

Successful treatment for a 90-year-old female with severe perineal and buttock burns and concomitant COVID-19 pneumonia: A case report and literature review

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Abstract: Elderly patients infected with the novel coronavirus disease 2019 (COVID-19) are prone to experience a severe or critical type with more serious and even life-threatening clinical manifestations which are difficult to manage. If the infected elderly patient sustains burns to anatomically special sites, the management will be demanding and stressful since the patients are at higher risk of developing severe complications such as infection, shock and multiple organ dysfunction. This report reviewed and analyzed the clinical manifestations, diagnosis and successful treatment of a 90-year-old female sustaining severe perineal and buttock burns with the comorbidity of COVID-19. A general principal, i.e., 'care for COVID first while stabilizing burn-related conditions' for treating patients of this kind is introduced and recommended.

Keywords: Burn; COVID-19; Pneumonia; Elderly

1. Introduction

Elderly patients infected with the novel coronavirus disease 2019 (COVID-19) tend to present more clinical symptoms and are at higher risk of developing a severe or critical type, for which advanced age and underlying conditions are the two main risk factors [1]. Buttock burns often involve anal and perineal injuries, making the patient susceptible to bacterial infection and thus require special considerations in the treatment plan [2]. This study reviewed and analyzed the clinical characteristics and management of a 90-year-old patient with severe perineal and buttock burns and concomitant COVID-19 admitted to our burn department, in hopes of strengthening clinicians' understanding of the comorbidity to facilitate more timely and accurate diagnosis and treatment plans and avoid any delays or mistakes due to misdiagnosis or missed diagnosis.

2. Case presentation

A 90-year-old female patient was hospitalized with the presenting complaint: "hot water scald on the perineal and buttock for 6 days". After the injury, the patient self-applied medicine at home, and later experienced fever, redness and swelling of the wound with abnormal secretions.

The patient's COVID-19 antigen and nucleic acid test was positive upon admission. Her body temperature was 38°C, respiratory rate fluctuated between 20-22 bpm, SPO₂ fluctuated between 91-93% without supplemental oxygen, and 96%-98% with oxygen therapy at a flow rate of 3L/min. Whether auscultated at anterior or posterior chest, the patient had normal breath sounds in upper lungs. However, when the sites of auscultation moved to the basal fields, coarse breath sounds were identified in the right basal lung, and diminished breath sounds were identified in the left basal lung. The patient sustained 5% TBSA full-thickness burn involving perineal and buttock. The burn wound was covered by necrotic tissue, and redness and swelling with abnormal secretions (Figure 1).



Figure 1: The wound of the patient at admission.

Laboratory tests showed a leukocyte level of $15.0 \times 10^9/L$, neutrophilic granulocyte percentage of 81.7%, serum albumin of 26.3 g/L, Ca^{2+} of 1.82mmol/L, procalcitonin of 0.233 ng/ml, and D-dimer of 919 ng/ml. The chest X-ray image showed double pneumonia, mainly in the left lung and small nodules in the left lung (Figure 2A). The following diagnoses were made: 1) 5% TBSA full-thickness burns on perineal and buttock; 2) COVID-19 infection; 3) pneumonia; 4) hypoproteinemia; and 5) hypocalcemia.

Due to COVID-19 and double pneumonia, surgical procedures had to be postponed. While stabilizing burn-related conditions, we cared for COVID-19 first. On the third day after admission, the patient developed high fever, rapid respiratory rate, shortness of breath, and dyspnea. In the resting state, the patient's SPO_2 was lower than 90% without supplemental oxygen.

Regarding COVID-19 status, we took the following treatment measures: Firstly, conventional oxygen therapy and atomization inhalation. Inhalation of budesonide (1mg, 2/day) and N-acetylcysteine (0.3g, 3/day) were administered. Secondly, prone positioning. Guided the patient to maintain prone position, and gradually increased the prone position time. Discharging sputum with machine vibration allowed respiratory secretions to move along the main bronchus, thus improving the ventilation perfusion ratio. Thirdly, the use of dexamethasone. Dexamethasone intravenous injection 5mg/day, for 5 days. Fourthly, supportive treatment. Normal hemoglobin, albumin and globulin levels were maintained by intravenous infusion of red cell suspension, plasma, human blood albumin, and human immunoglobulin. Fifthly, nutritional support. Daily nutritional requirements were calculated, and the enteral nutritional emulsion TPF-T (500ml/day, 650kcal) and enteral nutritional powder TP (55.8g, 3/day, 753.3kcal) were added in addition to three meals. Last but not the least, complications prevention. Because the patient was bedridden for a long time, we guided the patient to perform active and passive lower limb exercises, and used the air wave pressure therapy apparatus to perform segmental massage of both lower limbs to prevent the formation of deep vein thrombosis. We repeated the PCR test for COVID-19 was negative on the 9th day after admission. On the 16th day of hospitalization, the chest X-ray image showed that double pneumonia was significantly relieved (Figure 2B).

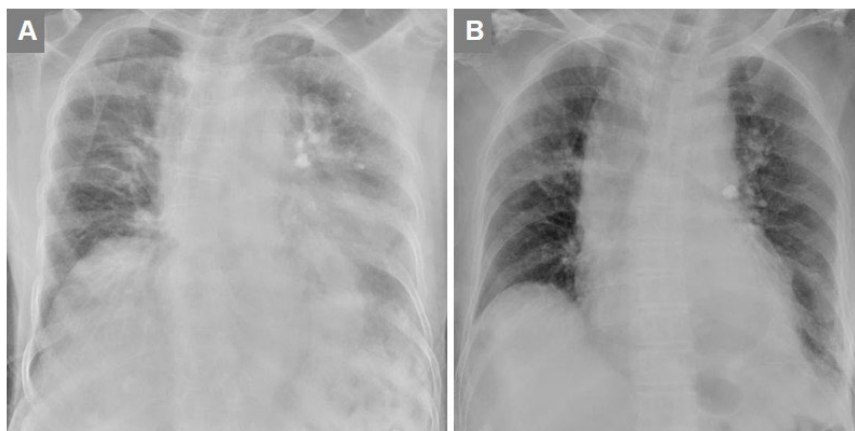


Figure 2: Chest X-ray. (A) On the admission day. (B) On the 16th day of hospitalization.

Regarding the burn wound, 1% iodine (6/day) was used to keep the wound dry, and its application to the wound resulted in a very low surface bacterial count. On the 8th day after admission, the eschar began

to separate, and yellow secretions could be seen under the eschar (Figure 3A). Its separation was hastened by daily debridement of the loose and easily removable tissue with scissors and forceps, application of wet gauze dressings changed two to three times daily. Before skin coverage can be obtained, the eschar must be completely removed and the wound appropriately prepared (Figure 3B). The results of wound bacterial culture were: enterococcus faecalis (+), morganelia mosani (++) , and pseudomonas aeruginosa (+++). Sensitive antibiotics (meropenem and linezolid) were selected for anti-infection treatment, and the infection indexes gradually decreased to normal levels. The wound was covered with split-thickness skin grafts taken from back regions under epidural anesthesia on the 22nd day after admission (Figure 3C). After the surgical procedures, the patient's condition began to gradually improve.

During the hospital stay the multidisciplinary team included burn surgeon, respiratory specialist, infectious disease specialist, anaesthetist, nursing specialist, and physiotherapist. The hospital stay was 45 days, and before discharge all wounds were healed (Figure 3D). The blood oxygen saturation remained at the normal level without supplemental oxygen, and the patient had no discomfort such as shortness of breath or dyspnea. The follow-up visits were scheduled with burn surgeon, and the patient was able to walk with assistance.

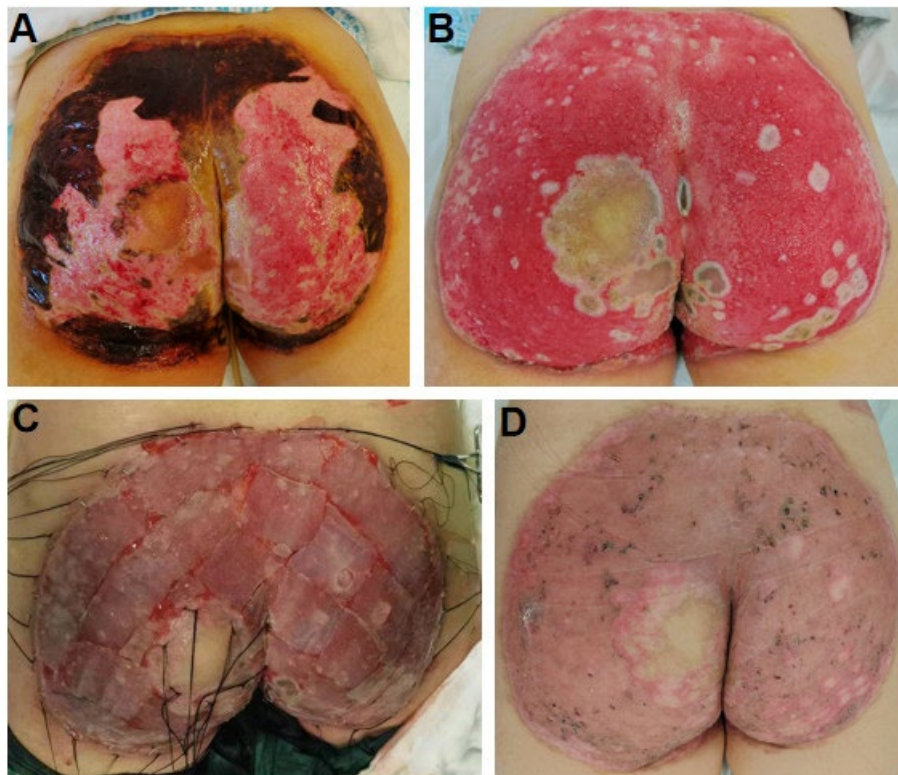


Figure 3: The burn wound. (A) The eschar began to separate. (B) The eschar was completely removed. (C) The wound was covered with split-thickness skin grafts. (D) The wound were healed before discharge.

3. Discussion

Case series have identified age as an independent prognostic factor for mortality of COVID-19, and national registries have shown a high mortality rate among patients older than 80 years [3]. Previous studies have shown that older adults seem to have a higher proportion of severe cases of COVID-19, and the proportion of older patients with fatal respiratory diseases such as acute respiratory distress syndrome (ARDS) and respiratory failure is significantly higher than that of other age groups [4]. These findings are consistent with a higher susceptibility to the infection and severe clinical manifestations observed in older adult patients.

The age is factor that induces the modification of immune response [5]. One of the crucial attributes of an aging immune system is a chronic low-grade pro-inflammatory state, and this state is greater in female than in male subjects [6]. This fact could be influenced by both the physiological aging process

and, especially, the greater prevalence in older adult patients of frailty and comorbidities [7]. Immune-aging is strongly linked with a suboptimal innate immune response to viral pathogens, and contribute to a decrease in functional reserve that reduces intrinsic capacity and resilience and hinders the fight against infections [8].

The clinical manifestations of the older patients are mainly upper respiratory tract infection symptoms such as cough, sore throat, fever and fatigue. In addition to the above symptoms, the elderly may also have digestive system symptoms such as diarrhea, nausea and vomiting [9]. After COVID-19 infection, this 90-year-old female patient developed fever, fatigue, cough, and then shortness of breath and wheezing. Blood oxygen saturation decreased progressively. The chest X-ray image showed double pneumonia, which would threaten her life if not treated in time. Therefore, under the guidance of the diagnosis and treatment plan for COVID-19 [10], we strengthened atomization inhalation, prone positioning, use of dexamethasone, nutritional and supportive treatment, and complications prevention. Finally, after two weeks of admission, the patient's double pneumonia was significantly relieved. After three weeks of admission, the patient's pneumonia subsided and her general condition was stable. No symptoms of shortness of breath or dyspnea occurred again, and her blood oxygen saturation remained at normal level.

With age, senescent cells accumulate in the skin and spread the aging phenotype to neighboring cells, resulting in decreased thickness, regenerative capacity, and a barrier effect in the skin [11, 12]. In most cases, the wound of the elderly is deeper than that of the young after scald. The elderly patients move slowly, and have decreased self-care ability. The perineal and buttock wounds are close to anus, which are susceptible to bacterial infection due to improper care. In this case, the patient self-applied medicine at home, and later experienced fever, redness and swelling of the wound with abnormal secretions. After admission, in order to prevent aggravation of the wound, we first adopted prone or lateral position for the patient. Then catheter was placed to avoid urine contaminating the wound, and perianal cleaning care was strengthened. Due to the pneumonia caused by COVID-19 infection at the early stage, surgical procedures had to be postponed. The early surgery had high risk, such as high risk of anesthesia, poor tolerance of operation, large operation area, excessive bleeding, and graft necrosis, etc. The risk control requires effective perioperative preparation and the selection of appropriate surgical opportunity, which not only stabilizes the condition, but also avoids causing a second blow to the wound. Therefore, under the general principle of "care for COVID-19 first while stabilizing burn-related conditions", eschar preservation was performed on the wound at the first week, followed by bedside debridement and dressing change two to three times daily. Skin grafting was performed to seal the wound after the eschar was completely removed and healthy granulation was formed. Due to the advanced age of the patient, previous infection COVID-19 and double pneumonia, the risk of general anesthesia is relatively high, and the postoperative extubation may be impossible. Therefore, after discussion with the anesthesiologists, we finally decided to fully cover the wound with split-thickness skin grafts under epidural anesthesia, and MEEK skin graft was used in the donor site. In this way, the skin survival rate is improved, the operation time is shortened, the intraoperative bleeding is reduced, and the risk of surgery is reduced. In terms of the selection of the skin donor site, since the patient was mostly in the lateral or prone position, we preferred the back skin donor site. 1:6 MEEK skin was grafted in the skin donor site, which not only accelerated the healing of the donor site, but also avoided the formation of new iatrogenic wound. Finally, all the skin grafts survived, the wound was successfully healed, and the patient recovered and was discharged from hospital.

4. Conclusions

The elderly infected with COVID-19 are at higher risk of developing a severe or critical type because of immune-aging. If the infected elderly patients sustain anatomically special sites burns, a general principal, 'care for COVID first while stabilizing burn-related conditions' is introduced and recommended. We need to develop personalized treatment plans based on the characteristics of elderly patients to improve clinical efficacy and reduce mortality.

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