Aerosolization of epidermal cells with fibrin glue for the epithelialization of porcine wounds with unfavorable topography.

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Abstract:

Aerosolized epidermal cell suspension was previously found to be effective for the epithelialization of full-thickness wounds. This suspension is less expensive than and requires a shorter preparation time than the currently used cultured epithelial autografts. Still, convex and irregular wounds present unfavorable conditions for homogenous dispersion of the aerosolized cell suspension. The authors hypothesized that the addition of fibrin glue to the aerosol of cells would reduce cell movement and ensure homogenous dispersion of the cells, thereby promoting wound epithelialization. The objectives of the study were to evaluate the healing of wounds with unfavorable topography after autotransplantation of an epidermal cell aerosol with and without fibrin glue. Six Yorkshire piglets were studied. An epidermal suspension was made from full-thickness groin skin. Dispase was used to separate the epidermis from the dermis, and trypsin was used to separate the epidermal cells from one another. Twenty-four hours later, full-thickness wounds with unfavorable topography were created adjacent to the vertebral column of six pigs. Twelve wounds were treated with an aerosol of epidermal cell suspension mixed with fibrin glue (study group), and 12 wounds were treated with the same suspension without the fibrin glue (control group). The percentages of total wound contraction and the epithelialized and nonepithelialized areas were evaluated 1, 2, 3, and 4 weeks after aerosolization. The histologic characteristics of the newly formed skin were examined by light microscopy using slides stained with hematoxylin and eosin. Study wounds were characterized by central epithelialization, whereas control wounds were characterized by peripheral epithelialization. Study wounds contracted at a slower rate than control wounds, but wound size was the same in

both groups after 4 weeks. The addition of fibrin glue facilitated epithelialization: Study wounds showed 75.5 +/- 22.4 percent (mean +/- SD) and 94.2 +/- 8.8 percent epithelialization after 3 and 4 weeks, respectively, compared with 46.3 +/- 9.5 percent and 47.9 +/- 13.1 percent epithelialization of the control wounds at the same times. These differences between the study and control groups were statistically significant ($p < 0.001$, paired t test). The addition of fibrin glue to an aerosol of epidermal cells significantly enhances the epithelialization of wounds with unfavorable topography in pigs.