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Burn Contracture in Children: A Case Series

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ABSTRACT

Background: *Contractures after burns are the most common complication, should be prevented, and if they occur, are more difficult to treat. In developing countries such as Indonesia, it is more difficult for children with burns to get treatment for acute burns, resulting in joint contractures and soft tissue weakness. On the other hand, if contractures have already appeared, various methods such as z-plasty, multiple s-plasty, and even reconstructive flaps can be performed, especially in persistent contractures.*

Purpose: *This study aims to find out several types of therapy and surgical management that can be carried out in contracture patients.*

Method: *This study uses a qualitative research method with a case study approach. The data collection techniques used in this study are observation, medical record study, and literature study. The data that has been collected is then analyzed through three stages, namely data reduction, data presentation, and conclusion drawing.*

Results: *The results of the study show that early management of burns in children can provide a better prognosis, if contractures have occurred, treatment requires several stages and the function cannot return to normal and aesthetics can be improved according to the difficulty of the burn. contracture.*

Conclusion: *Research on contractures due to burns in children shows that early management can provide a better prognosis. If contractures have formed, treatment requires several stages and often cannot completely restore normal function.*

INTRODUCTION

Burns are damage or loss of tissue due to contact with heat sources such as fire, hot water, chemicals, electricity and radiation. Burns occur due to direct or indirect exposure to fire, as well as exposure to high temperatures from the sun, electricity or chemicals. Burns caused by fire or indirect exposure, such as being scalded by hot water, often occur in household accidents (Sari et al., 2018). The World Health Organization (WHO) estimates that there are 265,000 deaths each year worldwide due to burns. There are around 3,518 cases of burns in Indonesia. This figure continues to increase from 1,186 cases in 2012 to 1,123 cases in 2013, and 1,209 cases in 2014. Based on Basic Health Research (RISKESDAS) in Indonesia, the prevalence of burns is 0.7%, with the highest prevalence occurring at age 1-4 years with an incidence reaching 1.5% (Zakaria et al., 2021).

Contractures after burns are one of the most common and serious complications that can occur. Skin contractures may appear after wound healing, impeding joint mobility and causing aesthetic defects. Treatment involves intensive physiotherapy and, in some cases, surgery (Saputra, 2023). Contracture is a common complication that occurs after a patient experiences a burn injury, so its treatment and prevention are very important in the medium and long term management of burn wounds. Contracture is a condition in which contraction of scar tissue causes increased stiffness in the soft tissues of the joint, such as periarticular structures and muscles, resulting in decreased range of motion (ROM). Contractures can occur in 2nd degree and 3rd degree burns (Goverman et al., 2017b) ; (Stekelenburg et al., 2015); (Akershoek et al., 2018); (Prabhu et al., 2013).

Contractures occur when the scar tissue that forms during the healing process of a burn tightens and shrinks, causing stiffness in the skin and surrounding tissue. This can limit joint movement and muscle function, and interfere with daily activities (Malekmirzaei et al., 2021). Therefore, prevention of contractures is essential and should be an integral part of burn wound care. Prevention involves proper wound care, physical therapy, and the use of compression bandages or garments to minimize scar tissue formation. If contractures occur, treatment becomes more complex and requires long-term therapy, including intensive physiotherapy and possibly surgery to improve joint mobility and function.

According to the Decree of the Minister of Health Number HK.01.07/MENKES/555/2019 concerning national guidelines for medical services for the management of burns, it is explained that contractures are not only limited to the joints; Other areas such as the soft tissues of the lips and mouth also require stretching, exercise therapy, and physical modalities to maintain tissue length and function. In developing countries like Indonesia, children who suffer burns often face challenges in receiving adequate acute burn care. Lack of access to complete medical facilities, limited medical knowledge among the community, and limited health resources are the main factors that hinder optimal treatment. As a result, burns in children are often not treated properly, increasing the risk of joint contractures and weakening of soft tissue.

Contractures are a serious complication that can disrupt joint function and cause permanent deformity. Therefore, when contractures appear, more intensive and complex medical intervention is needed to overcome them. Various surgical procedures can be performed to correct this condition, such as z-plasty, multiple s-plasty, and reconstructive flaps. These techniques aim to improve joint mobility, expand narrowed tissue, and restore function lost due to contracture. This surgical approach is very important, especially in persistent and severe contractures, to provide hope for better recovery and improve the quality of life of pediatric burn patients.

This research can add to the existing literature regarding the management of burns in children. Findings regarding the stages of contracture treatment can help in the development of new theories related to burn wound management and rehabilitation. This study aims to determine several types of therapy and surgical management that can be performed on contracture patients.

RESEARCH METHODS

This research uses a qualitative research method with a case study approach. According to Maleong, qualitative methods are a type of scientific research that aims to understand a phenomenon in a natural social context, by emphasizing the process of in-depth communication interaction between the researcher and the phenomenon being studied (Rukin, 2019). This research uses an approach of 6 case studies of children. The data collection techniques used in this research were observation, medical record study, and literature study. The data that has been collected is then analyzed in three stages, namely data reduction, data presentation and drawing conclusions. First, data reduction, namely the process of selecting, focusing, simplifying and transforming raw data into a form that is easier to understand and relevant to the research objectives. Second, data presentation where the reduced data is arranged and presented in a format that allows researchers to draw conclusions, such as in the form of a descriptive narrative. Third, drawing conclusions is the process where researchers examine the data that has been presented to look for meaning that can answer research questions or test hypotheses that have been previously formulated.

RESULTS AND DISCUSSION

Observations showed that six case studies of burn contractures in children were as follows. Case 1 a child had a four-handed contracture due to burns a few months ago, restricting movement of his right hand.

Picture 1. Case 1

Case 2 a child had contractures of the right hand located at the index and middle fingers due to burns.

Picture 2. Case 2

Case 3 was a child suffering from contractures of the fingers.

Picture 3. Case 3

A child had leg contractures due to burns, requiring a series of treatments to restore mobility.

Picture 4. Case 4

A child had a contracture of the right hand.

Picture 5. Case 5

Finally, a child had a full-body contracture that required surgery and intensive rehabilitation to restore mobility and quality of life.

Picture 6. Case 6

Children are a vulnerable population to burn injuries as they tend to have high curiosity and lack awareness of the dangers around them. They often do not understand the risks of hot objects, boiling liquids or open flames, making them more susceptible to dangerous situations (Santoso, 2021). Children's skin is also thinner and more sensitive than adults, making them more susceptible to deeper and more serious burns. At home, incidents such as hot liquid spills, contact with cookware, or accidents during play can cause burns. Parental supervision and education on household safety is crucial to prevent burns in children (Haikal & Susilo, 2021).

Acquired burns will cause contractures. Contractures are a major source of morbidity in patients recovering from burns, as they can cause a significant reduction in a person's quality of life and ability to perform daily activities. Post-burn contractures occur when damaged tissue shrinks during healing, resulting in restriction of motion in the affected joints and muscles. This can lead to physical deformity, pain and functional limitations that affect an individual's ability to perform basic tasks such as dressing, eating or walking (Tiro et al., 2021). In addition to the physical impact, contractures can also cause psychological problems such as decreased self-confidence and depression, due to changes in appearance and limitations in activities. Therefore, proper treatment and rehabilitation are essential to minimize contracture progression and help patients achieve optimal recovery (Goverman et al., 2017b); (Goverman et al., 2017a).

Pediatric burn contracture is a condition in which skin and muscle tissue that has been severely burned shrinks or tightens during the healing process, causing limitation of motion in the affected area. Pediatric burns often affect flexible areas such as joints, so contractures can inhibit normal growth and development (Muhammad & Sabir, 2021). Treatment involves intensive physical therapy, the use of assistive devices such as splints, and in some cases, surgical intervention to restore function and reduce pain. A multidisciplinary approach including physicians, physiotherapists, and plastic surgeons is often required to optimize recovery outcomes for children affected by burning contractures (Muhammad & Sabir, 2021).

The pathological consequences of contractures can vary significantly, ranging from relatively mild movement limitations to severe and permanent physical impairments. For example, contractures in the digital joints can cause finger movement limitations that impair a person's ability to perform activities that require manual precision, such as writing or buttoning a shirt. On the other hand, more severe contractures, such as neck contractures,

can lead to deformities that limit head movement, impair vision in the horizontal plane, and cause chronic pain (Saputra, 2023). These conditions not only limit daily activities but can also lead to additional complications, such as postural problems and prolonged neck pain. Variations in contracture severity and location require a customized and focused treatment approach for each patient to minimize negative impact and improve their quality of life (Masanovic & Téot, 2020).

The formation of post-burn contractures is multifactorial and influenced by various factors. First, injury-related factors include the depth and extent of the burn, the etiology or cause of the burn, and the location of the injury. Deeper and more extensive burns tend to cause more severe contractures. Secondly, patient-related factors include genetic inheritance, race, skin color, age, gender, nutritional status, and adherence to therapy. For example, children and individuals with poor nutritional status or who do not adhere to therapy tend to have a higher risk of developing contractures. Third, treatment-related factors include the type and timing of wound closure, the underlying condition of the wound, and preventive strategies used (Johanneke et al., 2018). Timely wound closure and the use of preventive strategies such as physical therapy and splint use can reduce the risk of contracture. The combination of these factors determines the extent to which contractures can develop and how effective prevention and treatment efforts are (Goverman et al., 2017b).

Most second- and third-degree burns result in some degree of scarring, but there are steps that can be taken to minimize scarring and reduce contractures. One effective way is to wear a splint, which helps keep the affected joint in an optimal position and prevents tissue shrinkage during the healing process. In addition, performing regular range-of-motion exercises is essential to maintain flexibility and prevent stiffness in the burned area. Exercising regularly also plays a role in maintaining mobility and muscle strength, which can support the recovery of function (Samsudin & Arimurti, 2018). Promoting independence in burned children is also essential, as tdinhis encourages them to actively move and use the injured body part, which in turn helps in the rehabilitation process and reduces the risk of contractures. This holistic approach, which includes the use of assistive devices, physical exercise, and psychological support, can significantly improve the recovery outcomes and quality of life of post-burn children (Perez et al., 2024).

Often, patients have multiple contractures and defects in the body due to burns or other injuries. In some cases, it is important to operate on more than one contracture at a time. This approach has several advantages, including minimizing the need for repeated anesthesia, reducing the overall cost of treatment by consolidating surgical procedures into one, and shortening the patient's rehabilitation time (Hartoko & Junaedi, 2023). By operating multiple contractures at once, the medical team can optimize surgery time, maximize the efficiency of medical resources, and provide patients with the opportunity to recover holistically by reducing ongoing disruptions in their rehabilitation routine. However, this approach must be carefully considered by the medical team to ensure the safety and well-being of the patient, as well as taking into account the individual needs and severity of their condition (Bhattacharya, 2013).

There are many reconstructive methods used to address contractures in children, depending on the severity and location of the contracture. These methods include non-surgical and surgical approaches. Non-surgical approaches include intensive physical and occupational therapy, where stretching techniques and exercises are used to improve range of motion and prevent further stiffness. The use of assistive devices such as splints and

orthoses are also common to maintain joint position and reduce pressure on the affected area (Akita et al., 2017).

In more severe cases, surgical intervention may be required. Frequently used surgical procedures include Z-plasty, where scar tissue is excised and repositioned to reduce tension on the skin and improve mobility. Skin grafts are also often performed, where healthy skin from another part of the body is transferred to the burn area to repair the damaged tissue. In addition, flap techniques may be used, where tissue with a good blood supply is moved to cover the affected area and improve function (Mubarak, 2020). After surgery, intensive rehabilitation is required to ensure optimal recovery and prevent the formation of new contractures. A combination of these various reconstructive methods, tailored to the individual needs of the child, aims to maximize function, reduce pain, and improve quality of life.

Case studies of burn contractures in children highlight the challenges in post-burn recovery. From elbow contractures to shoulder contractures, each case demands a unique treatment approach. Post-burn contractures are a major source of morbidity in children, restricting movement and affecting their quality of life. Factors such as burn depth and patient characteristics influence contracture formation. Intensive rehabilitation and multidisciplinary care are crucial to minimize contractures. With the right approach, including physical therapy and surgical intervention, children can achieve optimal recovery.

CONCLUSION

Research on contractures due to burns in children shows that early management can provide a better prognosis. If contractures have formed, treatment requires several stages and often cannot completely restore normal function. However, the aesthetic aspect can be improved depending on the degree of difficulty of the contracture. So with the right approach and comprehensive treatment, the quality of life for children who experience contractures due to burns can be improved even though challenges in recovering full function remain.

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