Utilization of Banana Leaf Dressing in Wound Healing: A Case Series

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The East Avenue Medical Center

- 1 of 3 SIGN Program Beneficiaries in the Philippines
- "650-bed" capacity hospital
- "Level I" Trauma Center
- End referral center for most Central Luzon provinces and Northern/Eastern Metro Manila Cities
- Bordered by 3 major (accident-prone) highways
Rationale

• Open wounds secondary to trauma are among the most common reasons for medical consultation
• Open wounds range from trivial lacerations to life- or limb-threatening injuries
Rationale

• US National Trauma Data Bank: 700,000 new cases in 2011
• A retrospective analysis of 7099 wounds in 5240 patients using various wound care modalities pegged the costs of wound care in these patients at over $29 billion (whether the wound healed or not)

Rationale

• Lack of a Philippine national database on open wounds is a major hurdle in determining the socio-economic impact of these injuries
• In 2013, 24.9% of Filipinos lived below the poverty line (GDP per capita of US$ 366 or PhP 16,841 a year)¹
  • More than 18 Million Filipinos live on just US$ 1.00 a day!
  • The average cost of an antibiotic mesh dressing is US$ 2.00 per piece²
  • The cost of Cefuroxime (IV), a widely-used second-generation cephalosporin in the treatment of open wounds ranges from about US$ 1.50 to US$ 6.50 per vial²

1. www.philstar.com, Philippine Statistics Authority
2. Source: A leading drug store in the Philippines
Rationale

• Several guidelines have been developed – attempts to standardize open wound care\(^1\)
• Several types of wound dressing systems are available
• No identified wound dressing “gold standard”\(^1\)

1. HSE National Best Practice and Evidence-Based Guidelines for Wound Management. Dr. Steevens’ Hospital, Dublin, Ireland. 2009
Review of Literature

• Skin wounds have a limited self-repair capacity
• Three stages of wound repair:
  • Inflammatory phase
  • Proliferative phase
  • Remodeling phase
• Large defects cannot be repaired by the physiologic process
Review of Literature

• Most common dressing used is the so-called “wet-to-dry” dressing
  • Osmotic Medium which pulls exudates, bacteria and third-space fluids from the wound bed²
  • Wet-to dry dressing is associated with delayed wound healing, increased risk for infection and pain²

2. Antony, J. A Study to Assess the Effectiveness of Banana Leaf Dressing (BLD) on Wound Healing Among Patients with Partial Thickness Burns in Selected Hospitals at Mysore. JSS College of Nursing 1st Main Saraswathipuram, Mysore. October 2011
Review of Literature

• The effect of banana (*Musa sapientum*) on promoting GI ulcer healing has been documented for 30 years³

• Preliminary biochemical analysis of derivatives of *Musa sapientum* revealed the presence of flavonoids, sterlyacylglycosides and sitoindisides³

Review of Literature

• Studies extending banana’s wound healing properties to skin wounds have been attempted

• Processed (autoclaved) banana leaves used as wound dressings for burn patients and skin graft donor sites showed promising results 4,5


5. Gore, MA, Akolekar D. Banana leaf dressing for skin graft donor areas. Department of Surgery, LTMG Hospital and LTM Medical College, Sion, Mumbai, India. August 2003
Evaluation of banana leaf dressing for partial thickness burn wounds

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Accepted 29 January 2003
Banana leaf dressing for skin graft donor areas

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Review of Literature

• Theories on the efficacy of BLD:*
  • Stimulates collagen proliferation and cross-linking (faster tissue repair)
  • Reduces lipid peroxidation on wound bed (leads to increased collagen strength, promotes micro-circulation and DNA synthesis)
  • Anti-microbial effect (reduces infection, promotes faster tissue repair)

* Agarwal, PK, Singh, A, Gaurav, K, Shalini, G, Khanna, KD, Goel, RK. Evaluation of wound healing activity of extracts of plantain banana (Musa sapientum var. paradisiaca) in rats. Departments of Pharmacology and Biophysics, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India. September 2008
Review of Literature

• Banana leaves are cheap and readily available in the Philippine setting
  • PH is the 4th-largest producer of banana in the world, about 6% of total global production*
  • Banana leaves are sold for US$ 2.50 for a 25-kg bundle (internet price)
  • Patient’s Relative: “We have several banana trees around the house”

*R.P. Calderon and A.C. Rola. Assessing Benefits And Costs Of Commercial Banana Production In The Philippines. UP Los Banos, Laguna, Philippines *)
Research Objectives

• Determine the viability of processed banana leaf dressing in treating avulsion injuries, open fractures with soft-tissue compromise, decubitus ulcers and fasciotomy wounds
  • To determine if banana leaf dressing promotes wound healing
  • To determine if banana leaf dressing reduces the need for skin grafting or the size of the wound that needs to be covered by skin grafting
Inclusion/Exclusion Criteria

• Inclusion
  • All patients with open wounds seen by the Department of Orthopedics at the East Avenue Medical Center were considered for the study
  • Patients underwent at least one thorough debridement of the wound, and had a skin/soft tissue defect not amenable to primary closure
  • Adequate (culture-guided) antibiotic coverage
Inclusion/Exclusion Criteria

• Exclusion
  • Patients with grossly infected wounds or wounds extending to the bone, muscle or fascia that could not be covered by skin grafts (i.e. require musculo-cutaneous or fascio-cutaneous flap coverage)
Methodology: Enrollment Flowchart

- Initial Screening (N)
- Treatment (Banana Leaf Dressing)
  - Patients with improved wounds ($P_b$)
  - Comparison with no intervention
Methodology: Preparation of Banana Leaves

- Fresh banana leaves were cut into 12 x 15 cm slabs, washed with tap water
- Autoclaved for 45 minutes at 120° C
- Sterilized banana leaves were stored in one refrigeration unit between 10-18° C
Methodology: Procedure of Dressing Changes

• Removal of soaked dressings using aseptic technique
• Washing with a small amount of normal saline solution to remove excess exudates or blood clots
• Wounds measured using “map technique”
• Two layers of sterile gauze over the banana leaf dressing
• Dressing changes every 5 days
Protocol Design: Procedure
Outcome Measurements

• The primary outcome measure was the evaluation of wound size and time to healing
  • reduction of wound size
  • Days to epithelialization, if applicable
Outcome Measurements

• Secondary outcome measures include
  • Pain
  • Infection Rate
  • Need for skin grafting
Results

• Healing time ranged between 20 to 90 days, with a mean of 45 days
• No wound infections while on BLD
• No pain on dressing changes
• Some patients were discharged while still on BLD; follow-up revealed excellent adherence to dressing changes
Results

• All fifteen patients enrolled into the program were subsequently discharged improved with no mortalities or morbidities

• Three opted for early closure of their wounds by split-thickness skin graft (STSG), while the rest opted to let the wounds undergo secondary healing by epithelialization
  • The patients who underwent STSG had injuries in close proximity to joints, which required immediate mobilization; when offered the surgical option, they consented
  • The patients who opted for secondary healing were also offered early closure by STSG; due to varying reasons, they declined to undergo the procedure
  • One patient who underwent STSG had a failed graft and declined to undergo the procedure a second time
<table>
<thead>
<tr>
<th>Patient</th>
<th>Age/Sex</th>
<th>Wound</th>
<th>Initial Wound Size (sq. cm)</th>
<th>Days to Healing (Epithelialization)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JA</td>
<td>13/F</td>
<td>Avulsion Ankle</td>
<td>111</td>
<td>45</td>
</tr>
<tr>
<td>AB</td>
<td>50/M</td>
<td>Fasciotomy (Forearm)</td>
<td>175</td>
<td>20 (STSG)</td>
</tr>
<tr>
<td>AE</td>
<td>38/M</td>
<td>Open Fracture (Big Toe)</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td>RG</td>
<td>32/M</td>
<td>Infected Stump (traumatic AKA)</td>
<td>108</td>
<td>90</td>
</tr>
<tr>
<td>DL</td>
<td>23/M</td>
<td>Fasciotomy (Leg)</td>
<td>283</td>
<td>90 (Failed STSG)</td>
</tr>
<tr>
<td>NL</td>
<td>8/F</td>
<td>Open Fracture (Tibia)</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>JN</td>
<td>58/F</td>
<td>Non-Healing Wound, Foot</td>
<td>42</td>
<td>25</td>
</tr>
<tr>
<td>MN</td>
<td>22/M</td>
<td>Burn</td>
<td>72</td>
<td>25</td>
</tr>
<tr>
<td>EN</td>
<td>40/M</td>
<td>Decubitus Ulcer</td>
<td>101</td>
<td>75</td>
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<tr>
<td>SO</td>
<td>45/F</td>
<td>Decubitus Ulcer</td>
<td>15</td>
<td>15</td>
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<tr>
<td>PS</td>
<td>10/M</td>
<td>Avulsion Foot</td>
<td>78</td>
<td>30</td>
</tr>
<tr>
<td>AS</td>
<td>9/M</td>
<td>Avulsion Thigh</td>
<td>144</td>
<td>80</td>
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<tr>
<td>RS</td>
<td>14/M</td>
<td>Open Fracture (Radius/Ulna)</td>
<td>36</td>
<td>25</td>
</tr>
<tr>
<td>VT</td>
<td>70/M</td>
<td>Decubitus Ulcer</td>
<td>240</td>
<td>75</td>
</tr>
<tr>
<td>WU</td>
<td>9/M</td>
<td>Avulsion Ankle</td>
<td>112</td>
<td>25 (STSG)</td>
</tr>
</tbody>
</table>
Results

• 40 year-old patient, victim of human bite who underwent fasciotomy of the forearm and hand
  • Top: Injury
  • Second: Post-Debridement
  • Third: Post-STSG
  • Bottom: 30 days Post-STSG
Results

- 8 year-old male, victim of vehicular crash, avulsed wound without open knee injury
  - Top: Injury
  - Second: Post-Debridement
  - Third: 10 days post-BLD
  - Bottom: 20 days post-BLD
Results

- 70 year-old male, paraplegic with Grade IV Sacral Ulcer
- Top: Injury
- Bottom: 75 days post-BLD
Discussion

• Banana Leaf Dressing seems to function in a variety of ways
  • faster tissue repair, enhances epithelialization
  • promotes micro-circulation and DNA synthesis
  • Anti-microbial effect (reduces infection, promotes faster tissue repair)
• Biologic-occlusive dressing with probable antibiotic properties
• Dressing changes are less cumbersome and less demanding compared to wet-to-dry saline dressings
• Patients experienced no pain on dressing changes
Conclusion and Recommendations

• Banana Leaf Dressing may be a viable alternative armamentarium in wound care
• Need for direct comparison to an established standard of wound care (i.e. wet saline gauze dressing)
• Bio-chemical analysis of the actual contents of the banana leaf, both before processing and after processing
• Increased sample size
YOU MUST
UNLEARN WHAT YOU HAVE LEARNED
Dedicated To

• Joseph Keat T. Sison, M.D., FPOA