AN IN VIVO EFFICACY EVALUATION OF VARIOUS WOUND MANAGEMENT PRODUCTS FOR THEIR RELATIVE DEBRIDEMENT ACTIVITY, USING A PORCINE WOUND ESCHAR MODEL.

Authors: Kan Lam¹, Heather Somers², Dino Ochoa¹, Chelsey Muse¹, Josh Robbins¹, Renee Patton¹, and Paul Attar*¹

¹BRIDGE PTS, Inc., San Antonio TX; ² previously employed by Hydrofera, LLC, Willimantic, CT

* Corresponding Author

Abstract

Productive debridement is critical for the care and support of the healing of chronic wounds. However, there is a shortage of comparative data on the efficacy of various products and technologies with debridement potential, currently available on the market. In order to expand the understanding of how different products can affect wound debridement, a study was conducted using a porcine, full-thickness burn model, which has previously been reported in the literature. [Shi, L. et al 2009]

In this model, a series of twenty, 2cm, full-thickness burn wounds were created on the backs of pigs. Immediately after the burns were created, a variety of different products were applied to the eschar using a split-back study design. Using a time-course study design, debridement of the burn eschar was evaluated by clinical (visual) assessment. Depending on manufacturers’ recommendations, products were re-applied either every 24 hours or every 72 hours.

The results of this study demonstrate clear differences in the debridement activity of the various products tested, highlighting the utility of this animal model as a tool for screening debridement technologies in a pre-clinical setting.

Methods

Surgery

On Day 0, each pig was premedicated by intramuscular injection of atropine (0.5 mg/kg) (1/120, Spartanwe Laboratories Inc.), and anesthetized with Telazol (Telazol, Ltd, Wausau, 5mg/kg, intramuscular), (Fort Dodge Animal Health, Fort Dodge, IA), followed by masked inhalation of isoflurane (University LSP mixed with 3.5% oxygen). Following premedication, a small portion of the caudal dorsum and the dorsal and lateral thorax of the pigs were clipped with a # 40 Oster clipper blade and washed with soap. The pigs were then transferred to the surgical suite where general anesthesia continued.

Once in the surgical suite, the pigs were prepared for surgery using a chlorhexidine scrub and isopropyl alcohol in an alternating fashion three times to mimic the skin preparation in humans and the treatment site. Twenty (20) full-thickness wounds (20 mm diameter) were created using a heated brass rod with a diameter of 2-0, 2-0, or 1-0 pig; 10 per side of pig. The brass rod was heated to 100°C by immersion in water at a rolling boil. The brass rod was removed from the boiling water and dried quickly but thoroughly prior to placing it on the skin surface. The heated brass rod was placed on the surface of the skin for 45 seconds to create a third degree burn. No surgical debridement occurred after burning.

Treatments

Antimicrobial dressing was applied according to manufacturer’s instructions, and was changed at each dressing change day.

Post Surgical Management

All wounds were covered with a blue- absorbent pad (Underpad Dunsmore (Condui)) this is the secondary dressing. The exclusive layer of the blue pad was placed against the skin.

The blue pad was changed to the absorbent side against the skin if the wounds looked too wet (Optional, after day 7).

The pig was washed with a layer of elastic bandage over the blue pad to prevent movement of the dressings underneath.

Pain Management

To relieve post -wound pain (Day 0), Buprenorphine (0.005–0.02 mg/ kg, IV) was administered, and a Fentanyl patch (50ug/ day) (Fentanyl (Takeda), Tokyo) was administered, and a Fentanyl patch (50ug/ day) (Fentanyl (Takeda), Tokyo) was administered, and a Fentanyl patch (50ug/ day) (Fentanyl (Takeda), Tokyo). The wound pain was to be monitored at the wound site.

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Assessment

Measurements of Eschar, Erythema and Edema were made via visual (clinical) assessments on the following study days. D0, D1, D4, D7, D10, D13 and D14.

Physical Observations

Wound Measurements: For each wound, the calipers were used to measure the distance across the widest part of the wound as well as the narrowest part of the wound. The estimated wound area was calculated by using the equation for an ellipse (major axis x minor axis x π/4).

Euthanasia

All the conclusion of the experiment, the experimental animal were euthanized. Euthanasia was performed by the attending veterinarian, or designated, following sedation with Telazol (4-6 mg/kg). Euthanasia was by intravenous injection of Pentobarbital Na. 110 mg/kg (Euthasol, Diamond Animal Health, Inc., Des Moines, IA).

Results

Antimicrobial dressing, both alone and in combination with Enzymatic debrid. shows autolytic debridement activity in this porcine burn model. Wound healing assessments demonstrated some differences in healing rates between test and control dressings. A Student’s t-test was performed to allow pairwise comparisons of all test animals against the control dressing (p-values adjusted via Dunnett’s test). The results of that analysis can be found in Figure 2, below.

Analysis of the visual (clinical) assessments (Tables 1-3) suggests that the Antimicrobial dressing, both alone and in combination with Enzymatic debrid., resulted in a lower percentage of wound eschar when compared to the control. Furthermore, all of the products tested were non-irritating and generated little or no swelling.

Conclusions

Using amount of eschar as the primary clinical endpoint, Antimicrobial dressing and Antimicrobial dressing with Enzymatic debrid. were more effective than the other products and controls evaluated in this porcine, burn-eschar model. All products and controls were non-irritating.

References


Contact Information

For additional information about this poster or for a list of testing services provided by BRIDGE PTS, Inc. Please call us or visit our web site:

Poster Information:
BRIDGE PTS Contract Research Services: Dr. Paul Attar
(5) 210-842-5890
paul.attar@BRIDGEPTS.com
www.BRIDGEPTS.com

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Antimicrobial dressing = Hydrofera® Blue, Hydrofera, LLC
Enzymatic debrid. = 10% Collagenase+Clarinex, Smith & Nephew
Honey dressing = Medihoney, Wound and Burn Dressing, Derma Sciences Control = Talin™ ("Ouchless" Non-Adherent Pad), Kendall

Table 1: Wound size and percentage as a function of Day 0

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<thead>
<tr>
<th>Treatment</th>
<th>Day 0</th>
<th>Day 1</th>
<th>Day 4</th>
<th>Day 7</th>
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<tr>
<td>Control</td>
<td>100%</td>
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Table 2: Erythema

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Table 3: Edema

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<th>Day 7</th>
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