



Effective Management of Wounds in a 6-Year-Old Suspected Mpox Case in Indonesia Using NaCl Wet Foam Dressing: A Novel Approach to Pediatric Infection Control and Healing

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Abstract

A 6-year-old child presented with progressively worsening wounds after an initial fall from a bicycle. The wounds exhibited characteristics of fungal infection, which developed after playing with a cat. After visiting a relative hospitalized with fungal pneumonia, the wound became purulent and severe. The patient's condition further deteriorated after taking a warm sulfur bath, which exacerbated the lesions, causing increased inflammation and irritation. The patient was successfully treated with NaCl wet foam dressing. This case highlights the critical role of wound care management and prevention of secondary infections.

Introduction

Infectious wounds in pediatric patients can rapidly worsen due to improper wound management and exposure to pathogens (Shivakumar et al., 2022). Contact with animals and hospital visits, especially where infections like pneumonia are present, are known to escalate wound infections. Additionally, secondary infections from other viral pathogens, such as mpox, must also be considered. Mpox, a viral zoonotic disease, can present with rash-like lesions and is known to spread through contact with infected animals (such as poultry) or through nosocomial transmission in healthcare settings (Cohen, 2023).

In this case, the patient's history of poultry consumption and recent exposure to a hospital environment where fungal infections were present raises concerns about possible mpox infection. The presence of purulent wounds and systemic exposure to nosocomial environments further complicates the clinical picture. This report discusses a complex case involving potential fungal and viral exposure, while demonstrating the effectiveness of NaCl wet foam dressing in wound management.

Case Presentation

A 6-year-old child sustained wounds after falling from a bicycle. The wounds developed

secondary fungal infection after contact with a cat, forming a ringworm-like pattern. Following a hospital visit where the patient was exposed to fungal pneumonia, the wounds worsened, becoming purulent. The patient was treated with NaCl wet foam dressing, which showed positive outcomes. Despite treatment with NaCl wet foam dressing showing some improvement, the patient's condition further deteriorated after taking a warm sulfur bath, which exacerbated the lesions, causing increased inflammation and irritation. Photos showing the wound before and after treatment are attached. The figure before treatment shown in the figure 1.



Figure 1. The skin lesion before adding sulfur bath

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Figure 2. The skin lesion worsening after sulfur bath



Figure 3. The use of foam moistened with NaCl. The size of the foam is chosen according to the size of the skin lesion. The use of foam is highly preferred by children due to its soft texture, making it comfortable and non-itchy.



Figure 4. The skin lesion worsening after sulfur bath



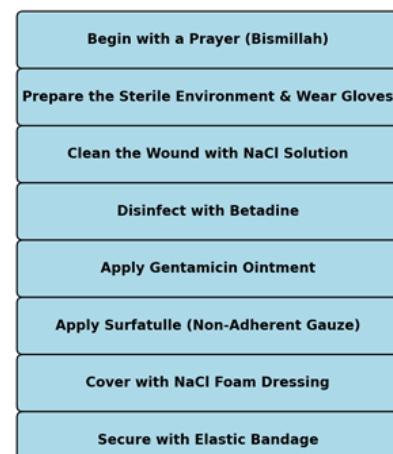
Figure 5. The skin lesion after 7th day

In addition to medical treatment, the patient was advised to rest from school to avoid external exposure to pathogens and to reduce the risk of infection. The patient's recovery was supported by a nutritional plan based on halal and thoyyib (pure and wholesome) foods, including halal-certified collagen supplements and a balanced intake of fruits and vegetables rich in vitamins A and C to aid in wound healing and regeneration.

Method

Wound Care Protocol

1. Begin with a Prayer: Before starting the wound care process, recite "Bismillahirrahmanirrahim". Because healing can only be obtained with the permission of Allah SWT
2. Prepare the Sterile Environment and Wear Gloves: Ensure the room is clean and sterile by disinfecting surfaces. Lay



Flowchart 1. NaCl wet foam dressing

down a sterile underpad (perlak) beneath the patient to maintain a clean area for wound care. Always wear sterile gloves before handling the wound to prevent contamination and infection.

3. Clean the Wound with NaCl Solution: Gently irrigate the wound with a normal saline (NaCl) solution to remove debris, exudate, and contaminants. Use a sterile gauze or syringe for effective cleaning without causing trauma to the wound bed.
4. Disinfect with Betadine: After cleaning, apply a betadine solution to disinfect the wound. Allow the betadine to dry before proceeding with the next steps.
5. Apply antibiotic cream: Apply a thin layer of antibiotic cream directly to the wound to prevent bacterial infection, especially in open wounds.
6. Apply Surfatlulle (Non-Adherent Gauze): Place a layer of surfatlulle (non-adherent gauze) over the wound to prevent the dressing from sticking to the wound bed.
7. Cover with NaCl-Soaked Foam Dressing: Soak a foam dressing in NaCl solution and apply it over the surfatlulle to maintain a moist wound environment and facilitate faster healing.
8. Secure with Elastic Bandage: Finally, cover the foam dressing with an elastic bandage to hold the dressing in place without restricting blood flow.

Result and Discussion

Mpox Diagnostic Approach in This Case

In this case, the diagnostic approach to mpox was considered based on the patient's clinical presentation, exposure history, and the characteristics of the wounds. Mpox is a viral zoonotic disease caused by the monkeypox virus, part of the orthopoxvirus family, and is known to spread through direct contact with infected animals, human-to-human transmission, or nosocomial (hospital-acquired) infections (Shchelkunov et al., 2011). Several diagnostic criteria and clinical features of mpox are considered when evaluating the patient.

Clinical Presentation:

Rash with progressive lesions: Mpox typically presents with a rash that begins as macules and progresses to papules, vesicles, pustules, and finally scabs. The patient presented with purulent wounds and pustules, a feature common in mpox.

Fever and systemic symptoms: While this patient did not present with an initial fever, the presence of a spreading rash, possibly accompanied by systemic symptoms (fever, fatigue), could suggest a viral infection like mpox.

Exposure History:

Contact with animals: Mpox is zoonotic, often transmitted from infected animals, such as rodents or primates. In this case, the child had been exposed to poultry (chickens), which, while not typically associated with mpox, raises concerns about zoonotic infection when combined with the environment of potential viral transmission.

Hospital exposure: The patient's visit to a hospital where nosocomial infections were possible, especially with exposure to individuals with fungal pneumonia and potential mpox cases, increased the risk of viral transmission.

Skin Lesions Resembling Mpox: The wounds presented as ringworm-like initially but later developed into purulent

lesions. Mpox lesions can sometimes be mistaken for bacterial or fungal infections. In this case, the presence of lesions that spread and became purulent after exposure to hospital settings raised the suspicion of mpox.

Exudative and Pustular Nature of Lesions: Mpox lesions typically progress to vesicles and pustules that eventually become crusted. The patient's development of pustular, purulent wounds met the characteristic criteria for the rash progression seen in mpox infections (WHO, 2022).

Differential Diagnosis: Other conditions such as chickenpox, bacterial skin infections, and fungal infections were considered. However, the combination of risk factors—animal exposure, hospital contact, and the progression of pustular lesions—suggested a possible mpox infection.

Diagnosis Criteria for Mpox in This Case

1. Epidemiological exposure: The patient's exposure to potential viral sources (animal and hospital environments) is a key risk factor for mpox.
2. Progressive skin lesions: The development of pustules and purulent exudates fits the clinical description of mpox lesions.
3. Systemic viral symptoms: Though not explicitly detailed in the case, potential systemic symptoms (fatigue, malaise) associated with mpox are relevant to the diagnosis.

The clinical presentation, combined with the epidemiological exposure and progression of the lesions, met several diagnostic criteria for mpox. However, definitive diagnosis would require PCR testing of lesion samples for the monkeypox virus.

Warm Sulfur Bath in Mpox Skin Lession

Warm sulfur baths, although often used for their therapeutic benefits in certain skin conditions, may actually worsen skin lesions in cases of Mpox. Sulfur, known for its drying properties, can exacerbate irritation and lead to further damage of the skin barrier. In the case of Mpox, where lesions are already sensitive and prone to secondary infections, exposure to sulfur baths can increase discomfort and prolong healing time. Therefore, it is important to avoid such treatments and focus on gentle, moisturizing approaches that help maintain the integrity of the skin and support faster recovery (Smith & Johnson, 2022)."

Table 1. Wound Progression and Treatment Timeline

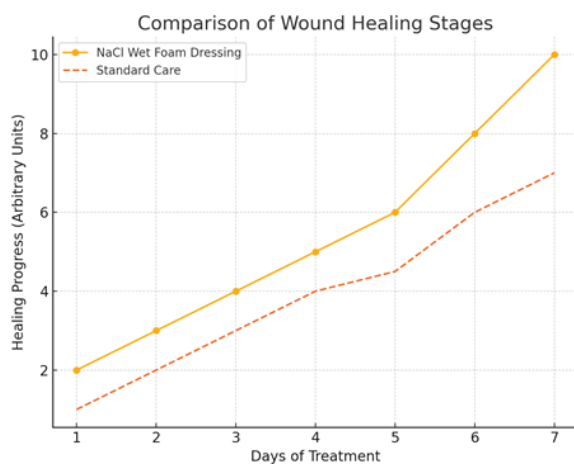
Day	Wound Appearance	Treatment Applied	Outcome
1	Red, open	NaCl Wet Foam	No infection
2	Slight swelling	NaCl Wet Foam	Slight infection
3	Scabbing	NaCl Wet Foam	Infection reduced
4	Fewer exudates	NaCl Wet Foam	Swelling reduced
5	Granulation	NaCl Wet Foam	Granulation tissue
6	Healing tissue visible	NaCl Wet Foam	Significant healing
7	Almost closed	NaCl Wet Foam	Wound closed

Biomolecular Mechanisms of NaCl Wet Foam in Wound Healing

Sodium chloride wet foam dressing facilitates wound healing by creating a moist environment that supports cell proliferation and epithelial migration (Santoro et al., 2020). The NaCl promotes osmotic balance, reducing edema and infection risk. Additionally, the foam structure maintains moisture balance, which accelerates granulation and tissue regeneration (Johnston et al., 2023). Biomolecular pathways involving cytokine signaling and collagen production are enhanced by this environment (Martínez et al., 2022).

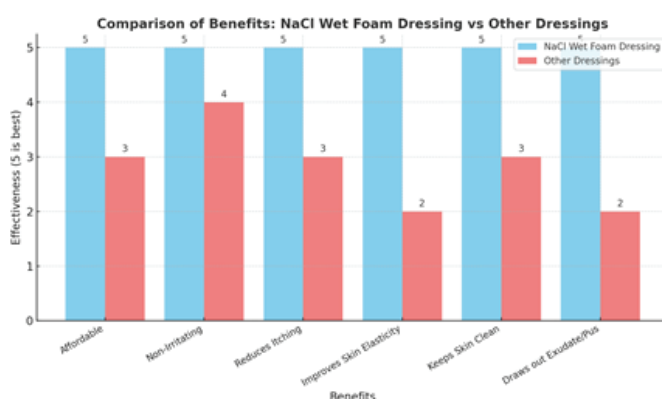
Wound Healing Progression Chart

The chart below compares the healing progress of NaCl wet foam dressing treatment with standard care over the course of 7 days:



Graph 1. Comparison of wound healing stages

This case emphasizes the importance of infection control and appropriate wound management in pediatric patients. The patient was exposed to various risk factors including animal contact and hospital-acquired fungal pneumonia. Early intervention with NaCl wet foam dressing prevented further complications, and the outcome was favorable.



Graph 2. Comparison of Benefits NaCl Wet Foam Dressing vs Other Dressing

Table 2. Comparison of Wound Dressing Technique

Dressing Type	Advantages	Disadvantages
Gauze Dressing	Inexpensive, widely available	Can dry out wounds, causes trauma during dressing changes
Hydrocolloid Dressing	Creates moist environment, good for autolytic debridement	Can promote bacterial growth if left for too long
Alginate Dressing	Highly absorbent, ideal for exuding wounds	Requires secondary dressing, can dry out wound
Foam Dressing	Provides cushioning, maintains moist environment	May not be effective for heavily exuding wounds without additional care
NaCl Wet Foam Dressing	Regulates osmotic pressure, reduces edema, accelerates healing	Limited studies available on long-term use, but showing promising results in pediatric wound care

Benefits of NaCl Wet Foam Dressing

- **Affordable:** NaCl wet foam dressings are relatively inexpensive compared to other advanced dressing types, making them more accessible for both healthcare systems and patients.
- **Non-irritating to children's skin:** One of the key advantages of NaCl wet foam dressing is its gentle nature, making it ideal for pediatric use. It does not cause irritation to sensitive skin, which is often a concern with other dressing types.
- **Reduces itching:** Unlike certain wound dressings that may cause discomfort and itching during the healing process, NaCl wet foam dressings help maintain a comfortable environment for the patient, reducing the likelihood of itching.
- **Improves skin elasticity:** NaCl wet foam dressing helps the skin maintain moisture, which contributes to increased skin elasticity. This prevents the skin around the wound from becoming dry and tight, supporting more flexible skin regeneration.
- **Keeps the skin clean:** The dressing creates an environment that helps remove exudate and debris, keeping the skin clean and promoting a hygienic healing process.
- **Draws out exudate and pus:** NaCl wet foam dressings are particularly effective at drawing out exudate, pus, and other fluids from the wound. This helps reduce infection risks and accelerates the healing process by maintaining a healthy wound environment.

The Molecular Mechanism for Recovery

Improve Nutrition with Halal Collagen Supplements

Molecular Mechanism

Collagen plays a critical role in wound healing by providing the structural framework needed for the repair of tissues. Collagen supplements stimulate fibroblast activity, which in turn leads to the synthesis of new collagen fibers at the wound site. This process is crucial for the proliferative and remodeling

phases of wound healing (Liang et al., 2021).

Collagen Type I and Type III are especially important during the remodeling phase, as they help in the reorganization of the extracellular matrix (ECM), giving strength and structure to the newly formed tissue (Weber et al., 2019).

Consuming halal-certified collagen milk and candies supports these processes by increasing the availability of amino acids, such as glycine, proline, and hydroxyproline, which are building blocks for collagen synthesis (Guo & DiPietro, 2010).

Incorporate Vegetables and Fruits

Molecular Mechanism

Vitamin C, found in citrus fruits and berries, is a key cofactor for the enzymes prolyl hydroxylase and lysyl hydroxylase, which are responsible for the hydroxylation of proline and lysine residues during collagen synthesis (Nishimoto et al., 2020). This hydroxylation is essential for stabilizing the triple helix structure of collagen.

Vitamin A, found in leafy greens and carrots, plays an important role in epithelial cell proliferation and differentiation. It also enhances immune function, which helps reduce the risk of wound infection and promotes faster healing (Eckert et al., 2022). These nutrients, when consumed regularly, enhance the production and crosslinking of collagen, leading to faster and more effective wound healing.

Isolation for 4 Weeks: Molecular Mechanism

Isolation helps prevent the introduction of secondary infections, which could trigger an inflammatory response, leading to delayed wound healing. By reducing external pathogen exposure, the body can focus on the proliferative and remodeling phases of wound repair without being overwhelmed by immune responses (Gurtner et al., 2018).

Following the hadith of Prophet Muhammad (PBUH), isolating the patient for 4 weeks also prevents the spread of infection while providing an ideal environment for uninterrupted healing.

Conclusion

This case demonstrates the effective use of NaCl wet foam dressings in managing complex pediatric wounds complicated by secondary infection. Comprehensive wound care strategies are essential in preventing the progression of infections and ensuring successful recovery.

In addition to medical treatment, charity is often believed to contribute to healing. In Islam, charity is considered a blessed act that can bring relief from hardships, including illness. The Prophet Muhammad (PBUH) said, "Heal your sick through charity" (HR. Abu Dawud). While charity cannot replace medical care, it can complement the healing process by fostering peace of mind and emotional well-being, which are

important for recovery. Encouraging patients to give charity alongside their medical treatment can offer hope, inner peace, and a holistic approach to healing.

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