

SHORT COMMUNICATION

ORTHOPEDECS DURING THE COVID-19 EPIDEMIC. LITERATURE REVIEW

ORTOPEDIA W CZASIE EPIDEMII COVID-19. PRZEGLĄD PIŚMIENICTWA

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ABSTRACT

Orthopaedics during COVID-19 pandemic does not seem to stand on the front line of fight against the virus. It is, however, important part of health care system in every country, apparently facing currently major challenges. This paper is aimed at reviewing available literature and recommendations related to orthopaedics during COVID-19 pandemic. Major issue for the orthopaedic surgeon is increased risk of infection both for patient as well as medical personnel and increased risk of related complications. The paper summarizes recommendations based on scientific data and regulations issued by state institutions, national and international societies. Recommendations have been developed for outpatient clinics, surgical units, safety measures for operated patients as well as returning to performing regular elective surgery.


Keywords: Covid-19, coronavirus, orthopedics, traumatology

STRESZCZENIE

Ortopedia w walce z pandemią COVID-19 nie jest na pierwszej linii frontu. Jest jednak istotną częścią systemu służby zdrowia w każdym kraju. W obliczu pandemii musi stawić czoła różnym istotnym problemom. Praca jest przeglądem literatury zawierającej dane naukowe oraz rekomendacje dotyczące ortopedii w obliczu pandemii COVID-19. Głównymi problemami pracy ortopedy jest zwiększone ryzyko infekcji u pacjenta i personelu oraz zwiększone ryzyko powikłań operowanych pacjentów. Praca zawiera zbiór rekomendacji na podstawie danych naukowych, regulacji instytucji naukowych, towarzystw i narodowych. Rekomendacje dotyczą przyjmowania pacjentów w poradni, leczenia operacyjnego (także zabiegów planowych), zachowania środków bezpieczeństwa operowanych pacjentów oraz wskazówek dotyczących możliwego planowania stopniowego powrotu do wykonywania zabiegów operacyjnych ze wskazań innych niż pilne.

Słowa kluczowe: Covid-19, koronawirus, ortopedia, traumatologia

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Orthopaedics is not on a front-line of a fight against COVID-19 pandemics. Yet it is an important part of health service in every country, and must face many important issues (Adhikari *et al.* 2020). Early experiences from Wuhan, China, showed 20–40% of mortality rate among patients hospitalized due to bone fractures (Lei *et al.* 2020, Mi *et al.* 2020, Rodrigues-Pinto *et al.* 2020, Visvanath *et al.* 2020, Zou *et al.* 2020). There are also problems with increased COVID-19 morbidity among operated patients, especially those of aged population. One of the reasons for this is the decreased immunity, but also hospitalisation, bed rest and immobilisation. There is increased risk of developing complications of cardio-respiratory system. COVID-19 infection is real danger in such patients. In Lei *et al.* (2020) research, 44% out of 34 elective surgery patients in Wuhan needed ICU therapy afterwards. Patients were mainly older with pre-existing conditions, and also ones who undertook extensive surgeries. Twenty-one percent of them died, mainly due to ARDS, shock and cardiac rhythm abnormalities. Most of infections occurred during hospitalisation. In Mi *et al.* (2020) research it occurred to 7 out of 10 patients, and mortality rate was 40%.

During pandemic, access to advanced therapies and intensive care for orthopaedic patients can be significantly limited. Looking at Italy's example, hospital bed occupation is an additional medical system burden, compromising bed availability for COVID-19 patients. On the other hand, orthopaedic patients, even during pandemic, need medical and rehabilitation services. With heavy burden on medical system and suspended elective procedures, this help is severely compromised. Some patients with injuries (i.e. rotator cuff) face health deterioration and irreversible damage due to current pandemic, and a lack of proper medical care.

In their report, Liang *et al.* described their experiences of orthopaedic surgery in Singapore during pandemic (Zhen *et al.* 2020). They based their operation planning on the

following rules: clinical urgency, patient and healthcare personnel protection and conservation of healthcare resources. It has been decided which procedures will continue, and which can be postponed. All major, not urgent, elective surgeries, ones that require prolonged hospitalisation (3–5 days), have been postponed, i.e. spinal deformity, paediatric orthopaedics and arthroplasty. The later were considered too risky in the presence of COVID-19 infection danger, also taking in account older age of patients and pre-existing conditions. It has been decided to carry on with urgent procedures, the same way as during regular workflow for example in case of tumours and fractures. Decisions regarding all non-urgent procedures were based on balance between providing regular medical service and containing pandemic spread. same-day procedures were still allowed (less than 23 hours of hospitalisation, due to lesser risk of being infected. This included arthroscopies (shoulder, knee, ankle) and simple soft-tissue surgical procedures or removing implants. The authors also defined several other recommendations:

- prolong periods between follow-ups in order to avoid unnecessary contact and crowding
- patients would be triaged, checked for COVID-19 symptoms and have temperature checked before visit in a clinic
- all healthcare personnel need to wear adequate Personal Protection Equipment (PPE) and undergo rigorous hygiene procedures at each patient contact
- using full personal protection PPE during operations (goggles, face shields)
- minimalizing number of personnel
- fast procedure preference
- healthcare personnel should social-distance as much as possible in and out of workplace
- COVID-19 infected patients separation and using negative-pressure surgical wards
- rescheduling non-urgent older patients appointments
- using technology, where possible (telemedicine, telerehabilitation, remote education).

Authors also mentioned importance of interdisciplinary and team work, leadership, empathy and creativity.

Scope of orthopaedical surgeries reduction during pandemic is a controversial issue. Sarac *et al.* published a review of regulations adopted in United States (2020). In 30 states issued guidance regarding the discontinuation of elective procedures. Sixteen states defined “elective” or which procedures should continue. Four states explicitly allowed trauma procedures. In 4 states issued guidance against arthroplasty. In 10 states allowed continuation of oncological orthopaedic procedures. It was advised to heed recommendations of the American College of Surgeons (ACS) to postpone or cancel all elective procedures (ACS 2020). Another US agency Centers for Medicare & Medicaid Services (CMS) established priorities for surgical procedures to life-saving procedures, serious cases and to avoid further deterioration (Centers 2020). Responsibility for decisions lies on state and local authorities, but ultimately, also on physicians. CMS:

- suggest that the following factors to be considered as to whether planned surgery should proceed during pandemic
- current and projected COVID-19 situation in the region
- availability of telemedicine for control and monitoring
- supply of PPE, number of personnel, beds, ICU beds, respirators
- urgency of the procedure
- risk of serious complications.

CMS also established 3-tier system for procedures, taking into account: procedure urgency, patient health status, location. Tier-1 procedures should be postponed (i.e. carpal tunnel syndrome). Tier-2 procedures also should be considered for postponement. They include non-urgent surgeries (i.e. spinal surgeries, knee / hip replacements). Tier-3 procedures should not be postponed due to their high urgency (traumatic injuries, limb threatening vascular surgery).

Sarac *et al.* (2020) cited Ohio Hospital Association recommendations not to operate anyone not fulfilling following criteria:

- threat to patient’s life if procedure will not be performed
- threat of permanent dysfunction of an extremity or organ
- risk of metastasis or progression of oncological disorder
- fast worsening of symptoms.

American Academy of Orthopedic Surgeons (AAOS) advises to respect CMS and ACS recommendations (Guy *et al.* 2020). Broadly speaking, recommended procedures to carry on include fractures and trauma injuries that may lead to loss of function (including nerve and ligament injuries), infections, malignant tumours, pathological fractures. Procedures that are recommended to be postponed include:

- chronic afflictions
- injuries with preserved function or loading ability
- malunion
- benign tumour
- degenerative chronic changes (i.e. tennis elbow, De Quervain Syndrome).

Todd Schmidt also prepared a decision diagram recommended by AAOS (Schmidt 2020).

Prada *et al.* published a scoping review of best practices and recommendations (until 11.04.2020) in peer-reviewed articles identified by search of MEDLINE, EMBASE, major public organisations (World Health Organization, American Center of Disease Control, AAOS, American and British orthopaedic societies) (Prada *et al.* 2020). Aim was to find evidence-based recommendations. Authors found limited amount of data about pandemics. They used articles describing procedures to limit risks of complications and mortality. The authors found 72 eligible publications. Most of them based on expert’s opinions and clinical experience. Only 5 (7%) were evidence-based. Based on eligible material analysis the authors main recommendation

is to cancel elective procedures during medical system preparatory for pandemic, but they also noticed, that some of the health systems continue with elective procedures. Risk of disturbing health system needs to be evaluated in case of widespread pandemic. In such a case there needs to be an alternative plan if situation in the region worsens, like in case of Singapore, where running elective procedures is pandemic situation dependent. In case of heavy, but still controllable burden (code orange) it is possible to continue with trauma, oncology and same-day procedures. But with pandemic burden overwhelming ability to control the situation (code red) – advice is not to continue same-day procedures. The authors created a list of recommendations based on review of literature. General recommendations include:

- maintaining safety of a patient and healthcare personnel
- applying hygiene and social distance (personal and institutional)
- washing hands, avoiding handshaking, limiting visitors, PPE, testing for COVID presence, cleanliness of surfaces (operating wards, tables, phones, equipment)
- separation of people with COVID symptoms
- telework (non-clinical)
- recommendations for healthcare personnel
- surgeons have to constantly verify pandemic situation development, protocols and knowledge – national, system-level, regional, hospital institutions, knowledge bases
- work in only one facility
- clear leadership
- rotating teams (i.e. work for 1–2 weeks and 2-week isolation in between rotations)
- surgeons need to be prepared for non-orthopaedical duties.

Tele-healthcare should be used where possible:

- with patients (tele-visits, tele-rehabilitation)
- for personnel management (tele-conferences)
- for education (e-learning, VR)

<https://www.youtube.com/channel/UCRswDorrHU5w5KaGraEA93Q>

The authors also created specific recommendations for orthopaedic outpatient clinics:

- patient triage with COVID infection symptoms and underlying risk factors
- reducing inter-patient contact
- reducing number of patients, more time between consultations, reducing consultations frequency, cancelling or postponing non-urgent visits
- definitive diagnosis and treatment plan during an initial consultation
- using best possible diagnostic imaging from beginning, avoiding tomography (needed for COVID-19 diagnostics)
- preference for non-operative procedures

They also advised for limitation of follow-up visits frequency and prioritise ones to check early healing wounds, control of bone fracture reposition, to assess healing-related complications, potential weight-bearing status change, imaging, if significantly changes management.

Separate set of recommendations were issued for the most controversial issue, namely, elective surgical procedures. The authors advise to establish a decision process for each institution based on available data, so clear criteria can be established. Decisions regarding non-urgent procedures should be reviewed by a committee comprising of surgeon, anaesthetist and a nurse. Following criteria should be met:

- documented advantage of operative over non-operative treatment
- risk-gain assessment
- status of patient (age, underlying conditions)
- tissue damage status and procedure urgency
- pandemic status in the region
- resources availability: PPE, beds, personnel, ventilators).

Gathered recommendations for surgeries, that should be postponed (non-traumatic, non-oncologic) include:

- arthroplasty due to chronic degenerative conditions
- spinal surgeries: spinal disc herniations (laminectomy, fusion)
- fractures > 4 weeks old that do not lead to loss of function
- chronic, neurologic compression syndromes (i.e. carpal tunnel)
- chronic pain of shoulder and elbow with retained function
- foot and ankle procedures other than fractures and Achilles tendon ruptures
- chronic inflammatory and tendonitis of the hand

There's no doubt that urgent procedures should be prioritized. To reduce risk of COVID-19 infection, surgeries should be planned as same-day procedures. (upper extremity simple fractures, child fractures). Non-operative treatment should be prioritized. Some of the procedures could be administered in the Emergency Department i.g. joint dislocations, suturing, abscesses drainage.

Different degrees of urgency has been defined. Procedures considered as "emergent" include:

- open fractures
- compartment syndrome
- exsanguinating injuries
- spinal fractures with neurologic compromise
- septic arthritis, prosthetic joint infections

Definition of other "urgent" procedures is not very clear. In this group, the authors mention closed fractures that may lead to loss of function of permanent disability if left untreated for more than 30 days.

All procedures should be well planned and performed in a single stage. Limb amputations should be considered if chances of limb salvage are low. If multi-stage procedure is to be adopted, patient should be released between stages to reduce risk of hospital infection. Recommendations regarding peri-operative concentrate on anaesthetic and surgery procedures. Regional anaesthesia should be utilized when appropriate. If a general anaesthetic is

the only option, intubation require special safety precautions:

- full PPE (FFP2 masks)
- only anaesthetic personnel allowed during intubation / extubation
- time to enter operating ward for the rest of the personnel – minimum 15 minutes
- for COVID-19 infected patients – separate operating ward.

During operation it is advisable to avoid creating aerosols. There need to be smoke evacuation in case of using electric knife, or suction pump during cauterisation. Operating room personnel should be careful in order not to be injured by any sharp object. Assisting personnel number should be kept to minimum. Also number of visitors, sales representatives should be reduced to minimum in the facilities. Personal hygiene should be utmost priority.

Post-operative dressing and splints should be easily removable to allow remote follow-up visits.

After finishing surgery, when general anaesthesia were performed, patient have to be extubated in the operating room to safely transport patient out of operating theatre, so non-operating personnel doesn't need to use advanced PPE. COVID-19 suspected, or COVID-19 symptomatic patients should wear FFP2 masks during transport.

Operating room needs to be disinfected very thoroughly and ample time needs to be allocated for this procedure (intervals between surgeries). All PPE and clothes should be undone before leaving operating room.

Same authors published revised review with modified recommendations mostly by adding indications towards gradual return to performing elective surgeries (Prada *et al.* 2020). Authors mentioned lack of clear data, however recommended supporting the decision by:

- local status of epidemic
- availability of tests
- clear protocol of testing, e.g. all elective cases vs. selected indications

- execution of protective procedures
- availability of resources (beds, ventilators, ICUs)
- prioritization of particular procedures
- before restoration of elective surgeries, assure high standard of safety and quality of medical care.

In our institutions, we decided to create a COVID-19 knowledge base, where we are gathering following information:

- lists of our adopted procedures, that are regularly modified
- Covid-19 statistics resources, allowing monitoring pandemic development and forecasting (planning subsequent surgeries)
- recommendations and links to other institutions and medical resources
- list of selected scientific literature regarding COVID-19 in orthopaedics.

All these resources can be publicly accessed at: www.rehasport.pl/covid

In conclusion we are in unprecedented period, never before experienced in modern medicine on a global scale. Most of procedures and recommendations are being created ad-hoc in individual medical units. On one hand COVID-19 related knowledge is still small, on the other – we are experiencing huge increase in number of related publications. Our experience grows steadily, so recommendations can change, sometimes daily. We need to follow scientific publications. Many periodicals and science search engines created separate channels of information for COVID-19. Scientific communities, foreign and national (i.g. Polish Shoulder and Elbow Society – www.ptbl.pl) publish their recommendations and help gather scientific knowledge. It is important to share our recommendations and procedures for well-being of all our patients and ourselves.

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