The Transepidermal Absorption of Prostaglandin E_1 as a Topical Ointment: An Experimental Study of Application Over a Rat Skin Flap

Yuji Nakanishi, MD*
Tatsuo Nakajima, MD†
Yohko Yoshimura, MD†
Yasutaka Okamoto, MD†
Tai Yamada, MD†

Prostaglandin E_1 (PGE_1) ointment has been shown to improve the survival of skin grafts. However, the mechanism of the effects of PGE_1 through topical application is unknown. A rat skin flap model was used to determine whether PGE_1 is absorbed through the intact skin. The prostaglandin concentrations in the flaps in the study group were greater than those in the controls. It is suggested that PGE_1 is absorbed through the skin.

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From the *Department of Plastic and Reconstructive Surgery, Ise Keio Hospital, Keio University, and the †Department of Plastic and Reconstructive Surgery, Fujita Health University School of Medicine.

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Address correspondence to Dr Nakanishi, Department of Plastic and Reconstructive Surgery, Ise Keio Hospital, Keio University 2-7-28 Tokiwa, Ise City, Mie 516, Japan.

In a previous report, we described the clinical effects of the continuous infusion of prostaglandin E_1 (PGE_1) into flap feeding arteries on the prevention of flap necrosis and the improvement of local microcirculation and flap survival [1]. Basic research and clinical studies of PGE_1 ointment have been concluded in our laboratory. This work has resolved in the discovery that the concurrent use of occlusive dressing therapy augments the effectiveness of PGE_1 ointment. As a result, flap survival was augmented by about 12% in the treated group (Fig 1) [2].

When applied over areas of ulceration or tissue loss, PGE_1 ointment is absorbed directly into the wound [3]. However, when applied over a graft or flap with intact epidermis, the absorption of PGE_1 has not been proven. In this study, PGE_1 absorption through the skin was demonstrated in an animal model.

Materials and Methods

Preparation of PGE_1 Ointment

The ointment was prepared by dissolving injectable 40 μg of PGE_1 in minimal volume of physiological saline solution. This solution was then blended with 10 g of polyethylenmineral oilgel (plastibase). The ointment was used within 1 hour of preparation. A new batch was prepared each time the ointment was applied.

Experimental and Control Group Animals

The experiment was performed using 40 male Wistar rats weighing approximately 400 g. On the back of each rat, a 3 × 9-cm flap was raised with caudal base (Fig 2A). The flaps were created by dissecting beneath the panniculus carnosus and sutured back to its original position, creating a tight seal at the skin edge. The rats were divided into a study and control group. In the study group, PGE_1 ointment was applied evenly to the entire surface of the flap and covered by an occlusive dressing using a polyurethane sheet. The flap in the control group was covered with plastibase and an occlusive dressing. The flaps (five at each time in each group) were harvested at 0, 12, 24, and 48 hours after the application of ointment.

Measurement of PGE_1 Content in Tissue

Immediately after harvesting the flaps, an 8 × 8 × 1-mm section of dermis was removed and tested (see Fig 2B). To avoid the possibility that the PGE_1 on the exterior of the flap would contami-

