Tissue expansion for closure of the donor site of a distant pedicle flap

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RM Zuker, C Fielding, S Beatty. Tissue expansion for closure of the donor site of a distant pedicle flap. Can J Plast Surg 1994; 2(4):155-158. Tissue expansion continues to provide new and exciting applications in reconstructive surgery. Tissue expansion has allowed for an increase in size of specialized tissue, particularly about the head and neck. It has also been demonstrated that the blood supply of pedicle flaps can be augmented, thus extending the surviving length of expanded flaps. Recently tissue expansion has been used with free flap transfer to expand the amount of tissue to be transferred and to facilitate donor site closure. In certain situations free tissue transfer may not be recommended and pedicle flap and particularly cross leg and cross thigh flaps are required. In addition to the prolonged unnatural positioning of the patient, the donor defect of these flaps has been harshly criticized. In this report tissue expansion is used to provide adequate tissue for direct closure of the donor defect thus minimizing the deformity.

Key Words: Pedicle flap, Tissue expansion

Expansion tissulaire pour la fermeture du site donneur au moyen d’un lambeau pédiculé à distance

RÉSUMÉ : L’expansion tissulaire continue d’offrir de nouvelles applications prometteuses en chirurgie reconstructive. Ce procédé a permis d’accroître la taille des tissus spécialisés, particulièrement au niveau de la tête et du cou. Il a en outre été démontré que l’apport sanguin au niveau des lambeaux pédiculés peut être accru, ce qui prolonge la survie des lambeaux. Récemment, ce procédé a été utilisé pour le transfert d’un lambeau libre qui a permis d’agrandir la portion de tissu à transférer et qui a facilité la fermeture du site donneur. Dans certaines situations, le transfert de tissu libre ne peut être recommandé et les lambeaux pédiculés, particulièrement les lambeaux de la jambe ou de la cuisse contralatérales sont nécessaires. En plus d’imposer au patient une posture qui n’est pas naturelle, le site donneur fait l’objet de critiques sévères. Dans le présent rapport, l’expansion tissulaire est utilisée afin de produire un segment de tissu suffisant pour une fermeture directe du site donneur, ce qui réduit les risques de déformation.

Tissue expansion continues to see new and innovative applications (1-6). Additional tissue may be provided utilizing this technique for conventional flap reconstructions. Recently tissue expansion of free flap donor sites has not only provided additional tissue for transfer but has also facilitated closure of the donor site (7,8). The cross leg and cross thigh flaps, although not commonly used, suffer from aesthetically unappealing residual donor site deformities. In this report we describe the use of tissue expansion at the time of pedicle flap elevation to facilitate donor site closure.

CASE HISTORY

A six-year-old boy sustained a major lawn mower injury to his left foot. He was initially resuscitated at a local hospital. The wound was superficially cleaned and, because of a strong family history of malignant hyperthermia, he was transferred by air ambulance to the major tertiary centre for adequate cleansing under general anaesthesia.

Shortly following arrival at The Hospital for Sick Children he was taken to the operating room where the wound was thoroughly cleansed (Figure 1). There was a major injury to the posterior medial aspect of the foot with extensive soft tissue loss, as well as fracture of the underlying calcaneus and division of the Achilles tendon. At the initial procedure, following thorough debridement of necrotic tissue, the calcaneal fracture was reduced and held in place with K-wires, the Achilles tendon was repaired, and the exposed tendon itself was covered with a bipedical fasciocutaneous flap. The residual soft tissue defects were skin grafted (Figure 2).

In order to achieve definitive cover, a flap would be required. A free tissue transfer was considered, but after appropriate consultation with the anaesthesia staff it was felt that shorter procedures would be safer for this patient with a strong history of malignant hyperthermia. Five days following the injury he was returned to the operating room where plans were made for a cross thigh pedicle flap to resurface the $7 \times 3$ cm defect. This flap was designed as a superiorly based fasciocutaneous flap on the medial aspect of the right thigh. The donor defect could not be closed and was covered with Biobrane (Dow Hickam Pharmaceuticals, Texas). Through the anterior incision, a pocket was created on the anteromedial thigh which would house a 150 mL tissue expander (Figure 3). After the required defect on the foot was prepared, the fasciocutaneous flap was secured in place (Figure 4).

As the patient was from a considerable distance away, he
remained hospitalized during the time of pedicle attachment. This allowed for injection of the expander on alternate days. After three weeks the expander was fully inflated and the pedicle flap was ready for division. He was returned to the operating room where the pedicle was divided and the flap was inset in the foot. The tissue expander was removed as was the Biobrane over the donor site defect. With relative ease the donor site was closed primarily (Figure 5).

The postoperative course was uneventful both in the thigh and in the foot with primary healing taking place (Figure 6).
With gradual mobilization the patient returned to full activity after three months.

At two year follow-up the patient was taking part in all activities with no limitation. He had a full range of motion of his ankle and forefoot with normal strength in dorsiflexion and plantarflexion (Figure 7). He wears normal footwear and has had no breakdown problems (Figure 8). The flap exhibits protective and light touch sensation throughout. Imprint analysis demonstrates that the flap is taking the majority of the weight on the patient’s left heel (Figure 9). The donor site on the right thigh remains satisfactory (Figure 10).

**DISCUSSION**

The continued use of tissue expansion provides reconstructive solutions for difficult problems. In addition to providing additional specialized tissue and augmenting the blood supply of traditional random flaps, tissue expansion also may play a role in improving donor site morbidity. This has been demonstrated in free tissue transfer to provide not only additional tissue for transfer, but also to facilitate donor flap closure. This same concept can be used for closure of the donor site of pedicle flaps with no additional surgical procedures required. The expanders are inserted in the tissue adjacent to the flap at the time of flap elevation. It is removed at the time of flap division. The expanded tissue can provide for primary donor site closure.
REFERENCES

CALENDAR OF EVENTS

JANUARY 7-11, 1995
Northwest Society of Plastic Surgeons
Manell Bay Hotel Resort, Lanai, Hawaii.
Contact Louis H McCraw MD, 510 NE 49th Street, Portland, OR 97213, USA

JANUARY 22-27, 1995
Ninth Annual British Virgin Islands Workshop in Plastic Surgery
Prospect Reef Resort, Road Town, Tortola
Contact Celia Steele, Butterworth Hospital, 100 Michigan NE, M.C. 38, Grand Rapids, MI 49503, USA

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Drs. Baker, Gordon, Stuzin and Baker present the 29th Annual Symposium on Cosmetic Surgery
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Contact Joyce Norris, 1501 South Miami Avenue, Miami, FL 33129, USA.
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FEBRUARY 10-12, 1995
American Association for Accreditation of Ambulatory Surgery Facilities – Ambulatory Surgery in the 90s
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Telephone (708) 949-6058.

FEBRUARY 20-25, 1995
Perspectives and Advances in Plastic Surgery Symposium
Olympic Valley, California
Contact Plastic Surgery Educational Foundation, Dept D, PO Box 4769, Carol Stream, IL 60197-4769, USA. Telephone 1-800 766-6955, Fax (708) 228-0117.

FEBRUARY 23-25, 1995
Annual Mayo Clinic Update on Plastic Surgery
Pheonix, Arizona
Contact Mayo Clinic Scottsdale, 13400 East Shea Blvd, Scottsdale, AZ 85259, USA. Telephone (602) 301-7447.

MARCH 4-6, 1995
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Dallas, Texas
Contact Department of Continuing Medical Education, University of Texas SouthWestern, 5323 Harry Hines Blvd, Dallas, TX 75235-9059, USA. Telephone (214) 648-2166, Fax (214) 648-2317.

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Contact Sara Burke. Telephone (415) 476-4251.

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Contact British Association of Plastic Surgeons, 35-43 Lincoln’s Inn Fields, London WC2 3PN, UK.

APRIL 13-14, 1995
International Society of Aesthetic Plastic Surgeons Postgraduate Instructional Course: Contrast Between Asians and Caucasians for Aesthetic Procedures
Kyoto, Japan
Contact Dr Kiyotaka Watanabe. Telephone 81-3-3572-3719, Fax 81-3-3289-2577

APRIL 16-21, 1995
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158
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