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Early tangential excision and skin grafting in major burns

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ABSTRACT

Wounds are a form of tissue damage to the skin caused by directly contact with a heat source, the result of medical action, or changes in physiological conditions. Wounds cause disturbances in the function and structure of the body's anatomy. The body has a physiological response to injury, which is in the form of a wound healing process. This type of research is a case study conducted on Mr. MI, male patient and 38 years old. Techniques for analyzing and handling cases were employed as a family medicine approach. The case diagnosis was a deep dermal/full thickness burn (degree 2-3) with a 28% TBSA e.c flame which was classified as a severe degree burn. The patient experienced primary and secondary trauma management. Fluid resuscitation was administered using the Parkland formula. Wound care was performed by tangential excision, followed by covering the STSG. The patient went home with an improved condition after 3 days of treatment. His prognosis is generally good, but with the risk of functional limitations in the burn area.

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INTRODUCTION

Wounds are a form of tissue damage of the skin caused by directly contact with a heat source, the result of medical action, or changes in physiological conditions. Wounds cause disturbances in the function and structure of the body's anatomy (Guo et al., 2016; Laidding et al., 2020; Sukmawati, 2018). The body has a physiological response to injury, which is in the form of a wound healing process. The process consists of various complex processes to restore network integrity. During this process, blood coagulation, acute and chronic inflammatory responses, neovascularization, cell proliferation to apoptosis, which are mediated by various cells, cytokines, matrices, and growth factors occur. Burns are a form of tissue damage or loss caused by contact with heat sources such as fire, hot water, chemicals, electricity, and radiation. Burns are a type of trauma with high morbidity and mortality that require special management from the start (shock phase) to the advanced phase. Burns can be caused by exposure to fire, either directly or indirectly, for example as a result of being splashed with hot water which occurs in many household accidents. In addition, exposure to high temperatures from the sun, electricity or chemicals can also cause burns (Seswandhana *et al.*, 2021).

In wounds that penetrate the epidermis, there is damage to blood vessels that cause bleeding. Initially, there is local vasoconstriction of the arteries and capillaries mediated by epinephrine, norepinephrine, and prostaglandins to help stop bleeding. For the next process, there is a process of hemostasis which requires the role of platelets and fibrin. When blood vessels rupture, the clotting process will start from the stimulation of collagen against platelets. It will undergo aggregation mediated by fibrinogen protein and von Willebrand factor to close capillaries (Greenwood, 2017; Kitala *et al.*, 2016). Furthermore, a cascade of coagulation factor activation occurs with the final form in the form of fibrin threads that serve as a framework for endothelial cells, inflammatory cells, and fibroblasts. Besides the fibrin, fibronectin also helps in cell attachment and regulates the movement of various cells into the wound. The fibrin-fibronectin framework binds cytokines produced during injury and acts as a store of these factors for the healing process (Josh *et al.*, 2021; Laidding *et al.*, 2020).

Burns can heal spontaneously with the help of epithelialization (Burns *et al.*, 2020; Laidding et al., 2021). These burns are divided into epidermal and superficial dermal burns (Lumintang *et al.*, 2021). Epidermal burns affect only part of the patient's epidermis and the healing process results from regeneration of the basal layer of the epidermis. Wounds can heal quickly for about 7 days without leaving cosmetic scars. Meanwhile, superficial dermis burns affect the epidermis and superficial dermis (papillary dermis), which are characterized by the formation of bullae. Part of the skin covering the bullae has died and separated from the part that is still viable and forms edema. The bullae can rupture and expose the dermis layer which can increase the depth of damaged tissue. The wound can heal spontaneously with the help of epithelialization within 14 days which leaves a defect in the different color of the wound from the skin that is not exposed (Muhammad *et al.*, 2021).

According to patient data treated at the RSCM burn unit in 2012-2016, the most common causes of burns were due to fire (53.1%), hot water (19.1%), electricity (14%), chemicals (3%), and contacts (5%).[3] Clinical and experimental studies indicated that severe burns result in markedly impaired dysregulation of the immune response several hours after injury, including increases in cytokines, chemokines, acute phase proteins, and sympathetic tone.

RESEARCH METHOD

This type of research is a case study (Fajarwati & Irianto, 2021; Sugiyono, 2017, 2019) which aims to find out the management of burns. The subject of this case is Mr. MI, male and 38 years old. Techniques for analyzing and handling cases used a family medicine approach.

RESULTS AND DISCUSSIONS

The patient came with complaints of being exposed to an explosion of fire from a gas stove since 1 hour ago. He had previously left the gas stove, which was almost finished and then suddenly the fire struck his face, feet, and hands directly. The duration of the fire exposure was about 30 seconds and the fire was successfully extinguished. The part exposed to the fire turns black and some parts turn white. Skin blisters filled with fluid appear on the hands and feet. The patient did not feel pain in the affected area. He was still wearing cotton clothes when the fire broke out. No action had been given to the patient yet. History of collision to the head and neck was denied. History of inhaling black smoke from the explosion site was denied. Denied history of loss of consciousness, vomiting, shortness of breath, body weakness.

Picture 1. 5% in the head region

Picture 2. 9% in the anterior and posterior forearm region, left et dextra

Picture 3. 14% in the lower leg region on the right and left side, total 28%

Total 28% Initial therapy performed airway action to secure the airway. Then, ensure adequate chest expansion, saturation was maintained > 95% and administer oxygen at 15 L/min via NRM. Circulation was done by installing 2-way intravenous access. If unable, then consider a central venous catheter. Observation for signs of shock, blood pressure, heart rate, fluid

resuscitation were carried out with the Parkland formula, namely 4 ml x 28% x 65 kg = 7280 ml/24 hours resulting in 3640 ml given in the first 8 hours and 3640 ml given in the next 16 hours . Fluid used Lactated Ringer. Monitor urine output was through urinary catheter. Urine output was maintained at 0.5 ml/kg/hour. Analgesic with 3x30 mg ketorolac injection, and antiemetic with 2x50 mg ranitidine injection. Wound treatment with temporary wound dressing using paraffin/Vaseline gauze. Tetagram injection was 1 ampoule.

The use of dressings or wound dressings must mimic the normal function of the skin as protection, avoid exudate, reduce local pain, good psychological response, provide thermal insulation, allow gas and water vapor exchange, not stick, and retain moisture. Besides dressing, cleaning the wound is also an important step to help healing process (Haikal & Susilo, 2021; Munthe, 2018). For contaminated wounds, cleaning should be done aggressively, thoroughly, and frequently to dislodge the biofilm on the wound (Anggraini *et al.*, 2019; Damayanti, 2021). Debridement is recommended if the biofilm could not be removed by irrigation. Generally, paraffin gauze/Vaseline is used as a primary dressing, covered with gauze in layers without causing peripheral circulation disorders as a secondary dressing, and elastic bandages as a tertiary dressing. The newest dressings are in the form of transparent film dressings, foam dressings, hydrogel, nano crystalline silver with an additional bacterial barrier function (Haikal & Susilo, 2021; Munthe, 2018).

After that, further therapy was carried out. Because the burn reached degree of 3, debridement (tangential excision) was performed on deep dermal and full thickness burns in the operating room followed by covering using STSG (split thickness skin graft) from the right thigh as primary dressing and secondary dressing with elastic bandan. The patient was put on a diet according to the recommendation of a patient with severe burns and was observed for signs of infection and organ disorders.

In wounds that penetrate the epidermis, there was damage to blood vessels that cause bleeding. Initially, there was local vasoconstriction of the arteries and capillaries mediated by epinephrine, norepinephrine, and prostaglandins to help stop bleeding. For the next process, there was a process of hemostasis which requires the role of platelets and fibrin. When blood vessels rupture, the clotting process will start from the stimulation of collagen against platelets. These will undergo aggregation mediated by fibrinogen protein and von Willebrand factor to close capillaries. Furthermore, a cascade of coagulation factor activation occured with the final form in the form of fibrin threads that serve as a framework for endothelial cells, inflammatory cells, and fibroblasts. Besides the fibrin, fibronectin also helps in cell attachment and regulates the movement of various cells into the wound. The fibrin-fibronectin framework binds to cytokines produced during injury and acts as a store of these factors for the healing process.

After 10-15 minutes, the blood vessels experienced vasodilation and increased permeability due to the activity of serotonin, histamine, kinins, prostaglandins, leukotrienes, and endothelial products. Leukocytes then migrated to the wound tissue through a selectin-mediated diapedesis process. Then, leukocytes will be more attached due to integrins found on the surface of leukocytes with ICAM (intercellular adhesion moleculer) on the endothelium. Chemotactic agents, such as bacterial products, complement factors, histamine, PGE2, leukotrienes, and PDGF (platelet derived growth factor) stimulate leukotic cells to migrate to endothelial cells. On days 1-2 of the wound, neutrophils play a role in removing dead tissue and bacteria through phagocytosis. Neutrophils also secrete proteases to degrade the remaining extracellular matrix. Then, on day 3-4,

macrophages begin to enter the wound to carry out the functions of phagocytosis, degradation of the extracellular matrix, and stimulation of the production of various products (fibroblasts, collagen, new blood vessels, *etc*. Lymphocytes play a significant role on days 5-7 to produce various cytokines that have a role in chronic wound healing.

Studies show that there is a poor quality of life condition within 1 and 10 years after the burn injury. Although generally the domain of quality of life improves, some domains experience impairment, such as activity participation, anxiety, depression, pain, and discomfort. Quality of life conditions were lower in those who experienced urinary tract infections, thromboembolism, pneumonia, or acute kidney failure during treatment. The highest mortality is caused by sepsis and multiple organ failure.[5] The prognosis is worse in patients aged > 60 years, experiencing airway trauma, other trauma, and burns > 40% (Dingle *et al*., 2021; Stanojcic *et al*., 2018).

CONCLUSION

An examination was carried out on a male patient aged 37 years with a diagnosis of 2-3 degree burns with a TBSA of 28%. The patient experienced primary and secondary trauma management. Fluid resuscitation was administered using the Parkland formula. Wound care was performed by tangential excision, followed by covering the STSG. The patient went home with an improved condition after 3 days of treatment. The patient prognosis is generally good, but with the risk of functional limitations in the burn area.

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