REPORT: **To assess second-degree burn wound treatment with Water-Jel®**

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INTRODUCTION

The beneficial effect of local cooling on burn wounds is not completely understood. Hydro gel dressings have been shown to have an immediate cooling effect on wound surfaces. Water-Jel® burn dressing is a emergency burn-care product designed to cool and protect while easing the pain of burns. Previously we have examined the use of Water-Jel® in reducing the temperature of burn wounds when applied at different time intervals. The result from this preliminary study demonstrated that the temperature declined sharply when Water-Jel® was applied. Tissue sections from this preliminary experiment appeared to show cellular differences on day 4 post burning when Water-Jel® dressing was applied. A thinner band of coagulative necrosis was observed in both the epidermis and dermis when compared to either the air exposed or gauze treated burn wounds. This findings suggest that tissue cooling seen when Water-Jel® was applied may deter the amount of eventual dermal necrosis. In order to substantiate the reduction in temperature and examine any possible indication of hypothermia, we performed the following experiments.

MATERIALS AND METHODS

Experimental Animals

Five young specific pathogen free (SPF) pigs weighing 20-25 kg were conditioned for two weeks prior to experimentation. Four animals were used for these studies and one additional animal served as a reserve conditioned animal. The animals received water and a basalt diet without antibiotics (Purina Control Factor) *ad libitum* and were housed individually in our animal facilities (meeting American Association for Accreditation of Laboratory Animal Care [AAALAC] compliance] with controlled temperature (19^0-21^0C) and light and dark (12h/12h LD).

Burn Wounding and Treatment

The experimental animals were clipped with standard animal clippers. The skin on the back and both sides of the animals were prepared for wounding by washing with a non-antibiotic soap (Neutrogena®). Antiseptics were not used because of their potential influence on the wound healing process.

Burn wounds were made according to the methodology of our established burn model[1]. On the day of burning (Day 0), the pigs were anaesthetized with ketamine (I.M.) and inhalation of a halothane, oxygen and nitrous oxide combination. Four specially designed cylindrical brass rods weighing 358 g each were heated in a boiling water bath to 100 ^{0}C. A rod was removed from the water and wiped dry before it was applied to the skin surface to prevent water droplets from creating a steam burn on the skin. The brass rod was held at a vertical position on the skin, with all pressure supplied by gravity, for six seconds, to make a burn wound 8.5 mm diameter x 0.8 mm deep. Immediately after burning, the roof of the burn blister was removed with a sterile spatula. The burn wounds were made approximately 2 cm from each other.

ASSESSMENTS

Temperature

Two animals received thirty burns, ten burn wounds were assigned to one of the following treatment groups: 1) air exposed, 2) gauze, or 3) Water-Jel® dressing. Water-Jel® dressing was applied at three different time intervals (t=0, 15 and 60 seconds) after burning. Gauze treated burns received treatment immediately after burning. The temperature of the burn wounds was recorded every five seconds post burning for a five minute period.

Hypothermia

Two animals received one hundred burn wounds and then were treated with Water-Jel® dressing. The temperature of one of the burns was recorded for one hour by using a hypodermic temperature probe that was placed underneath the skin at a consistent depth at a 10^0 angle (Figure 1). This procedure places the hypodermic probe in the papillary dermis at a depth of approximately 0.3 mm. The burn was made directly over the implanted temperature probe and the lowest skin temperature during this time period was measured. One hundred burn wounds represent a 25 % to 35 % total body burn and these animals were monitored for hypothermia. Rectal temperatures were recorded before burning, post burning and at 15 minute intervals to detect hypothermia. Animals also were observed for any physical signs of hypothermia.

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1 Davis SC, Mertz PM and Eaglstein WH: Second-Degree Burn Healing: The Effect of Occlusive Dressings and a Cream. J.Surg. Res. 48,245-248, 1990

RESULTS

The mean temperatures of this study were combined with the data from the previous preliminary study. A curve was generated from the data and is presented in Figure 2. Water-Jel® dressing applied at the different time intervals sharply reduced the temperature of the burn wounds. Applying the dressing immediately after burning prevented the temperature from reaching it's peak. When the time of assessment was extended to one hour the temperature levelled off (Figure 3). The rectal temperature was recorded for this time period and no significant decline in temperature was observed from the normal temperature of 39.7 ^{0}C (Figure 3). No other signs of hypothermia were observed during any of the experiments.

CONCLUSIONS

Water-Jel® dressing treatment reduced the temperature at the burn wound site without significantly reducing the core body temperature. This data suggest that the animals were not at risk for hypothermia following Water-Jel® treatment. We believe that the ability of this dressing to reduce the burn wound temperature may reduce the progression of injury as indicated by the preliminary histological results. The presence of a thinner band of epidermal and dermal necrosis four days post burning in Water-Jel® treated burns, would be an important justification for the use of the burn blanket as a first-aid therapy. However, more tissue specimens need to be examined to confirm this preliminary finding before a substantiated claim can be established. It is possible that Water-Jel® treatment might also stimulate epithelization of second-degree burn wounds.

FIGURE 1: TEMPERATURE ASSESSMENT

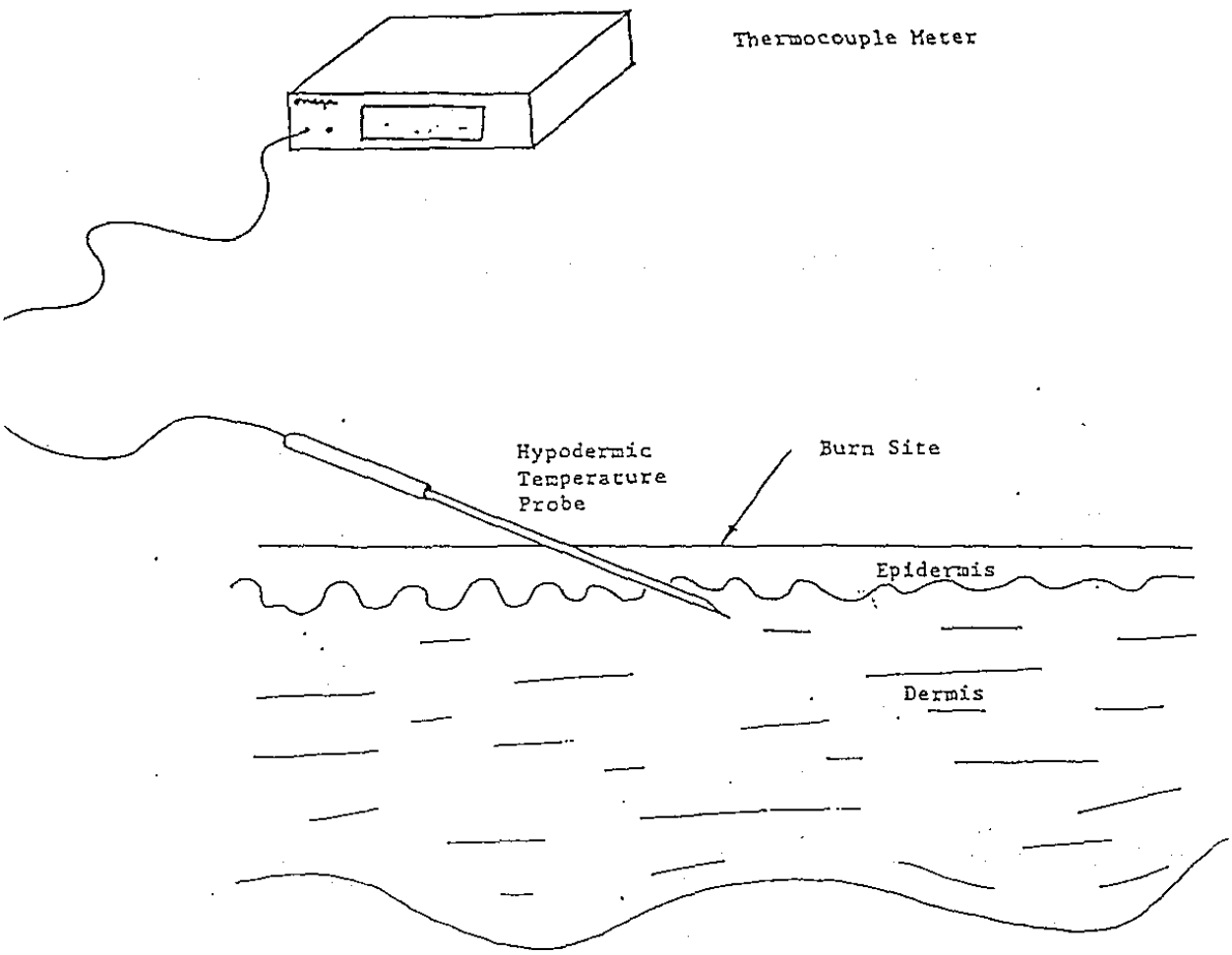

Figure 2:
The Effect of Water-Jel® Dressing on
Burn Wound Temperature (4 Animals)

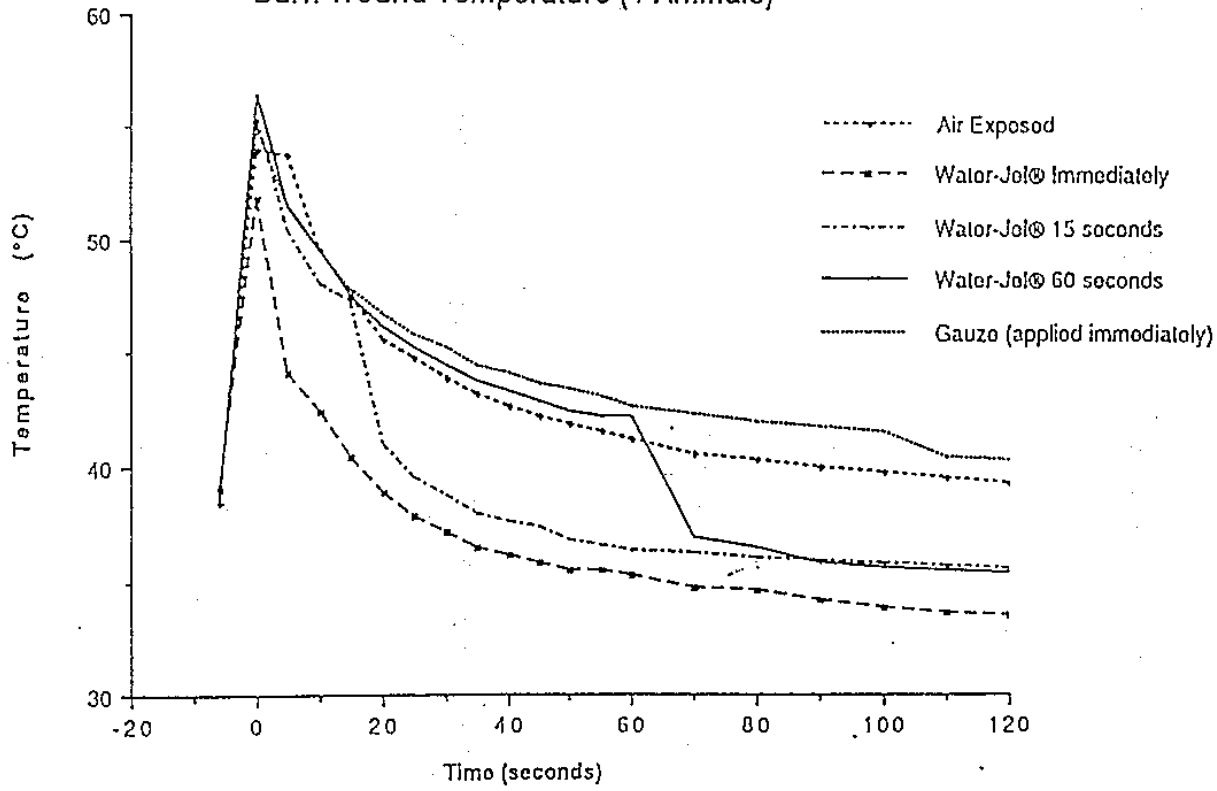

Figure 3:
The Effect of Hydro-Jel® Dressing on Rectal Temperature and Burn Wound Temperature (2 Animals)