of competing interest

We the Authors of this manuscript hereby state that we have no conflict of interest at any stage during the writing, analysis and Submission of this Manuscript.

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