Management strategies for pediatric burns during the COVID-19 pandemic

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Global health is under threat due to the ongoing outbreak of the coronavirus disease 2019 (Covid-19) [1]. The pandemic has brought serious challenges to public global health, and to medical and research communities [2].

As part of coping with and reducing virus spread, many countries announced that all nonessential and non-urgent elective surgeries and medical treatments were postponed until further notice. This policy freed health systems to focus their workforce and other resources on crucial treatments for Covid-19 patients.

Even though pediatric cases are a minority of all Covid-19 patients (~ 2% worldwide [3]), their presentation is atypical and might be confusing. Therefore, any patient in the Burn Department should be a suspect Covid-19 carrier until proven otherwise, and should be managed carefully by employing specific strategies [4]. Furthermore, the pediatric patients’ escorts are even more suspect.

During the Covid-19 pandemic we noted an increase in pediatric burn cases, especially from domestic accidents. Therefore, we decided to establish an outpatient pre-hospital clinic as an intermediate "station", in order to triage pediatric burn patients into those who present at our hospital, and those treated via telemedicine [5].

Our institution is a dedicated pediatric tertiary care center, the only one of its kind in the Middle East, with a max COVID of 73 positive patients during the first surge, which significantly raised later unfortunately. The center performed many operations on COVID+ patients.

The pediatric burn unit, as part of the surgical array in our institution, is in daily coordination with the hospital's incident command system (ICS). The logistics array, para-medical array and nursing array are shared. We are also supported by the pediatric intensive care unit (ICU), which addresses strategic considerations. All the resources including personnel are coordinated and synchronized. Daily discussions deal with assessment of the hospitalization capacity, the need for operating rooms, the need for personnel treating in COVID departments and the need for equipment. Burn care priorities needs are taken into account by the incident command in their decision-making.
In order to better understand the burn injury trends we conducted a retrospective study based on retrieving information on all burn cases that presented at our pediatric medical center Emergency Room (ER) during the quarantine, and compared them to cases during the same time period in the previous two years (2018-2019). We found that compared to 2018-2019, time from injury to presentation in the ER was longer, more patients were hospitalized (4.5% vs. 2.6%), and there was a predicted increase in indoor injuries, a lower rate of superficial 2nd degree burns, and higher rates of 1st degree and 3rd degree burns.

Our main strategies when treating pediatric burn patients were:

1. To ensure adequate treatment despite pandemic constraints.
2. To avoid infection of patients and their escorts by staff members or vice versa, resulting from treatment.

In order to optimize pediatric burn treatment during Covid-19, we recommend these tactics:

1. Environmental
   a. Hospitalization
      i. The same escort should stay with the pediatric patient throughout the hospitalization period, with no entries or exits.
      ii. The Burns Department and Burn Intensive Care Unit (ICU) should be divided into clean, potentially infected and infected areas; separations should be strict and clear.
   b. Outpatient (clinic, rehabilitation center, wound treatment center, scar treatment center)
      i. Pre-hospital visit at our intermediate "station".
      ii. One escort per patient.
      iii. Body temperature and epidemiological screening of the patient and escort before entrance.
iv. Division into clean, potentially infected, and infected areas with strict separation.

2. Patient Management
   a. Hospitalization
      i. The pediatric patient and escort must have a Covid-19 test prior to hospitalization.
      ii. Medical staff is limited per patient. Thus, the goal is to assign a staff member to a specific patient, to prevent multiple staff-patient contacts.
      Burn treatment might be highly contagious due to intensive washing and wound dressing [6].
      iii. Vital signs (body temperature, pulse, respiratory rhythm, blood oxygen saturation) and suspicious symptoms (general muscle pain, fatigue, loss of appetite, cough, dyspnea, etc.) should be observed and monitored.
      iv. Burn patients who are hospitalized for long periods of time should be examined by a dedicated nurse using a projected examination, in order to reduce medical staff exposure.
      v. The psychological state of patients and their parents is assessed, since due to isolation they are prone to anxiety, anger, fear, loneliness, sleep disorders and more.
   b. Outpatient (clinic, rehabilitation center, wound treatment center, scar treatment center)
      i. Changing burn wound dressing: after guidance and training, the escort should do this alone on a daily basis at home. Our health medical
organization team is available daily online for questions via telemedicine.

ii. The type of dressing should be easy to use. Single layer and gel dressings are preferred over multiple layers. Dressings that can be replaced every few days are preferred over single day use.

iii. Rehabilitation: Consultation and instruction by the medical staff should be available online on a daily basis via telemedicine.

3. Medical staff management

a. Health management

i. No public transportation: hospital arranged special transportation for staff.

ii. Daily health status self-monitoring.

iii. Personal history of COVID-19 contact, if existent, reported to the epidemiological unit.

iv. In cases of possible infection: strict quarantine, including psychological assessment due to isolation.

b. Preventive care

i. The staff is divided into teams who do not meet each other and work separately, such that if one member is infected, that team and no other medical staff enter quarantine.

ii. Meetings were via video-conference instead of face-to-face.

iii. Personal protective equipment including gloves, medical masks (i.e., N95 or FFP2 standard or equivalent), goggles or a face shield, and gowns; and for specific procedures, also respirators and aprons [7].
4. Surgery and bedside procedures

a. Only necessary and unpostponable procedures and surgeries are performed.

b. Bedside procedures such as central line insertion, escharotomy and airway management, are performed with minimum staff and wearing full personal protective equipment, as detailed in section 3.b.ii.

c. Minimal staff members are present in the room during airway handling.

d. All patients are tested for Covid-19 before the operation. Until receiving the test results, patients are isolated with one escort.

e. Operation room Covid-19 guidelines are followed (droplet isolation or airborne precautions, and contact isolation) [8][9]; appropriate personal protective equipment must be worn by all, as detailed:

   i. Contact isolation- gloves and disposable gowns.

   ii. Droplet isolation- medical mask and eye protection (face mask or goggles). Disposable equipment is used (blood pressure cuffs, pulse oximeters, thermometers). Airborne precautions- in all aerosol-generating procedures (manual ventilation before intubation and bronchoscopy, tracheal intubation, non-invasive ventilation, tracheotomy, cardiopulmonary resuscitation), the following are employed: gloves, long-sleeved gowns, eye protection, fit-tested particulate respirators (N95 or equivalent, or higher level of protection). Negative pressure rooms with a minimum of 12 air changes per hour or at least 160 L/second/patient in facilities with natural ventilation are used.
f. Patients who tested positively for COVID-19 or whose COVID-19 status is unknown, are transferred directly to the ICU instead of through the recovery room.

To summarize, pediatric burn treatment is not simple in normal times; all the more so during a pandemic time such as due to Covid-19. Our data show that the time from injury to presentation was longer than usual. We assume that patients and their escorts were afraid of the hospital visit, especially the ER, and therefore waited longer before arriving, or tried home treatments. Therefore, it is important to have a good regulation system of prevention and care, including the tactics described above (environmental, patient management, medical staff management, and surgery).

In our department, we achieved our goals: we had no infections among staff, patients, or escorts.

A higher proportion of patients was hospitalized during the pandemic (4.5% in 2020, compared to 2.6% and 2.0% in 2019 and 2018, respectively). However, the length of stay was similar to routine periods, the surgery rate was similar to that of the same month in previous years, and the length of follow up until healing, defined as no more need for bandaging, was similar. We assume that these factors reflect treatment quality, which was not affected, due to the use of telemedicine, and that our treatment standards were maintained.
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