

Wound Management of Patients with Toxic Epidermal Necrolysis Using Banana Leaf: A Case Study

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Abstract

The Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) are life-threatening allergic reactions to medication. They require immediate treatment with the primary goal to prevent infection and encourage healing. This research proposes a specific treatment and care for SJS/TEN patient using sterile banana leaf dressing, which allows the patient to be discharged swiftly and reduces the cost of treatment by 8 times. In conclusion, the case study where specific, supportive therapy using sterilized banana leaf dressing was given the patient can be discharged within 12 days.

Keywords: Toxic epidermal necrolysis; Wound dressing; Case study

Introduction

The potentially-fatal medicine allergy called Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN). SJS can be found in 8.61-9.69 per million populations and TEN can be found in 1.58-2.26 per million population [1]. In Thailand, statistics show that between 2002 and 2013 there was a total of 12.4 cases per million population [2]. Both SJS and TEN are of similar condition, having the same cause and pathophysiology but different in intensity. TEN is more severe than SJS. The days of hospitalization for SJS is 9.82 ± 0.24 days, while for TEN it is 16.20 ± 1.00 days and the costs of treatment for SJS is $21,437 \pm 806$ U.S. Dollars while the cost for TEN is $53,695 \pm 4,037$ U.S. Dollars (approximately $750,295 \pm 28,210$ Thai Baht and $1,610,850 \pm 141,295$ Thai Baht, respectively, with the conversion rate of 35 Thai Baht per U.S. Dollars). SJS and TEN has the mortality rate of 10-34% [3,4].

The differentiation between SJS/TEN is indicated by the surface area of epidermal necrosis. The less severe SJS involves skin lesion on <10% of total body surface area, while TEN involves 10-30% skin lesion with severe inflammation of mucosal tissues, especially in ocular, oral and genital mucosa or it involves skin lesion on >30% of total body surface area [5].

The popular tool used to assess the severity and mortality rate from SJS and TEN is SCORTEN, comprises of 7 risk factors including; 1) being >40 years old, 2) presence of malignancy, 3) pulse rate >120 beats per minute, 4) >10% damaged total body surface 5) serum BUN >28 mg/dl, 6) serum glucose >252 mg/dl, 7) serum bicarbonate (HCO_3^-) <20 mmol/L. Scoring 0-7 of the risk factors on SCORTEN scale signifies 1%, 4%, 12%, 32%, 62%, 85%, 85% 95% and 99% mortality rate respectively [6,7].

The goal of wound care is prevention of further mechanical trauma to the skin and management of wound infection [7,8]. Bacterial proliferation on the wound surface can lead to an invasive infection [4]. Initiation of topical antimicrobial agents should begin early for better infection control. One should manage exudate, prevent

maceration, and prevent further wound trauma to the patient. Medication management [7] includes immunosuppressive therapy using cyclosporine A, while Corticosteroid therapy is not recommended.

In addition, in developing countries there are financial constraints and limited all modern medical wound management. Examples of modern medical [3,6-8] supplies used are paraffin-coated mesh, vaseline, petroleum, disinfectant dressings with silver-compounds such as nanocrystalline silver dressing, silver hydrofiber, silicone silver foam dressing etc. This makes wound care an expensive proposition and every effort in cost reduction and decreased pain level is welcomed.

The recent, studies show that using Aloe vera resulted in better healing rate than silver-sulfadiazine; SSD [9]. Similarly, using honey dressing on burns resulted in better healing and lower rate of necrosis compared to SSD [10]. Another comparative study between boiled potato peel bandages and sterile banana leaf showed similar healing rates between the two, but banana leaf is more cost effective and the material does not cling to the wound. The price of using sterile banana leaf dressing is 160 times lower than the cost of paraffin gauze [11]. The decrease of pain level and the increase of ease and speed are statistically significant when sterile banana leaf dressing is used in wound management. However, the caution in using banana leaf dressing is infections from contamination; it is advised to use only leaves that have been sterilized for no more than 2 days [11-13].

While previous studies discussed, the use of sterile banana leaf dressing in burn patients, not many studies were found in the SJS/TEN, despite the similar wound of both groups. This clinical article explores and describes successful topical management of a patient with SJS/TEN using sterilized banana leaf dressing.

Case Study

The patient was a 23-year-old male, weighted 90 kg, reported for treatment with the symptoms of widespread rash that had broken out 3 days prior. Three weeks before the visit, the patient received psychiatric treatment to aid his recovery from narcotic addiction-a total of 7 medications had been prescribed, including; Lithium, Carbamazepine,

Clonazepam, Fluoxetine, Tarzodone, Risperidone, and Benzhexal. He took the medications daily without any reaction until 3 days before he came to the hospital. His initial symptoms are blisters on his back and night-time fever without chills. The blistering then spread to his chest, the rest of his torso and face, developing from reddish to yellowish blisters. The patient also had sore throat with no coughing and experienced pain when swallowing which debilitated his ability to eat and drink. He visited to a private hospital and was prescribed Cetirizine, Paracetamol, Bromhexine, Ibuprofen, and Calamine, and he stopped using narcotics. However, his conditions did not improve. The blistering advanced until he could not speak, the pain in his throat intensified and he could not open his eyes.

The patient was admitted to emergency fully conscious, vital signs reported as following; body temperature 40.9°C, respiratory rate 44 breaths per minute, pulse rate 136 beats per minute, blood pressure 107/55 mmHg, and peripheral oxygen saturation 96%. He had full-body blistering, widespread sloughing around the upper torso, face and genital, bleeding wounds around oral cavity and lips, Nikolsky's signs, and chest examination revealed wheezing noises in his lungs. The prognosis was 3 points on SCORTEN scale, having 33% mortality rate. Significant laboratory results included; CBC: WBC 9,980 PMN 84.2 Lymp 10.8 Hct 46.1 Plt 196,000 Coagulogram: PTT 29.9 sec PTT ratio 1.15 PT 13 sec (control 11.3 sec) PT INR 1.14 blood chem: BUN 16.8 Cr. 1.36 CPK 763. The patient was diagnosed with TEN and was given immediate first-aid treatment with 1,200 ml of normal saline solution (NSS) intravenously, Ceftriaxone antibiotic, blood culture testing, catheterization, and an admission for further treatments.

At intermediate care, the patient's vital reported as following; body temperature 40°C, respiratory rate 60 breaths per minute, pulse rate 124 beats per minute, blood pressure 155/71 mmHg, and peripheral oxygen saturation 90%. The patient was intubated. His treatment plans included; 1) rehydration—calculated volume for 50% skin lesions was 4 × body weight (kg) × area of skin lesions (%) equaled 750 ml/hour, 2) consultation with ophthalmologist for ocular treatments, 3) consultation with dermatologist and skin biopsy, 4) discontinuation of all previous medications, 5) cleaning wounds with NSS and cover with paraffin-coated mesh and gauze dressing, and 6) give the patient and his family basic information about the condition. After 3 days, the patient's respiration and skin lesions did not improve. The dermatologist admitted the patient to intensive care (ICU) and consulted a pharmacist regarding his medication history as well as issued order for testing. It was found that the patient had adverse reaction to Carbazepine and blood culture for septicemia was negative.

At ICU, the patient was isolated to prevent infection and had slow responses to instructions. The vital reported as following; body temperature 40°C, intubated respiratory rate 30-45 breaths per minute using abdominal muscles, pulse rate 139 beats per minute, blood pressure 96/55 (68) mmHg, and peripheral oxygen saturation 95%. Sedative was administered to improve and coax the patient's breathing into harmonizing with the respirator. Dexamethasone and Ceftriaxone antibiotic was given. Later, hypotension was observed. Ultrasound revealed dehydration, so 1,500 ml of NSS was immediately given intravenously. Pulmonary X-ray found no pulmonary congestion but the right lower-lobe infiltration was found. The sputum stain was negative and the patient's antibiotic was changed to Imipenem.

The attending medical staffs decided to change the procedure of wound management. After cleaning the wounds with saline and dermatologically recommended ointments (cold cream and olive oil) were applied, the wound was covered with sterile banana leaf and thick

gauze dressing twice a day, giving the patient fentanyl beforehand for pain relief. Each session of TEN wound management take 1-1.5 hours with a team of 3-4 nurses. The patient's eyes were cleaned with saline and medicated with Naphcon-an eye drop, tears natural free, and Vidisic eye gel, as prescribed by the ophthalmologist. Oral cavity was cleansed with saline 3 times a day and hydroxyzine and omeprazole was administered. However, the patient care followed the standard procedure of ICU which meant that breathing exercises were given and the patient was taken off the respirator and intubation seven days after being admitted to the ICU. The patient received 2,250 kcal per day through feeding tube and had normal digestion and excretion (Figure 1).



Figure 1: Shows the use of sterile banana leaf in wound management of the TEN patient.

After 9 days in the ICU the patient was alert, well enough to sit up on his bed, and could start ingesting food through his mouth. The skin lesions around his face and oral cavity started to pin ken and scabbed over. The lesions on the front and back of his torso were dried and showed signs of regeneration, except for around the waist where the wound was still a little fresh but there was no sharp pain. The wound management continued for 2 more days until the physicians decided that the patient can be safely released with a follow-up appointment in 2 weeks.

The follow-up appointment 2 weeks later reported that the patient could walk with good mobility, the wounds were healed and the patient personally related that the wound management using banana leaf was not as painful compared to the wound dressing when he was in intermediate care.

Discussion

The patient's adverse reaction to carbazepine was discovered through HLA-B*1502 testing. This correlates to existing research findings that HLA-B (human leukocyte antigen-B) 7, a gene involving protein biosynthesis found in human, has significant role in the immune system.

SJS/TEN reaction to carbazepine in asians are caused by HLA-B*1502 genotype7 [14]. However, it should be cautioned that other medicines with similar chemical structure to carbazepine such as phenytoin, ox-carbamazepine, etc. may be able to cause SJS/TEN as well. In Thailand, the 5 medicines that are found to be the most common cause of SJS and TEN are Sulfamethoxazole+Trimethoprim,

Allopurinol, Carbamazepine, Nevirapine-containing products and Phenytoin.

The severe allergy of SJS/TEN5-7 are non-acute adverse reaction to medicines with symptoms appearing 1-3 weeks after medication. The pathogenesis mechanism involves stimulation to immune response, releasing Cytokines which triggers various types of effector T-cells and causes keratinocyte apoptosis.

General symptoms start with high fever and difficult swallowing that usually preludes skin lesions by 1-3 days. Skin lesions, typically rash, usually starts from the torso before spreading to neck, face, arms and thighs. There are also redness and pain in mucosal tissues around the mouth, eyes, and genitals. Affected skin will feel painful, appearing red and blotchy from bleeding with no certain pattern in size and shape. Next the sloughing of epidermis starts and vesicular or bulla blisters appear around the face and torso. The blisters are prone to burst, exposing reddish and bleeding dermis below. The inflammation of various systems, such as gastrointestinal system and respiratory system, can cause infection, organ failures, breathing difficulties, hyperventilation, tachycardia, and hypoxia and may eventually be fatal.

The essential care giving [6,7] includes; 1) specific treatments such as steroid medication, Human Intravenous Immune Globulin (IVIG) medication, plasmapheresis treatment, etc.; 2) supportive care to control complications by isolating the patient in specific care units such as Burn unit or ICU for infection prevention, osmoregulation, nutrition management, pain management, mental and spiritual care for patients and their families; and finally, 3) wound management.

In this case study, the patient was preliminary treated using NSS to cleanse and paraffin and gauze dressing. When the dressings were removed, the materials had dried and stuck firmly to the wound, causing further damage and bleeding during cleansing even after the patient was given analgesic. The pain was so intense, the patient refused to be treated at times. However, after changing to banana leaf dressing, the patient reported a decrease in pain level during wound management, which correlated to the results from previous researches [11,12]. It was suggested that pain relief that comes with the use of banana leaf was due to water and fiber component of the leaf which help reduce the friction between the wound and dressing. Nevertheless, the banana leaf dressing needs to be used with caution in order to avoid contamination.

The steps to sterilize banana leaves for wound dressing are as follows;

- a) Cut the leaves from the tree, remove midrib and wash thoroughly with water.
- b) Leave to dry, stack together and wrap in clean cloth.
- c) Sterilize with autoclaving.

This method can destroy all microbes and bacterial spores by replacing air with boiling hot steam in closed container. The temperature will rise even higher as the steam is pressurized (pressure increase at 15 lb/ft²) resulting in steam temperature of 121-134°C. The heat and pressure will cause protein in the cells to denature and coagulate. For this case study, the patient's family personally prepared washed and dried banana leaves for the medical staffs to sterilize. The leaves can be used for 2 days after sterilization, twice a day, every morning and evening. The total cost of preparing sterile banana leaf dressing was calculated to be 200 Thai Baht per day which is 8 times lower than the use of paraffin mesh. Throughout the whole duration of

wound management in the ICU, the patient saved 9,800 Thai Baht of treatment cost, experienced better pain relief and the personal participation helped improve relationship with the family.

The factors that contribute to the successful use of sterile banana leaf dressing can be summarized as follows:

The attitude of the medical team towards the TEN patients who had to endure the pain throughout the course of wound management. As devoted care givers who nursed the patient intimately, the staff are open to change from modern medicine to natural alternative once they were informed that sterile banana leaf dressing was beneficial to the patient's wound management, even though the preparation and sterilization procedure took extra effort. It is also due to the collaboration between multidisciplinary professionals that drove the success of this case.

The combined effort of both the medical staffs that sterilize the banana leaf dressing and the family that provided them with clean banana leaves. Both, intra-organizational and inter-organizational collaborations between the hospital and related health organization that are favorable to change.

Conclusion

The TEN patients received both specific treatments and supportive care to control complications-infection prevention, osmoregulation, and nutrition and pain management, mental and spiritual care and wound management aided by sterile banana leaf dressing in wound management. Due to the treatment regime he patient recovered and was discharged within 12 days with no complications. However, the caution in using banana leaf dressing is infections from contamination; it is advised to use only leaves that have been sterilized for no more than 2 days.

Limitations of the Study

Although, the use of the sterile banana leaf dressing in TEN patients was similar to modern medical wound management, the banana leaf dressing needs to be used with caution in order to avoid contamination. However, there is a need for further study in large sample or a more comprehensive research design.

Conflicts of Interest

The authors declared no conflict of interest.

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