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Review Article

Burn care strategy in the covid-19 pandemic: a narrative review study

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Abstract: Introduction: The COVID-19 pandemic has changed the world and intensified health management in many parts of the world. Sensitivity in burn patients' care and prevalence of COVID-19 have a major impact on this group's healthcare system and infection control strategies. The purpose of this study is to review burn care strategies during the COVID-19 outbreak. Materials and methods: The present study is a narrative review study. In writing this paper, to access information, the keywords of Coronavirus, COVID-19, burn, strategy, care, and SARS were used. Due to the emergence of COVID disease, searches in Science Direct, PubMed, Scopus, Web of Science, Google Scholar, SID, Magiran, Springer, and Elsevier databases were performed without time limit. Research articles were purposefully selected and approved to be investigated based on the criteria for entering the research. A total of 14 articles had a full text related to the research scope. The researchers used qualitative content analysis to analyze the data. Data analysis was conducted as a comprehensive review of articles, qualitative conclusions, and results. Results: In this study, 14 articles related to burn care strategies in the COVID-19 epidemic were selected. Their results were reviewed in two areas of staff care strategies and burn patients during the COVID-19 outbreak. Findings indicate that appropriate prevention and protection strategies and measures should be followed to prevent the transmission of the COVID-19 virus to burn care professionals. In addition, burn patient care strategies were proposed in two levels of minor and moderate to severe burns, so that patients with burns receive adequate burn care during the COVID-19 outbreak. Conclusion: Implementation of staff and burn patient care strategies during the COVID-19 pandemic is essential to treat burn patients and prevent the spread of the COVID virus.

Keywords: Care, burn, COVID-19

Introduction

COVID-19, which is a global concern, is a viral pandemic with high transmission rates. At the time of writing this paper, more than 100 million patients were affected by this virus, and more than 2 million deaths were caused by it [1]. Furthermore, burn is a major public health problem and is the main cause of approximately 180,000 deaths annually [2]. There is burn risk in the home as people quarantine themselves at home to prevent the spread of the COVID-19 virus. Most burns are seen in children and the elderly prone to severe COVID-19 infection [3]. In this disease, involvement of several organs occurs due to the functional capacity of the viral receptor. It is then associated with the following consequences: increased inflammation, vascular leakage, acute lung injury, systemic and pulmonary hypertension, blood coagulation, cardiovascular and gastrointestinal complications. A history of illness or trauma may potentially exacerbate clinical complications like burn injuries [4, 5]. Multiple organ failure is common in people with severe burn injuries. It is most likely due to hypermetabolic/catabolic state and excessive microvascular permeability, leading to hemodynamic instability and immune system dysfunction. Accordingly, such patients are prone to infection, sepsis, persistent systemic injury, and worsening clinical manifestations [6].

The susceptibility of people with burns to the COVID-19 virus is not specified. They are prone to infections, including respiratory viral infec-

tions [7, 8] due to a weakened immune system, destruction of the first line of defense, special diet, use of various medications, and burn-related complications such as chronic liver and kidney failure. The burn is considered an acute disease associated with many systemic disorders, particularly blood coagulation [9], which is also a major complication in patients with COVID-19 requiring attention and efficient management [10].

Sensitivity in the care of burn patients and prevalence of the recent epidemic of COVID-19 have a major impact on the healthcare system and infection control strategies in this group of patients [11]. Burn care professionals may also become infected with the COVID-19 virus when exposed to infected individuals [12]. By reviewing the articles, the authors found that several principles of burn care during the COVID epidemic were stated in each of the articles. Therefore, this study was conducted to introduce comprehensive principles of burn care during an epidemic, considering the importance of burn treatment and prevention of COVID-19 disease.

Materials and methods

The present study is a narrative review study. In writing this paper, to access information, the keywords of Coronavirus, COVID-19, burn, strategy, care, and SARS were used. Due to the emergence of COVID disease, searches in Science Direct, PubMed, Scopus, Web of Science, Google Scholar, SID, Magiran, Springer, and Elsevier databases were performed without time limit. Research articles were purposefully selected and approved to be investigated based on the criteria for entering the research: being relevant to the research purpose, having a structured research framework, availability of the full text of the article, and being written in Persian or English. A total of 14 articles had a full text related to the research scope. A summary of the articles is provided in **Table 1**. The researchers used qualitative content analysis to analyze the data. Data analysis was conducted as a comprehensive review of articles, qualitative conclusions, and results. Two researchers independently of each other performed all stages of the research method, including search, review of articles, extraction of required data, and qualitative evaluation, and finally they agreed upon the results by holding a discussion.

Results

The papers' results were identified in two areas of care strategies for staff and burn patients during the COVID-19 outbreak. During the COVID-19 epidemic, most healthcare systems have focused their approach on disease control. Key strategies include measures to prevent the spread of the disease through social distancing, the use of personal protective equipment, testing, and quarantine of patients, which have had a significant impact on burn services around the world. Given the potential risks of COVID-19 transmission, infection control measures are important to protect burn-injured patients and healthcare workers while providing care [13].

Burn staff care strategies

All medical centers, including the burn center, must follow the rules and regulations to prevent the disease spread [14]. The goal should be to provide safe care for patients and to maintain the burn team's safety in order to maintain the health system's capacity given the virus transmission risk [15]. Burn care specialists are committed to providing high-quality care with the best therapeutic outcomes for patients [16]. Burn care professionals may become infected with the COVID-19 virus when exposed to infected people during the COVID-19 pandemic. COVID virus transmission occurs at all diagnosis and treatment stages in burn wards, public places in the hospital, operating rooms, burn intensive care units, and outpatient clinics [12]. If burn teams are not adequately protected against virus transmission during the COVID-19 outbreak, health systems' capacity to provide the necessary care is diminished [16].

Physical and psychological care of burn specialists is highly important during the COVID-19 outbreak. Mandatory rest and leave for burn care professionals should be considered. However, rest care burn specialists should not travel abroad to return to work if the number of patients with COVID-19 increases. To avoid the pressure of work on employees, they can be divided into different groups. Psychological care is also essential to prevent anxiety and burnout of Burn Care Specialists [12, 16].

Proper protection measures are extremely important to prevent the transmission of the

Table 1. Abstract of articles

Row	Researcher	Title	Row
1	Kumar, S et al.	Burns and COVID-19	Burn patients and health care workers are affected by Covid-19. Effective screening of patients and healthcare workers and proper segregation of patients with negative and positive Covid 19 test is essential to reduce infection transmission.
2	Saha, Sh et al.	Managing burns during COVID-19 outbreak	There is a risk of transmitting the Covid-19 virus to burn patients and staff. Safe and necessary measures should be taken in dealing with patients with negative and positive burns.
3	Kleintjes, WG et al.	A literature review of the urgency of burn victim escharotomy and fasciotomy and an algorithm for management during the COVID-19 pandemic	Emergency surgery and fasciotomy mustn't be delayed during the Covid-19 pandemic.
4	Al-Benna S	Protective Measures for Burn Care Professionals during the Corona Virus Disease 2019 Pandemic	Burn care in burn patients with positive and negative Covid-19 test is very important to reduce infection risk and protect them.
5	Toh, VV et al.	Management of COVID-19 in burns patients	Evaluation by a multidisciplinary team and protective equipment is important for patients and staff during burn care delivery.
6	Rogers, AD et al.	The Impact of COVID-19 on Burn Care at a Major Regional Burn Center	Introducing a new and user-friendly e-mail service will increase clinic nurses' and burn surgeons' access despite reduced face-to-face visits.
7	Al-Benna, S et al.	Availability of Information from National and International Burn Society Websites	Constantly providing new information on burn patient management during the Covid-19 outbreak, emphasizing safe practices for patients and caregivers, helps burn care professionals make the right decisions about their patient care.
8	Hesami rostami, M et al.	A case series of concomitant burn and COVID-19	Severe burns concomitant with COVID-19 may complicate clinical and nosocomial manifestations. Careful precautions should be taken in burn units.
9	Huang, Z et al.	Occupational exposure to SARS-CoV-2 in burns treatment during the COVID-19 epidemic	Implementing effective protection and developing protocols can increase healthcare workers' protection and reduce the risk of exposure to the Covid-19 virus.
10	Nischwitz, S et al.	Burns in pandemic times	An interdisciplinary committee of surgeons, specialists, and nurses should be formed to prioritize the measures taken.
11	Jiang, N et al.	Experience in the treatment of burn patients combined with inhalation injury during the epidemic of coronavirus disease 2019	During the Covid-19 epidemic, burn patients should be treated under appropriate protection by physicians and nurses.
12	Keshavarzi, A et al.	Cutaneous Vesicular of COVID-19 in Two Burn Patients	Careful management of the burn is an important step in preventing and controlling the epidemic. Protection and isolation of patients and family members are essential to prevent the spread of epidemics in burn wards.
13	Soltani, A et al.	Burn management during the COVID-19 pandemic	It seems necessary a precise management strategies in each burn center to control the prevalence of COVID-19.
14	Ryan, C et al.	COVID-19 pandemic and the burn survivor community: A call for action	Preparations for rehabilitation and meeting the psychosocial needs of burn patients should be ongoing.

COVID-19 virus to burn care professionals [12]. All healthcare workers should be trained in personal safety, screening, and training in new courses in infection prevention and control [15]. All members of the treatment team should be familiar with video tutorials and personal protective equipment. Based on the COVID-19 test capacity, burn team members should be weekly screened to prevent transmission of the disease by asymptomatic healthcare staff in hospitals [9, 15]. Even all healthcare workers can be screened regularly, and a suspect tested using a questionnaire. In case of staff infection and positive test reports, they are allowed to work in the department two weeks after the quarantine period [17]. All staff should be trained in protective equipment, hand hygiene, standard precautions when changing burn dressings, proper disposal of patient waste, gloves, hats, eye protection, and medical masks. All patients and their families should be given medical masks and trained in hand hygiene and respiratory etiquette to protect staff [17].

Burn patient care strategies

These strategies include measures for minor, moderate, and severe burn levels. A clear distinction between patients who need ongoing care and patients who can be treated on an outpatient basis is needed to reduce the number of patients in the hospital [14].

Minor burn level measures

Minor burns and uncomplicated wounds in burn patients should be daily managed to minimize the risk of exposure to patients and burn care professionals [12]. Minor burns involving <10% of the total body surface area (TBSA) are not normally admitted to the hospital and can be easily managed at home. Information on the treatment of small area burns should be provided to patients and their relatives [18]. Burn clinics should advise patients with minor burns in administrating first aid by cooling the burn with water for 20 minutes followed by a clean dressing at home. Professional guidance for such patients can be provided through remote counseling using video calls [15]. Patients can access clinic nurses and burn specialists with new e-mail services; however, formal clinic visits are significantly reduced and are mostly virtual [19].

Measures for moderate to severe burns

These measures include procedures performed when patients are hospitalized. Treatment for moderate to severe burns may take a long time; therefore, treating any patient in an emergency is a cautious outbreak [15]. Patients with burn injuries should be transported to the nearest burn hospital to control their burn injuries [12]. The hospital should have adequate isolation facilities, appropriate personal protective equipment, and the ability to diagnose and manage burn patients in the event of the COVID-19 outbreak. During the COVID-19 pandemic, patients who do not require emergency surgery are admitted to the emergency department in a separate room and treated as COVID-19 suspects. After screening patients for COVID-19, patients with a negative test can be transferred to a general room in the department [12]. All patients and their caregivers present in the emergency department should have their temperature checked upon arrival at the hospital [15].

An interdisciplinary committee of surgeons, specialists, and nurses should be established to prioritize the measures taken. Mouth and nose masks for patients and staff should be used regularly. Safety distances must be maintained, and sufficient personal protective equipment must be available [14]. Healthcare workers should observe a safe distance in the process of intravenous catheter placement, endotracheal intubation, mechanical ventilation, wound healing, and surgery, which are the highest risk points for exposure to the COVID virus [20]. All healthcare specialists should be familiar with the symptoms of COVID-19 and minimize their contact with body fluids in burn patients [12]. Fasciotomy should be performed immediately after diagnosing compartment burn syndrome and should not be delayed due to fear of the global COVID-19 epidemic [21]. Non-surgical treatment, including rapid enzymatic debridement, should be performed as much as possible to significantly reduce the use of burn surgery and improve the ability to cope with the COVID-19 pandemic and acute and severe deficiencies in blood products due to reduced blood donation [12].

Patients with burns are prone to pulmonary edema due to systemic inflammatory response syndrome and dehydration, which can be seen as multiple, small, spotted, and interstitial changes on the chest. It may be similar to the initial chest imaging findings of patients with COVID-19, and the clinical diagnosis of the two diseases may not be easy. Therefore, lung CT and routine blood tests should be accompanied by clinical signs and an epidemiological history for new patients admitted to the emergency department [20]. Thromboembolic complications are commonly observed in patients with severe burns and patients with the COVID-19 virus, leading to serious complications. Moreover, loss of large amounts of fluid in burn injury leads to liver damage and increased ALT and AST levels as a common complication having a similar pattern to other COVID-19 patients. Therefore, burn patients with a positive COVID-19 test need careful monitoring and follow-up [18].

Surgical and intensive care capacities should be significantly increased, and elective surgeries should be performed that may be life-threatening [12, 14]. Before surgery, examination, routine tests, lung CT, and screening for COVID-19 should be performed based on clinical and epidemiological symptoms [18]. In confirmed or suspected cases of COVID-19, surgical intervention is minimized if possible [20]. Strict adherence to emergency protocols for patients with suspected or confirmed COVID-19 should be applied and isolated in a single room

during hospitalization. Protective measures should be observed during and after the operation and dressing change, and all surfaces should be disinfected and sterilized in strict accordance with the protocol [20].

The intensive care unit (ICU) that manages a patient with COVID-19 positive should be separated from the burn ICU that manages burn patients, since the immunodeficiency nature of the disease makes them more sensitive. Burn patients with a positive COVID-19 test should be kept in an isolated room for 14 days, after which they can be transferred to the ward according to their condition [15]. It is best to reduce the duration of gatherings in clinical decisions, including shift delivery; all aggressive steps should preferably be performed in a room with negative pressure and full standard precautions. Nursing personnel should reduce their aggressive measures, such as sputum suction and lavage without disrupting the treatment process [15].

The frequency of dressing changes is appropriately reduced according to the level of wound seepage and the healing stage. Surgery time should be minimized as much as possible, and the operating room should be used with negative pressure. If such a room is unavailable, it should be listed as the last item or sufficient time (about 30 minutes) between cases for complete room air exchange [15, 18]. The staff and equipment should be kept to a minimum in the operating room, and all ward staff should use the recommended protective equipment. The room should be disinfected for more than two hours after surgery. The hospital's infection control team should test surface and air sampling in the operating room after disinfection. Patients' body temperature should be monitored at least three times daily after surgery. Wound infection should not be evaluated solely based on blood test results and body temperature for patients with COVID burn. It should be noted that fever is caused by the COVID-19 virus or burn wound infection [12]. The number of caregivers in contact with the patient should be limited to one or two and they should be screened for COVID-19. Visitors should only meet via video through the remote viewing system [18].

Discharge should be performed after surgery to reduce cross-infection in the hospital for patients with a negative COVID test [12]. Rehabilitation measures should be delayed, and in the case of discharge and follow-up, patients should meet the criteria for healing a burn wound and coronavirus. It is best to quarantine for a few days after hospitalization. Patients can have their dressings changed after discharge at an outpatient clinic to prevent transmission of the infection at the time of admission to the hospital. Follow-up after discharge can be remotely carried out using telephone counseling. The use of web-based video consultations or smartphones for rehabilitation counseling reduces the need for frequent follow-up and referrals. Performing remote physiotherapy as one of the basic components of burn care can be a safe and appropriate way to perform social distance [15, 22]. Severe burns with COVID-19 may complicate clinical manifestations [23], and patients with burn injuries may even experience fear and anxiety [18, 24]. Quarantine and limited ability to interact may exacerbate post-traumatic stress disorder (PTSD) and depression and prevent wound healing. Additionally, burn survivors are prone to social isolation associated with burn wounds, body image, stress symptoms, and depression that require emotional support [18].

Pain management is one of the most challenging aspects of treating burn patients. Effective pain management leads to the best results in burn wound healing, anxiety control, and rehabilitation, which should consider burn patients' physical, emotional, and psychosocial aspects. Acetaminophen and nonsteroidal anti-inflammatory drugs are the main pain management for burn patients, being similar to pain management in patients with COVID-19 [18].

Discussion

This article aimed to gain an insight into and knowledge about the principles of care for burn patients during the COVID-19 epidemic. This review also identified care strategies in the two areas of burn patient care and burn staff care. Key strategies included first aid training for minor burns, rapid and accurate screening of patients according to COVID-19, frequent screening of hospital staff, assessment of fever or other respiratory symptoms during hospitalization with continuous clinical supervision, use of personal protection in all wards with appropriate social distancing, isolation of potentially

infected patients, non-contact with burn wound discharge, and reduction of the hospitalization period for burn patients. Given the positive effects of these strategies on burn care (mental and physical care), these measures should be taken in all burn centers. These strategies increase the level of protection for healthcare workers and patients and reduce the risk of exposure to COVID-19 infection and the accumulation of patients with superficial burns. In all studies, the positive effects of the measures were discussed.

Conclusion

COVID-19, as an acute respiratory disease, poses many challenges to healthcare systems worldwide. Having insight and implementing accurate burn care strategies is essential to control the prevalence of COVID-19, since any inpatient or outpatient patient in the burn ward is a source of COVID-19 infection, and the risk of infection is very high for burn patients and staff. Thus, burn centers must maintain a necessary balance between providing the best patient care and limiting the prevalence of COVID-19.

Disclosure of conflict of interest

None.

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