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Post COVID-19: Planning strategies to resume orthopaedic surgery –challenges and considerations

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ABSTRACT

The Coronavirus SARS-CoV-2 (COVID-19) pandemic has had a substantial effect on the health care systems around the world. As the disease has spread, many developed and developing countries have been stretched on their resources such as personnel as well as adequate equipment. As a result of resource disparity, in a populous country like India, the elective orthopaedic surgeries stand cancelled whilst trauma and emergency services have been reorganised following Indian Orthopaedic Association and recent urgent British Orthopaedic association guidelines. Though these guidelines provide strategies to deal with trauma and orthopaedic surgery management in the present scenario, once the COVID-19 pandemic stabilizes, restarting elective orthopaedic surgery and managing delayed trauma conditions in evolving health care systems is going to be a profound task. We look at the future challenges and considerations of re-establishing trauma and orthopaedic flow during the post-COVID-19 phase and suggest an algorithm to follow (Fig. 1).

1. Introduction

With the novel coronavirus SARS-CoV-2 outbreak being highly contagious, it became clear that health care systems globally would need to evolve, develop strategies, identify new models or rejuvenate old conservative methods of orthopaedic care and thus reduce the risk of disease transmission. Managing trauma and elective surgery in India has been based on strategic recommendations provided by the Indian Orthopaedic Association (IOA),[1] British Orthopaedic Association (BOA)[2] emergency sub-speciality guidelines and Ministry of Health and Family Welfare, Government of India. However, as and when the pandemic wanes and stabilizes, a surge in orthopaedic patients is expected due to restrictions imposed by the pandemic including situations of trauma conditions which have been managed conservatively along traditional established orthopaedic principles and require a second stage corrective procedure.[3] In India, both the public and private hospitals deliver trauma and orthopaedic services. There is a shortage of orthopaedic surgeons rendering care to people in India[4] with a disproportionate surgeon to patient ratio along with lack of post-operative intensive care bed facilities.[3] However, as we look forward, orthopaedic community and public health systems in India need to consider as to how one can provide the best care for patients in the post-acute stages of COVID-19, patients with trauma who could not have proposed surgery because of non-availability of facilities locally or no possibility of reaching to the higher surgical centres due to national lockdown along with those on current waiting lists for proposed elective orthopaedic surgeries.[5,6] Currently physiological responses, mortality and morbidity in patients undergoing surgeries during the COVID-19 pandemic are still being published in literature.[7,8]

The main factors likely to hamper re-introduction of these trauma and orthopaedic surgery would be: a) staff shortages due to sickness and quarantine, b) deficient supply-chain in the surgical

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materials (consumables, instruments and implants), c) increased expenses to the patients and insurance companies for following elaborate protocols during the surgery, d) availability of suitable operating theatres, e) availability of anaesthetists, f) adequate provision of intensive care unit (ICU) beds and g) prioritize or triage non-emergency surgery according to risk-benefit ratio for the patient and community (see Fig. 1).

We highlight the challenges and considerations which we anticipate may be encountered in the post COVID-19 scenario in a resource limited public health system like India with lessons learnt which may be applied to other evolving economies.

2. Challenges and considerations

2.1. General considerations

2.1.1. Planning

It needs to be dynamic. The planning will be the key logistical challenge and will have to be supported by guidance and observations from other health care organisations like World Health Organisation (WHO), Centres for disease control and prevention (CDC),[9], Public Health England,[10] American college of surgeons[11] and National bodies of associate branches such as anaesthesia, infection control, and microbiology. These will be continually evolving and the surgeon needs to be frequently in touch with web education and news.

2.1.2. Role of ministry of health and family welfare

In India there are basically two types of hospitals; a) Public sector, and b) Private. The Public sector hospitals include district hospitals, state medical colleges (and associated hospitals), central government medical colleges (and hospitals) and autonomous institutes. All the government hospitals are governed by the central or state Ministry of Health and Family Welfare (MOHFW).These hospitals shall follow orders from the MOHFW for starting up of elective surgeries in their hospitals.[12] Autonomous government institutions like All India Institute of Medical.

(AIIMS) will also need a reference document to resume non-emergency surgeries. The MOHFW has and will have an overarching role in regulation of resumption of elective and semi-elective surgery in post-COVID-19 phase in India. They will also have to continually evolve standard operative procedures (SOP) as per feedback from elective surgery patients.

2.1.3. Indian Orthopaedic Association role (IOA)

The IOA has a pioneering role in overseeing orthopaedic surgery and education provision in India with a membership of more than 12,000 members associated with the organisation.[1] We are sure IOA will reflect on experiences of orthopaedic health care systems worldwide to provide new, updated guidance on recommendations for resuming safe elective and delayed trauma surgery.

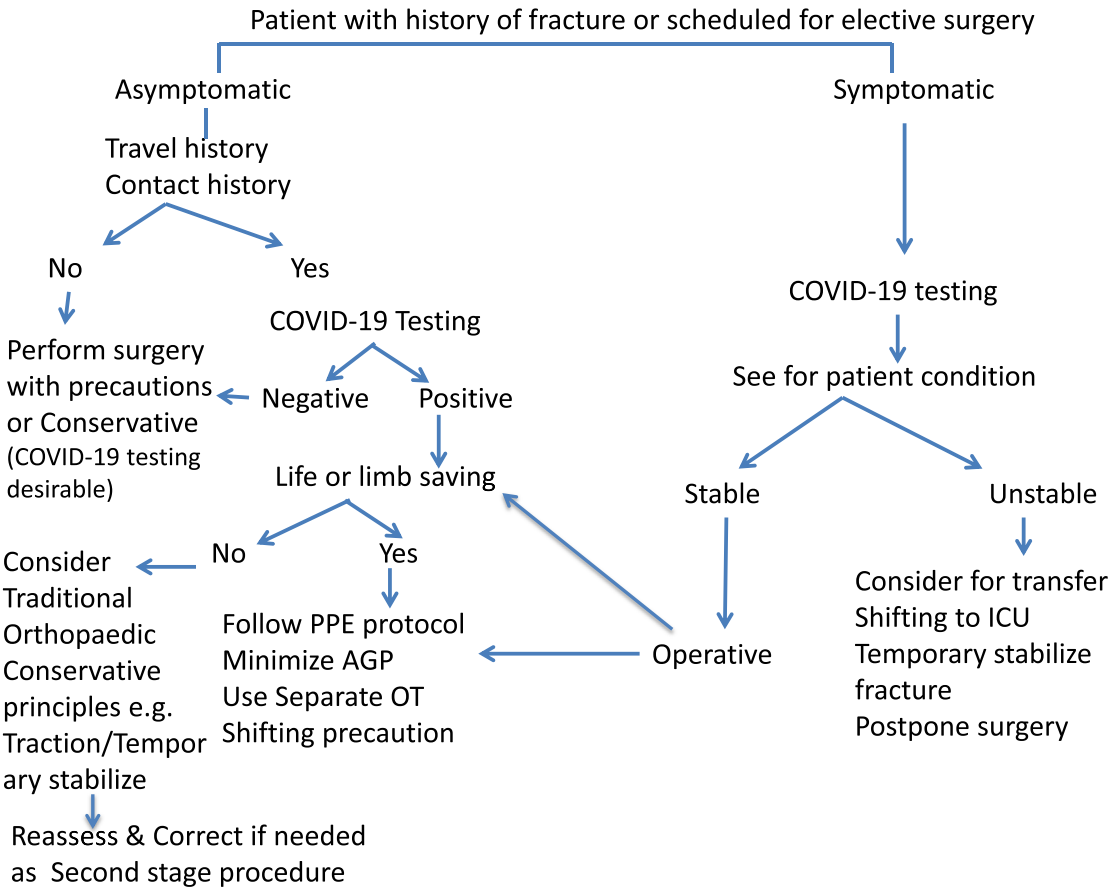

Fig. 1. Algorithm depicting planning strategy to resume trauma and orthopaedic surgery in Post- COVID-19 phase.Abbreviations:
AGP-Aerosol Generating Procedure
PPE-Personal Protective Equipment
OP-Operation Theatre
ICU- Intensive Care Unit.

2.1.4. COVID-19 testing

Patients and staff will all need to be tested prior to considering surgery in the post-COVID-19 phase. COVID-19 antigen and antibody testing SARS-CoV real time reverse transcription polymerase chain reaction (rRT-PCR) test[9] can be done to evaluate active contagion or exposure to the virus. The rapid kit tests to check the antibodies are not recommended for use in the surgical patients due to their variable results.[13]

1.5 The Government of India (GOI) has designated 235 government and 84 private laboratories across the country for testing COVID-19, as on April 25, 2020 (an updated list can be had from the website). Most of these testing laboratories are located in the bigger district places and cities. Smaller and far off states like Sikkim, Ladakh and Arunachal Pradesh are still to develop collection facilities. More testing and sample collection facilities need to be set up urgently and in house, to facilitate the detection of Coronavirus, before it is decided to start non-essential services. With Indian Council of Medical Research[14] SARS-CoV-2(COVID-19) testing updates, a logistical challenge is expected with the mobilization of national agencies to oversee and deliver the huge task of wide spread COVID-19 testing is a forethought. Clinical assessment and history of address of stay in a red zone or otherwise will assume more significance.

2.1.5. Resource challenges of rural India

A resource challenged rural India will have considerable challenges with multiple factors involved in post-COVID-19 recovery. Affordability of surgery, joblessness, economic recession will have significant impact for patients requiring surgery. Availability of implants due to international and national travel restrictions, production and price hike by implant companies due to more demand and less supply are other confounding factors. Strategies for rural COVID-19 testing facilities will need to be stepped up urgently, to facilitate the detection of Coronavirus, before it is decided to start non-essential services. Morbidity attached to surgery is still based on very little evidence; re-surgence of conservative treatment would be the trend, to balance outcomes.

2.1.6. Financial support of the government of India

Currently Pradhan Mantri Jan ArogyaYojana (AB-PMJAY) or Ayushman Bharat PM-JAY is the world's largest health insurance/assurance scheme fully financed by the GOI.[15] It provides 107.4 million poor and vulnerable entitled families (approximately 50million beneficiaries) secondary and tertiary care hospitalization across public and private empanelled hospitals in India. There are about 101 orthopaedic procedures and 12 polytrauma procedures enrolled in this scheme. Testing and treatment of COVID -19 is available for free under Ayushman Bharat. Till 24th April 2020 about 21,160 hospitals across the India are empanelled with this scheme. This undoubtedly will give some boost to the patients who cannot afford the cost of surgery but will cause more financial burden to the GOI in this dented situation. Orthopaedic surgeons will need to factor in the price of extra tests required, record keeping and Personal Protective Equipment (PPE) and as such the cost for any procedures in hospital is going to rise especially for intended surgeries.

2.2. Trauma and orthopaedic considerations

2.2.1. Timing of resuming orthopaedic surgery

As the incubation period of COVID-19 is reported to be 5–14 days it is recommended that a constant decrease in the rate of new COVID-19 cases for at least 14 days nationally or regionally in the area catered by the hospital is assessed prior to starting of elective or semi-elective procedures.[16] Timing will have to be coincided with availability and appropriate number of supportive equipment requirements e.g. ventilators, PPE and intensive care unit beds for post-operative care following surgery. Any resumption of elective surgeries or reopening of hospital should be approved by the appropriate state health authorities dealing with national COVID management action plan.

2.2.2. Delayed primary fixation of trauma strategies

The ideal timing of fracture fixation has been the subject of debate for a number of decades. As we routinely encounter that early fracture fixation is not always possible especially in hemodynamically unstable patients and with comorbidities, this probably will be compounded by the post-COVID-19 situation. In India, a delay in the definitive fixation of several fractures is delayed due to several reasons like lack of operation theatre availability, long waiting list in the public hospitals, and other operational reasons.[6] A late (>21 days) or delayed primary operative fixation of displaced fractures is a viable option for cases that presented late, with predictable, favourable results as described in many studies.[17–19] A delay to primary fixation of up to three months following injury may be acceptable[20] particularly if the outcomes in delayed surgeries are weighed against the risks of surgeries done during active COVID-19 infection and its associated complications.

2.2.3. Assessment of patients and consent

Patients currently on the orthopaedic elective surgery waiting lists will have to be re-assessed with regards to orthopaedic pathology, fitness for surgery, desire to undergo proposed surgery including revisiting informed consent. We do not know as yet what complications and physiological responses will be encountered in a post COVID-19 scenario. Hence with minimal current literature available on complications, a balanced, pragmatic approach may have to be undertaken. Robust pre-operative assessment to evaluate surgical fitness will be necessary with the aim to reduce the risk of post-operative complications with medical evaluation supported by pre-operative assessment, detect asymptomatic carriage of COVID-19 and reduce the demand for post-operative intensive care facilities.[11,21] It is the need of the hour that orthopaedic fraternity considering its high infectivity rates develop a chronological sequence of surgeries-a) surgeries which if not done in a month or so will cause impairment of limb function or make future surgery dangerous. (b) surgeries to improve lifestyle of patient and for more than one year old conditions can be withheld/deferred as of now unless patient function is seriously impaired that is he/she is bedridden/cannot walk in house also and (c) a different approach needs to be made for immunocompromised patients –diabetes mellitus, chronic organic dysfunction, on chemo/radiotherapy. It may be considered to make it mandatory for the patient to isolate himself/herself at home for at least two weeks prior to a major elective orthopaedic surgery like a joint replacement.

2.2.4. Orthopaedic resources and facilities

The concept of establishment of Non COVID-19 Care (NCC) zones and COVID-19 care zones will have to be undertaken. There may be a need to identify stand-alone hospitals, separate units on site or wards to facilitate patient admission. The biggest challenge in India will be the availability of resources including masks, gloves and PPE, operation theatre consumables, orthopaedic implants and instruments. Sufficient numbers of ventilators and high flow oxygen masks will also be required as a stand by necessity. Education of the staff is an essential tool in infection control and needs to be a multi-disciplinary approach. Education, training and change of behaviour of health care workers in accepting and adhering to changes with implementation of standard operating protocol for managing post-COVID-19 conditions will be necessary to prevent recurrence of this viral infection.

2.2.5. Screening protocols

Will have to be established. Television screens, posters on patient warning, disclosure and information need to be displayed and updated. All patients and staff will need to be screened for potential symptoms of COVID-19 prior to entering the NCC facility and staff must be routinely screened for potential symptoms. Isolation prior to surgery will be guided by infection control guidelines. Online patient registration has to be encouraged.

2.2.6. Orthopaedic theatre and staff planning

Will require guidance regarding level of PPE used during the surgery and staff training. Aerosol generating procedures (AGP) including anaesthetic induction and use of orthopaedic power tools would necessitate full PPE adornment.[22] Proper 'donning' and 'doffing' technique will need to be practiced. A separate operative theatre complex should be dedicated for the surgery involving suspected or infected patients of COVID-19 for emergency surgeries. These complexes must have separate access, the other infrastructure, and a separate exit of its own. Rodrigues-Pinto et al.[23] have given a detailed account of the surgical team flow for the orthopaedic surgery in a COVID-19 dedicated operating theatre and divided the complex into five zones: i) Entry dressing room, ii) Anteroom, iii) Operating Room, iv) Exit room, and v) Exit dressing room. These protocols must be followed as far as possible. The orthopaedic operation theatre must have a High Efficiency Particulate Air (HEPA) filter/Laminar flow with high frequency and rapid air changes, to reduce viral contamination. Minimum required number of staff and doctors must present during the surgical procedure inside the operating theatre. The orthopaedic tools and procedures which generate aerosols like drills, reamers, saw and electrocautery must be minimally or not used. The need to have covers for power tools like those currently used for arthroscopy equipment's and how to dispose the irrigating fluid without floor or personnel contamination needs to be worked out.Also the need to shift to un-reamed intramedullary nails and hand reamers and hand drills to reduce the amount of AGP may have to be borne in mind. The operating team numbers and seniority will need to be judicious. There has to be a re-enforced established plan for thorough cleaning and disinfection prior to use of operating theatre facilities for patients in the new context of COVID-19 pandemic. It would be necessary to check that equipment such as anaesthesia machines used to intubate or ventilate patients are thoroughly decontaminated as per anaesthesia society and CDC guidelines. It would be better if surgeries are introduced in a phased manner as orthopaedic surgery are as a group known to have element of high infectivity rate depending on aseptic precautions undertaken. The operating theatre (OT) list should be less in number and some OT's should be kept as substitute e.g. that is if facility has four OT, then to use two on first day, decontaminate them, seal them and use the other two OT on the other day giving each OT a 24 h decontamination rest. The COVID operating facility for high suspect/hot zone patient and COVID-19 positive patient should be separate.

2.2.7. Personal Protective Equipment (PPE)

There should be stored inventory of PPEs for at least 30 days and or a reliable supply chain. All healthcare workers and staff wear appropriate PPE. This includes full length fluid repellent gowns, appropriate respiratory masks such as Filtering Face Particle 3 (FFP3) masks or respirators, protective face and eye shields.[24] This is essential since usage of power tools e.g drills and saws along with anaesthetic intubation are AGP's. With the difficulties still being encountered in procuring PPE all efforts should be made to innovate them (e.g. intubation teams). Re-use and disposal will keep evolving as the knowledge consolidates in the world.

2.2.8. Post-operative care

Standardized post-operative protocols re-enforced following post COVID -19 assessment will allow a smoother recovery. The postoperative length of stay in the hospital must be kept to minimum required and the post-operative care (like dressing, intravenous antibiotics etc.) should be arranged at the patient's home or a guest house. Most of these operated patients can then be followed up by the surgical team through telemedicine or remote consultations (e.g. telephone or video consultation), so as to avoid their hospital visit and face-to-face interaction with the doctor and other hospital staff.[25]

Appropriate arrangements will have to be in place to evaluate common complications e.g. surgical site infection assessment and venous thromboembolism pathways probably as one stop visits to either confirm or future follow-up. The follow-up clinic setups should be separate.

2.2.9. Rehabilitation service

Enhanced recovery programmes and discharge planning will play a key role in reducing the length of in-hospital stay. Application of targeted rehabilitation at home principle identified in the pre-operative assessments may help safe and early discharge home.[26] Video based rather than direct physical training will be the forward in the future.[27]

2.2.10. Surgical audit of the operated cases

Because of the high risk of getting infection in these operated cases, a strict and regular audit of all the cases must be done on a regular basis, so as to find out the surgical and medical outcome of these patients and it would help to make future planning and decision of going forward with more cases or going backwards, depending on the outcomes.

2.2.11. Second wave preparation

A second wave was seen in both the SARS and Spanish Flu pandemics following relaxation of lockdown and containment methods. We must take lesson from these epidemics that a possible second wave can occur with COVID-19 as well.[28] So therefore we need continued vigilant and prepare for such second wave.[29] A high index of suspicion is needed to detect new cases of COVID 19, in the weeks to months following a slowdown in new cases. We need to strictly follow the policies of disinfection of surfaces and a social distancing in anticipation of a second wave of COVID-19.[30,31]

2.2.12. Opportunity in a crisis

Current experience may serve an opportunity in the post-COVID-19 phase with focus on improving pre-operative fitness for surgery, principles of remote supported discharges after surgery and 'remote consultations' like telemedicine for follow-up as key stones of future orthopaedic medicine.

3. Conclusion

Safety of the patients and the staff is foremost important while considering the orthopaedic surgery during and after COVID-19 pandemic. Therefore, the hospitals must have adequate infrastructure and resources to deal with these critical cases. An appropriate number of beds both in intensive care unit (ICU) and non-ICU, PPEs, ventilators and trained staff (anaesthetists and interventionists), peri-anaesthesia units, critical care, diagnostic imaging, and laboratory services to treat all emergency and non-emergency patients Any resumption of elective surgeries or reopening of the hospital should be approved by the appropriate state health authorities, dealing with COVID management action plan. The surgeon should assess the availability of coronavirus test

and its testing policies. The hospital should have COVID-19 testing facility for the health care workers and patients. If such testing and other facilities are not available then the surgeons must ensure first to create a safe environment in which elective or emergency orthopaedic surgery can be done. . During the peri Pandemic times, conservative management and operative treatments requiring minimal invasion and shorter surgical times should be preferred, over complex and long orthopaedic surgeries and those which are likely to generate significant amount of aerosols. There has to be significantly superior clinical outcomes of the proposed surgical procedure over the non-operative treatment to justify surgery.

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