

184 Comparison of Combined Surgical Tapes and Skin Adhesive vs. Either Method Alone for Laceration Repair in a Porcine Model

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Objectives: To determine whether the combination of surgical tapes and skin adhesive is superior to either method alone for laceration repair.

Methods: This was a prospective, longitudinal experiment on six anesthetized swine. Thirty-six full-thickness uniform linear wounds (6 cm in length each) were created using a metal template. Wounds were created on the upper back sides of each animal, and then closed using one of three methods: surgical tapes over benzoin, tissue adhesive, or a combination of both. The study was done in two parts. Group 1 (immediate excision) animals had skin excision for tensile strength testing following wound repair on day 0. Group 2 (delayed excision) animals went through recovery and healing after initial wound repair, then underwent delayed skin excision and wound tensile strength testing at day 35.

Results: The combination of both skin tapes and tissue adhesive provided the strongest immediate wound closure with a mean force required for disruption of 19.93 lb compared with 9.59 lb for tissue adhesive alone and 8.95 lb for skin tapes alone in group 1 wounds. The difference in immediate tensile strength is statistically significant ($p < 0.008$). In the group 2 delayed-excision wounds, strength after healing measured at day 35 was also superior in the wounds closed with the combination of skin adhesive over tapes. The mean force required for disruption was 188.9 lb for wounds closed with the combination of both methods, compared with 118.9 lb for adhesive alone, and 165.6 lb for tapes alone.

Conclusions: This study demonstrates that the combination of surgical tapes and skin adhesive provides superior wound closure strength to either of these methods alone in a porcine model.

185 The Role of Brain Natriuretic Peptide in Cutaneous Wound Healing: Proof of Principle

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Objectives: Brain natriuretic peptide (BNP) released from cardiac myocytes plays an important role in cardiac homeostasis through cyclic guanosine monophosphate (cGMP) activation. BNP also reduces cardiac remodeling and fibrosis. BNP's antifibrotic effects are mediated in part by blocking the effects of tumor growth factor-beta (TGF- β), a profibrotic cytokine that plays a significant role in cutaneous wound healing. It is unclear if BNP plays any role in cutaneous wound healing. We hypothesized that BNP levels would be elevated in thermally injured human skin and that human derived fibroblasts would respond to BNP exposure by increasing levels of cGMP.

Methods: Design: In vitro analysis of human skin. Subjects: Skin samples and cells from patients with and without thermal injury. Interventions and Measurements: We stained 3 skin samples from normal skin (taken at the time of elective cosmetic surgery) with antibodies to BNP and compared these with 3 tissue samples obtained from burned human skin taken during tangential excision of deep burns. Normal human-derived fibroblasts and keratinocytes were exposed to BNP in vitro and cGMP accumulation was evaluated. Data Analysis: cGMP levels were quantified and compared with analysis of variance (ANOVA).

Results: BNP was present in all specimens of thermally injured skin (especially around collagen, epithelial cells, and endothelial cells), but not in any uninjured skin samples ($p = 0.05$, single-tailed Fisher's exact test). In vitro grown fibroblasts showed significant increases of cGMP levels with increasing levels of BNP exposure (mean values: 0.6 ± 0.3 , 1.2 ± 0.2 , 4.6 ± 0.1 , and 5.0 ± 0.9 pmol/mL with BNP concentrations of 0, 10, 500, and 1000 nM, respectively, $p < 0.001$). The effect of BNP on keratinocytes was minimal and below the level of quantification.

Conclusions: These findings demonstrate proof of principle that human fibroblasts, and possibly keratinocytes, are responsive to BNP's effects in vitro and that BNP is present in injured skin, suggesting that BNP may play a role in cutaneous wound healing.

186 Correlation between Clinical and Histologic Assessments of Wound Reepithelialization

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Objective: Wound reepithelialization is one of the most important outcomes after cutaneous injury. Histologic evaluation of tissue biopsies is the criterion standard for wound reepithelialization; however, this method requires invasive biopsies exposing patients to pain, infection, and scarring. While gross clinical assessment of reepithelialization is frequently used, this method has not been validated. We hypothesized that clinical assessment of wound reepithelialization would not correlate with histologic assessments.

Methods: Design: Blinded animal experiment. Subjects: 4 isoflurane anesthetized swine. Interventions and Measurements: 48 partial-thickness injuries were created with an electric dermatome on both side of the pigs and treated with a split-thickness autograft or aerosolized autologous epidermal cells. Wound reepithelialization was assessed clinically and histologically at 7 and 14 days after injury using gross inspection and hematoxylin and eosin (H&E) assessments on histologic slides from full-thickness tissue biopsies. Data Analysis: Percentages of reepithelialization were compared with t-tests and Pearson's correlation between clinical and histologic assessments calculated.

Results: Mean percentages of reepithelialization by clinical and histologic measurements at 7 days were $51\% \pm 25\%$ and $35\% \pm 40\%$, respectively (mean difference 16%, 95% confidence interval (95% CI), 5-27). Mean percentages of reepithelialization by clinical and histologic measurements at 14 days were $100\% \pm 0\%$ and