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Review Article

Out-Patient Orthopaedic Practice amidst the Covid-19 Pandemic: A Review

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Abstract

SARS-CoV-2 is known to cause severe life-threatening respiratory disease. The virus is known to reside in mucous membranes and it is transmitted through aerosols from saliva and the respiratory droplets. As a result, the elective care was deferred in most health care facilities and emergency care was continued vigilantly. Few stringent preventive measures undertaken for combating the brisking nature of coronavirus, have brought changes not only in the COVID outbreak but also the in the epidemiology of traumatic injuries, affecting the regular orthopaedic practice. Many hospitals have been restructured to provide the best care to COVID patients, orthopaedic surgeons along with other healthcare professionals despite of their original specialities, have been serving COVID patients relentlessly on a regular basis. Therefore, a profound rearrangement of both in-patient and out-patient care.

Keywords: orthopaedic practice; occupational hazard; pandemic; covid-19; trauma; sars-cov-

Introduction

COVID-19 caused due to SARS-CoV-2 represents one of the greatest transmissible viral infection encountered by global healthcare challenges in last few decades [1-4]. The outbreak was declared as public health emergency in late January. On February 11, 2020 the infection caused by SARS-CoV-2 was officially named as COVID-19 [5-8].The infective, transmissible nature of COVID, deficit literature, lack of specific guidelines and the prevailing panic has created new hurdles for orthopaedic surgeons in managing these patients [9-12].

This pandemic has brought the need to revisit the conservative management of orthopaedic injuries back into sharp focus. However, conservative approach should be undertaken with great vigilance to minimize potential transmission of nosocomial transmission of this deadly virus. [13-15] A substantial reduction in traumatic injuries was observed, but the rate of fragility fractures remains unaltered during the coronavirus crises [16-18].

Evidence based guidance can help Orthopaedic surgeons to maintain vital functions during Out-Patient Department, adopting to appropriate preventive measures like physical distancing, offering telemedicine to needy, wearing PPE kits during evaluation of each patient, paperless prescriptions, online radiographs and file sharing. Orthopaedic surgical selection should be prioritised according to the severity: elective, urgent or emergency [19-23].Modifying surgical prioritisation is paramount to fulfil the needs of the entire healthcare system during the COVID outbreak [24].

The authors thus recommend commencement of orthopaedic practice amidst the pandemic, and each orthopaedic surgeon to follow Centres for Disease and Prevention Control Guidelines while evaluating each patient in Out-Patient Department and also in the Operation Theatres. Also lastly, the healthcare workers should be encouraged to follow proper disinfection protocols in the operatory to help combat the spread of this death-dealing virus [25-27].

Management of Patients with Traumatic Injuries and Urgent Orthopaedic Conditions Treated As Outpatients during the Coronavirus Pandemic [30]:

British Orthopaedic Association Standard for Trauma (BOAST) Protocol

a. Patients are supposed to have a prior tele-consultation, definitive decision making should be done, and not schedule for surgery without senior input.
b. If required, use facilities such as safely-spaced waiting areas. Also, there should be definitive planning of rooms for donning and doffing of the PPE kit [28].
c. Special Trauma units having trained Emergency Department staff should be meant to deliver emergency care for all patients who attend the Emergency Department with minor injuries. Timings of these ED

triage can differ according to the hospital requirements but it has to be a seven-day service [29].

d. Those patients requiring immediate management of traumatic injuries, such as dislocations, may need to remain in the Emergency Department, but the T and O teams should be able to manage them.
e. GPs and Minor Injury Units (MIU) are expected to have direct access to senior T&O through telephone in case advice is required to minimise the need for patients to attend the Trauma Clinic.
f. Initial assessment of the trauma should be done, in order to minimise repeat imaging. A mini-C arm should be arranged in the trauma clinic if possible. Use of CT scan can be minimised till the end of this pandemic since it is the investigation of choice for coronavirus pneumonitis. Teleradiology may be a better alternative for x rays, MRI and CT scan services. Entry to the diagnostic facilities in the hospital should be separate and all precautions as above in an OPD should be taken to avoid spread of infection.
g. Removable casts or splints should be preferred in order to reduce follow-up appointments.
h. Follow-up visits should be postponed unless urgently required, tele-consultation can help [31].
i. Follow-up radiographic imaging should only be performed when there is likely to be a significant change in the treatment protocol.
j. Rehabilitation services are likely to be very limited. Alternative resources such as written and web-based information should be preferred.

Patients with hip or femoral fractures require emergency operative management. If surgeons are not available for total hip replacement, atleast a hemiarthroplasty can be a better option. Further treatment protocol can be continued as per the NHSE Speciality Guide [32-33].

a. All patients with fragility fractures of the pelvis, acetabulum or lower limb, whether treated non-operatively or operatively, should be allowed to bear full weight immediately in order to facilitate rehabilitation, reduce hospital stay and thus less exposure to the coronavirus crisesp [34-35].
b. Wrist fractures should be treated with removable casts or splints to reduce follow-up visits [36].
c. For patients with Spinal Fractures, non-operative management along with bracing, can be considered [37].
d. Non-union of upper limb fractures can be treated later. On the other hand, non-union of lower limb fractures with failed implants or increasing deformity having significant impact on daily function may require urgent treatment [38].
e. Patients with infected fractures, septic arthritis, systemic sepsis, prosthetic joint infection require emergency intervention. Those patients who are not septic can be treated as out-patients in clinics and suppression therapy should be considered for them [39, 40].

Management of Specific Injuries

Dislocations of native and operated joints should be reduced in the Minor injuries unit (MIU), Trauma Clinic or Emergency department (ED) wherever possible. If the joint is stable after reduction, the patient should be discharged with appropriate follow-up.

Most upper limb fractures, including clavicle, humeral and wrist fractures, have high rates of union and can be managed non-operatively, recognising that some patients may require late reconstruction. Proximal femoral fractures also need to be taken care of [41].

Ligamentous injuries of the knee can be managed with bracing in preference to early ligament reconstruction.

Penetrating injuries (stab wounds) to any of the limbs that are clean and lack any neural connection and are neither devoid of vascular supply should be sutured in the ED, MIU or Trauma Clinic.

Abscesses in patients without systemic sepsis may be incised and drained under local anaesthetic in the ED, MIU or Trauma Clinic.

Patients with multiple injuries, pelvic & acetabular fractures with major haemorrhage, open fractures, compartment syndrome and exsanguinating injury all require emergent resuscitation and management.

Surgeons should consider alternative techniques for patients who require soft tissue reconstruction to avoid multiple operations or the need for critical care input (local flaps, intentional deformity and skin grafting for fasciotomy wounds) [42].

Consider early amputation in patients for whom limb salvage has an uncertain outcome and is likely to require multiple operations and a prolonged inpatient stay [43].

Surgeons may need to base decisions about vascular injuries on clinical assessment alone if imaging is not readily available [44-46].

Management of Patients with Hand Injuries during the Coronavirus Pandemic [30]:

The Section On Hand Injuries Is Supported By The British Society For Surgery Of The Hand (Bssh), British Association Of Plastic, Reconstructive And Aesthetic Surgeons (Bapras) And British Association Of Hand Therapists (Baht) [51-53]:

The British Society for Surgery of the Hand maintains a hand injury triage website and app, which will provide up-to-date triage & management guidance during the pandemic. Evidence-based guidance is also available from FESSH.

a) Aim for non-operative management for the majority of injuries where this is possible and safe.
b) If possible, arrange additional outpatient or minor operations space to perform manipulations and immediate surgery under local anaesthetic with application of removable splints, preferably with access to a mini C-arm used according to local rules.
c) Surgeons should aim to perform all hand and wrist surgery under local anaesthetic block or “wide-awake local anaesthetic no tourniquet” (WALANT) [47-49]
d) Appropriate plaster room with technician support and a supply of easily removable splints should be readily made available [36].
e) Use absorbable sutures and warn patients of the small risk of a mild inflammatory reaction to the sutures [50].

Consider leaving K-wires un-buried to reduce the need for an additional procedure for wire removal.

Use easily removable post-operative dressings & splints so remote follow-up may be performed by the hand therapy team [36].

Provide discharge packs for patients with dressing packs, dressings, antibiotics, analgesia, written self-follow-up instructions on wound care and where to find on-line therapy resources.

Management of children with orthopaedic trauma during the coronavirus pandemic [30]:

During the coronavirus crises, there will be increased emphasis on managing children with non-operative strategies and minimising outpatient visits. The main aim is to minimise long-term consequences by prioritising conditions that have immediate, permanent morbidity or lack a practical remedial option [54].

Surgeons should always consider the possibility of non-accidental injury. The principles of management are unchanged.

If required, children with the following suspected diagnoses can be managed without radiology at presentation:

i. Soft tissue injuries.

ii. Wrist, forearm, clavicle and proximal humeral fractures.

iii. Long bone fractures with clinical deformity.

iv. Foot fractures without significant clinical deformity and swelling.

The following injuries can be treated without a cast at the OPD:

i. Knee ligament and patellar injuries may be managed with bracing.

ii. Stable ankle fractures may be managed with a fixed ankle boot or Softcast.

iii. Hindfoot, midfoot and forefoot injuries may be managed with a fixed ankle boot or plaster shoe.

A single follow-up appointment at 4 to 12 weeks, depending on the limb or bone fractured, is required for the majority of injuries. Patient-initiated follow-up is appropriate for the following conditions [55].

i. Patellar subluxations and dislocations, knee ligament and meniscal injuries, excluding locked knees.

ii. B .Lateral malleolar fractures and suspected ankle avulsion fractures.

iii. Foot injuries, except suspected mid- and hindfoot injuries.

iv. Wrist, forearm, clavicle and humeral fractures, including proximal humerus.

v. Gartland type 1 and 2 supracondylar fractures.

Non-Operative Management

Many children's injuries can be effectively treated with a cast at the OPD. Wherever required, use reinforced Softcast for home removal:

1) Extra-articular tibial fractures without neurovascular or soft tissue compromise. A small number of these patients may require intervention:

i. Admit if high risk of compartment syndrome (adolescent or high energy injuries).

ii. *Consider sedation for reduction of clinically important deformity.*

iii. Accept that residual deformity or malunion may require corrective surgery.

2) Displaced wrist fractures in children aged under ten years.

3) Undisplaced ankle and forearm fractures.

4) Gartland types 1 and 2 supracondylar fractures.

Operative management: Day-case surgery [55].

Most children who require operative management may have surgery as a day-case:

a. Reduced joint dislocations.

b. Fractures with abnormal neurology or soft tissue compromise that is resolving after treatment.

c. Peri-articular fractures.

d. Extra-articular femoral fractures in children aged under six years (spica cast).

e. Displaced forearm fractures.

Management of Obligatory Inpatients

Few patients require inpatient treatment with anaesthesia and operative management:

a. Open fractures *(consider wash out with windowed cast).* [36]

b. Septic arthritis and osteomyelitis with subperiosteal collection.

c. Femoral fractures in children over the age of 6, can be stabilised better operatively.

d. Displaced articular or peri-articular fractures, including Gartland type 3 supracondylar fractures and acute slipped upper femoral epiphysis. [55]

Management of Children with Non-Traumatic Orthopaedic Conditions during the Coronavirus Pandemic [30].

Emergency conditions (require review or surgery within 24 hours):

- Non-accidental injury (Any child abuse case should be referred immediately to child protection services according to standard local guidelines)
- Suspected septic arthritis/osteomyelitis (osteoarticular infection should always be considered as a differential diagnosis in a febrile child and not be assumed that this is due to COVID-19)
- Children with new neurological dysfunction or limb ischaemia (including suspected compartment syndrome) require immediate intervention.

Urgent conditions (require review or surgery as soon as possible and within 72 hours):

- Suspected Slipped Upper Femoral Epiphysis (unless associated with sudden onset leg pain and difficulty weight-bearing, requiring emergency admission).
- Severe pain, which is not responding to standard analgesia.
- Exposed metalwork from previous surgery.

Time-dependent conditions (require review or surgery as soon as possible and within 4-6 weeks):

- MDT directed, suspected bone or soft tissue malignant tumours and suspected aggressive benign bone tumour.
- DDH Suspected cases and those currently undergoing harness or plaster immobilisation.
- CTEV Currently undergoing cast treatment.

Time-dependent conditions (require review or surgery as soon as possible and within 3 months):

- DDH Primary open reduction.
- CTEV Initial management including tenotomies.
- Limb length discrepancy/malalignment already undergoing treatment.

Non-urgent conditions (require review or surgery beyond 3 months but as soon as normal service resumes): [56-58].

All patients under routine paediatric orthopaedic clinic review, including:

i. DDH (secondary joint reconstruction)

ii. CTEV(Late presenting or relapsed)

iii. Corrective surgery for established deformity

iv. Reconstruction for established joint instability

v. Planned metal-ware removal

Need for telemedicine??

The World Health Organization defines Telemedicine as "The delivery of health-care services, where distance is a critical factor, by all health-care professionals using information and communications technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and the continuing education of health-care workers, with the aim of advancing the health of individuals and communities."

A telemedicine visit has the advantage that it can be conducted without exposing the staff to COVID, and thus reducing the risks to both health care workers and patients. [59-61]

Brisking Nature of Sars-Cov-2 Virus: Need for Rescheduling Aerosol Generating Procedures

Coronavirus has striking feature of cross-species transmission through droplet nuclei, and hence proved hazardous to the mankind. It is presumed to spread directly via infectious respiratory droplets of the infected individual or even close contact. Direct or indirect transmission of infected droplet nuclei could pose the host to the risk of developing a viral disease [62-65].

The SARS-CoV-2 is not capable of causing any infection without a carrier. [66] Incubation period of COVID-19 is 2-14 days. Respiratory droplets are produced during coughs, sneezes, airway health procedures, laryngeal intubation, or even by talking. Droplets carry infectious particles directly from the respiratory tract of the infectious agent to host susceptible mucosal surfaces. [67] The size of the droplet has traditionally being defined as >5 µm. The sizes of the droplets determines the maximum distance reached: largest droplets, between 60 and 100 microns, totally evaporate before spontaneously falling 2 m away. [68] For respiratory exhalation flows, the critical factor is the exhalation air velocity: these droplets are carried more than 6 m away by exhaled air at a velocity of 50 m/s (sneezing), more than 2 m away at a velocity of 10 m/s (coughing), and less than 1 m away at a velocity of 1 m/s (breathing) [69]. Varian et al 2003 found that with the SARS outbreak that occurred during 2003, the risk of acquiring the droplet-spread virus correlated with the distance to the patient [70].

As a result, viremia in patients with asymptomatic or confirmed positive COVID-19 patients could pose a risk of transmissibility to the entire team of orthopaedic surgeons during Aerosol Generating Procedures [15, 71, 72].

Opd infrastructure usage:

Only 50% OPD rooms should be utilized in a day. Every day when OPD is finished the hall, toilets and rooms should be sanitized with 1:9 dilution of 5% concentrated liquid bleach,[73] solution and should be kept shut for the following day while the nest set of OPD rooms are utilized for the next day. A thorough cleaning is advised twice a day. Fogging is no longer recommended. Gloves and face shields should be disposed of in a red bag and disposable masks, gown, gloves and respirators in a yellow bag after use [74, 75].

In OPD waiting area hand hygiene station should be installed, television screens should be installed to educate the people regarding signs and symptoms of COVID-19, hand hygiene, how to wear mask, maintaining social distancing, prevention and treatment of coronavirus, do's and don'ts and other health education videos. The OPD waiting area should have minimum furniture and instruments and that too should be adequately spaced [76].

It is necessary to convert OPD air conditioner into a non-circulatory system this can be done by blocking off the return air vents of the air conditioner; and placing HEPA Filters in the OPD section as well as in other operatory. Air conditioners in OPD: Stagnation of air should be avoided. Exhaust fans should be used everywhere if possible. Installation of separate ac units (window/split) in each room/chamber if possible. Central air conditioning to be avoided, ensure >12 air changes per hour if central air conditioning being used. HEPA (High Efficiency Particulate Air) Filters should be installed everywhere in the operatory [77].

Patients are requested to go to the appointment with minimum ornaments. At the entrance of the operatory, the patient must wear shoe covers, disinfect the hands with hydro alcoholic solution. Minimum of 2 meters of distance is advocated between 2 patients. The correct hand disinfection procedure with hydro alcoholic solution is as follows: a) Apply a squirt of sanitizer in the palm of hand, b) Rub hands palm against each other, c) Rub the back of each hands with the palm of the other hand, d) Rub palms together with your finger interlaced, e) Rub the back of fingers with the opposite palms, f) Rotate thumbs in the other hand, g) Do a circle on palm with finger clasped, h) Once dry, hands are safe. The same procedure is performed for washing hands with soap and water [78, 79].

The cloak rooms in the OPD waiting area should be properly sanitized with 1% hypochlorite solution after every patient visit, and so should the drinking water facility by maintaining adequate social distance. The PPE for sanitary cloak room cleaning is disposable rubber boots, gloves (heavy duty), along with a triple layer mask [80].

Diagnostics and Prescription [81].

The prescription and diagnostic test ordered may be paperless (as far as possible) with prescription emailed to the patient or sent by an app and to the hospital laboratory services. As the x rays & diagnostic films can be the source of infection and hence it should be avoided. The hospital should have or develop a server/Picture Archive and Communication System (PACS) so that imaging and investigative procedures are available online to the surgeon. Tele radiology is advised for x rays, MRI and CT scan services.

Patients should be given health facility number in case of emergency and should be encouraged for teleconsultation for future appointments. This all requires developing or updating an integrated hospital computer network with a fast server-broadband, robust secure bandwidth, enabling access to the patient investigations done in the hospital.

Pharmacy in house should follow the same precautions as OPD and PPE recommended for pharmacists is triple layer medical mask, latex examination gloves and frequent sanitization over gloves.

Two trolleys and wheelchair duly sanitized by 1% hypochlorite solution (a minimum 1 min contact time has been recommended by CDC for surface decontamination) with hospital attendant (PPE as above since they may have to bring unscreened patients from the vehicle and be the first contacts) should be kept ready at the gate behind temporary glass/plastic partitions for non-ambulatory patients.

Dressing and Injection Room

The dressing room should be sanitized vigilantly, can be fumigated every night, each table should have disposable waterproof bed sheets, floor and table sanitized after each patient visit, the instruments and dressing autoclaved on time. The surgeons should wear a PPE as at entry and patients should wear a gown and cap besides mask [82].

The healthcare professionals in charge should ask the patient appropriate history and sanitize patient's hand. All surgeons should wear PPE kits and

sanitize themselves and operatories with 1% hypochlorite bleaching powder after every dressing. Intraarticular, soft tissue and perineural steroid injections should be avoided, whenever possible during the COVID-19 pandemic to reduce the risk of reduced immunity to viral exposure [83].

Fracture clinic & plaster room

During the COVID era, more number of patients will be treated conservatively; the number of plaster applications and removal will be more. All un-displaced fractures of the upper or lower limb should have proper plaster of Paris cast application and visit at the expected fracture union time. They should be instructed about the cast precautions to be followed. Fractures that require reduction, are advised to be treated conservatively, follow-up visits for the same should be kept at 3-5 days for children whereas 7-10 days for adults. The follow-up imaging should be carried out only if it is likely to make a significant change to the treatment plan. Next visit should be planned at 4-6 weeks for children and 6-8 weeks for adult, and then at the time of fracture union (thus a total of 3/4 hospital visits in displaced and 2 in un-displaced fracture are required).

Virtual fracture clinic assessment (VFC) can be a better option for all ambulatory trauma cases visiting to the emergency department and were screened by a trauma consultant. VFC reduces follow-up visits [84].

Stable spine fractures may be immobilized in a readymade spinal brace and spinal precautions explained. They may visit at 6-8 weeks at follow-up if need be and then at fracture healing. Unstable/spine fractures may require operative management. Interim teleconsultation can be done when necessary. Relatively non-urgent plaster-like congenital talipes equinovarus cast can be avoided or delayed for long. Although guidelines are not specific the British Orthopaedic Association has confirmed with NHS England that uses of a Plaster cutting cast oscillating saw is not considered an 'Aerosol Generating Procedure' if used safely. The survival of the COVID-19 virus on casting materials has not been proved. It is advisable to prefer methods which won't require the use of plaster saw for removal like removable splints, POP Slab and braces. POP should be the favourite material and fiber-resin cast may be avoided as they will need cutting with plaster cutting saw though a slab of synthetic material may be used. Warm water should be readily available for faster cast setting, the container holding it should be adequate in number and rinsed with a bleach solution after every plaster, or better it should be applied after wetting the POP bandage directly from faucet/tap. The paramedical professional standing out at the operatory can alert regarding the type of plaster advised by the doctor enabling him to be ready with raw materials before a patient visit.

Cast Removal

As cast removal (both with and without a saw) is not considered an Aerosol Generating Procedure, the Personal Protection Equipment (PPE) for cast removal should be recommended for patient encounters within 2 meters. The guidelines states that for both COVID positive and COVID negative, the plaster technician should wear Mask, (fluid resistant IIR type); Single-use apron and gloves & Protective eyewear. A POP cast can also be removed after soaking in water and unwinding. The use of cast shears should be preferred oversaw. The removal of plaster should be done after donning of aforesaid PPE, a sharp, heavy-duty, efficient plaster blade should be preferred for faster removal of cast and the Operatory system should have a suction mechanism to suck all cast-dust. The plaster room should have HEPA Filter, a sanitation worker who sanitizes (1% hypochlorite solution for at least 1 min contact time) after every plaster and changes the disposable bed sheet. All dressing and pop are disposed of as per local biomedical waste norms after being sprayed by bleaching powder solution [36, 85].

Conclusion

SARS-CoV-2 caused COVID-19 is undoubtedly a deadly-virus affecting all parts of the world in less period of time. Extensive testing (Rt-PCR), a proactive tracing along with isolation of the affected patients will help diminish rate of spread of the virus. Thus, the authors recommend BOAST (British Orthopaedic Association Standard for Trauma) Protocol to be followed in managing patients with orthopaedic injuries during the Coronavirus crises. Amidst the pandemic, Out-Patient Orthopaedic practice is carried out swiftly by orthopaedic surgeons in unwavering manner.

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