

SUCTION BLISTER TRANSPLANTATION FOR LEG ULCERS¹

Bent Hentzer and Takasi Kobayasi

From the Department of Dermatology, University of Copenhagen, Rigshospital, Copenhagen, Denmark

Abstract. Application of suction blister transplants to leg ulcers is an alternative symptomatic treatment to split-skin grafting, i.e. "pinch-grafting". Blisters are produced by the suction device Dermovac® at a suction pressure of 250-300 mmHg for 1-2 hours. The blister-roofs are cut off at the periphery and placed on the granulation tissue of the ulcer. The healing time for leg ulcers was 10-14 days. Excellent epithelialization was seen in 10 out of 12 ulcers. The advantages of the method are, that it is easy to perform, no scarring is produced, and the procedure is painless.

Key words: Suction blister; Transplantation; Leg ulcer; Epidermis

The methods employed for the transplantation of leg ulcers are usually limited to split-skin thickness grafting (pinch-grafting), performed mainly by plastic surgeons or dermatologists.

Previous authors have described how blisters are produced in normal skin by suction (10, 5). The mean blistering time varies according to the suction pressure, the patient's age and the skin temperature (1, 6, 7, 8, 9). Histological and ultrastructural studies have shown that the separation occurs at the dermo-epidermal junction (4). The roof of the blister can be employed for tissue culture studies of epidermal cells (3). The present authors studied this technique in detail.

MATERIAL AND METHODS

Ulcers. Twelve leg ulcers were treated with epidermal graft transplants. The ulcers varied in size from 2 to 13 cm across. All ulcers were cleansed and well-granulated, but there were no islands of epithelia. Eleven ulcers were due to venous stasis, one to both venous and arterial insufficiency. Two patients had diabetes mellitus, one had hypogammaglobulinemia.

Pretreatment of ulcer. Before grafting, wet dressings with

0.1% Trypure® (crystalline trypsin; Novo, Denmark), in physiological saline were applied to the ulcer for 1-2 days. On the day of transplantation the ulcer was washed thoroughly with sterilized saline and thereafter dried with sterile gauze.

Production of suction blisters. A suction blister device Dermovac® (Oy Instrumentarium, Helsinki, Finland) was used (5). The suction cups were cleaned with 70% alcohol and irradiated with UV-light for 2 hours. The abdomen was chosen as the most favourable donor site. The skin was rinsed and disinfected with a solution containing Rodalon® 0.1% phenoxyethanol 1% and isopropanol 50%. The suction cup was connected to the central suction unit of the hospital, and suction pressure adjusted to -100 mmHg. The cleaned cups were placed on the donor skin and, within 2 minutes, the pressure was allowed to decrease slowly to between -250 and -300 mmHg. Blisters sized 5-15 mm in diameter developed after 1-2 hours at this minus pressure.

Transplantation of epidermal grafts. The roof of each blister was cut off around the periphery with fine scissors and transferred to the ulcer. The distance between the grafts was 5-10 mm. It was carefully observed that the deep aspect of each graft was put in contact with the granulation tissue of the ulcer. Curled edges of the grafts were unrolled. The grafts were gently pressed down with a 0.9% saline compress for a few seconds to establish close contact with the surface of the ulcer (Fig. 1). The grafted ulcer was covered with one layer of fine-meshed gauze which was fixed to the surrounding normal skin with collodion. Wet dressings with 2% boric acid were applied over the grafted area. The gauze prevented detachment of the grafts when the dressings were changed. The gauze was finally removed after 10 days.

RESULTS

Excellent epithelialization and no rejection was observed in 10 out of 12 ulcers. Grafting was successful in both diabetic and non-diabetic individuals. Epithelial cell outgrowth from the grafts appeared on the 4th to the 7th day after grafting. The ulcers were entirely covered by epithelial cells within 10 to 14 days, depending upon the distance between the grafts (Fig. 2). Incomplete epithelialization was seen in two ulcers. The ulcer of the patient with hypogammaglobulinemia was severely contaminated with

¹ This study was presented to the XX Scandinavian Congress of Dermatology, Stockholm, June 5-8, 1974.

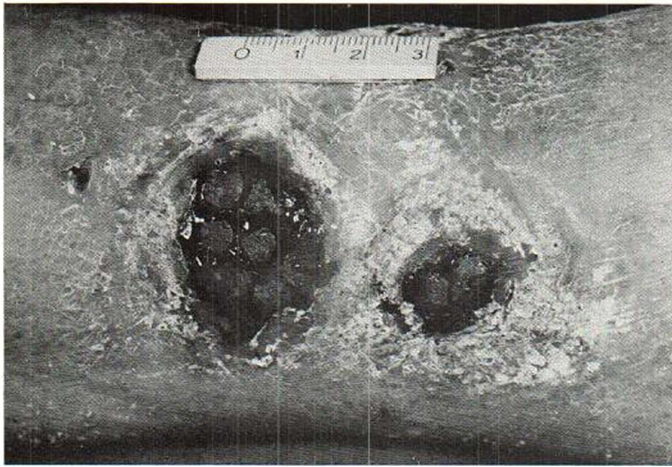


Fig. 1. Epidermal grafts placed on granulation tissue of the ulcer.

bacteria after the transplantation. In this case only a few grafts took and gave rise to some epithelialization. In another patient, who had a leg ulcer due to both venous and arterial insufficiency, a deep necrotic area in the ulcer centre rejected the grafts.

The epidermal injury at the donor site healed without scarring within 10 days, leaving a slightly diffuse pigmentation.

The results are summarized in Table I.

DISCUSSION

Application of epidermal transplants to leg ulcers was performed as an alternative method to pinch-grafting, especially to create more numerous foci for epithelialization. It has previously been shown by Falabella (2) that epidermal blister roofs can be transplanted to achromic areas arising from burns. The transplantation was performed in 4 cases and only one failed to take.

Suction blister transplantation is superior to pinch-grafting, when small blister roofs are used. Larger epidermal grafts had a tendency to curl at the edges, rendering transplantation time-consuming. The technique is easy to perform; no scarring is produced at the donor site; the procedure is painless, and local anesthesia is not needed.

Table I. *Result of grafting compared with etiology of ulcers.*

Partial rejection occurred in individuals with hypogammaglobulinemia and mixed venous and arterial insufficiencies. Grafting was successful in individuals with venous and diabetic disorders

Case no.	Etiology of ulcers		Result of grafting
	Vascular disorders	Complicating disorders	
1	Venous	Diabetes mellitus	Good
2	Venous	Diabetes mellitus	Good
3	Venous	Hypogammaglobulinemia	Contamination, partial rejection
4	Venous	None	Good
5	Venous and arterial	None	Partial rejection
6	Venous	None	Good
7	Venous	None	Good
8	Venous	None	Good
9	Venous	None	Good
10	Venous	None	Good
11	Venous	None	Good
12	Venous	None	Good

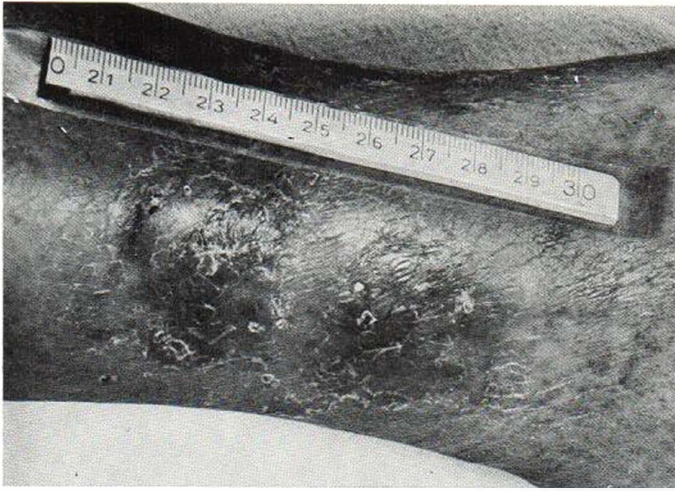


Fig. 2. Complete epithelialization on the 14th day after grafting.

REFERENCES

1. Comaish, S. & McVittie, E.: Suction blisters in bullous pemphigoid and other dermatoses. *Br J Dermatol* 89: 127, 1973.
2. Falabella, R.: Epidermal grafting. *Arch Dermatol* 104: 592, 1971.
3. Ingemansson-Nordqvist, B., Kiistala, U. & Rorsman, H.: Culture of adult human epidermal cells obtained from roofs of suction blisters. *Acta Dermatovener (Stockholm)* 47: 237, 1967.
4. Kiistala, U. & Mustakallio, K. K.: Dermo-epidermal separation with suction. *J Invest Dermatol* 48: 466, 1967.
5. Kiistala, U.: Suction blister device for separation of viable epidermis from dermis. *J Invest Dermatol* 50: 129, 1968.
6. Lenn, J. van der, Löwe, L. B. & Beerens, E. G. J.: The influence of skin temperature on dermal-epidermal adherence: Evidence compatible with highly viscous bonds. *J Invest Dermatol* 62: 42, 1974.
7. Löwe, L. B. & van der Lenn, J. C.: Suction blisters and dermal-epidermal adherence. *J Invest Dermatol* 50: 308, 1968.
8. Peachey, R. D. G.: Some factors affecting the speed of suction blister formation in normal subjects. *Br J Dermatol* 84: 435, 1971.
9. Peachey, R. D. G.: Skin temperature and blood flow in relation to the speed of suction blister formation. *Br J Dermatol* 84: 447, 1971.
10. Slowey, C. & Leider, M.: The production of bullae by quantitated suction. *Arch Dermatol* 83: 1029, 1961.

Received August 30, 1974

T. Kobayasi, M.D.
Department of Dermatology
Rigshospital
Blegdamsvej 9
DK-2100 Copenhagen
Denmark