WHOLE-THICKNESS GRAFTS IN CORRECTION OF CONTRACTURES DUE TO BURN SCARS

THREE CASE REPORTS

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The surgical correction of a deformity of the trunk or extremity resulting from the contractural effect of a deep burn scar presents a most difficult problem. Because of the continued contracture of such a cicatized area, the scars overlying joints tend to cause increased deformity in time and, in young subjects, the growth of the individual may contribute toward the development of crippling disability. The continued trauma coincident to locomotion or other exercise causes these unstable scars to ulcerate readily. The epithelium overlying the scar is thin; the blood vessels are few; and stretching of the scar in an attempt to correct the deformity, as is often practised in the methods of physical therapy, produces ischemia which may be followed by ulceration.

In cases in which the scarred area is not too large, the thickened scars may be excised completely and the superficial defect repaired with large grafts of skin. Blair and Brown have advanced this form of treatment, and have reported many cases in which large scars have been completely replaced by thick-split grafts of skin. When, however, complete excision of the scarred tissue is not feasible by reason of the magnitude of the deformity or the paucity of cutaneous areas from which grafts may be cut, some other method must be adopted. In such cases it has been my practice to combat the contractural effect of the scar by the interposition of an elliptically shaped, whole-thickness, free graft of skin at a strategic point in the line of pull of the scar. A simple, linear, relaxation incision is made in such a way as to divide the scar at the point where it exerts greatest force. Such an incision establishes an elliptical, gaping wound into the floor of which the normal fatty or muscular tissue bulges. Scar tissue remnants are dissected away from the edges of the wound. A whole-thickness, free graft of skin, patterned to fit the defect, is introduced. The graft is sutured accurately into place and held immobilized by a dressing incorporating sponge rubber. Because the successful transplantation of large, whole-thickness grafts of skin depends largely on complete immobilization of the wound in the early postoperative period, a suitable plaster spica is applied. The reward of adequate postoperative immobilization of the area is a complete "take" of the graft. When healed, the transplantation forms an elastic bridge at the midpoint of a contracture upon which both sections of the scar may exert their force. Because of its elasticity, its mobility, and

its resistance to potential contractions, the whole-thickness graft of skin is preferred, although the details of operation and after-care are more burdensome than those of the Ollier-Thiersch or thick-split graft. Split grafts of skin, if applied to a soft tissue surface, undergo contraction evidenced by the development of wrinkles on the surface of the graft and by the subsequent decrease in width of the original relaxation incision.

ABBREVIATED CASE REPORTS

Case 1.—N. Y. Hosp. No. 73967: Massive burn scar of lower abdomen, groin and upper thigh; causing flexion contracture of thigh. H. H., male, age 10, while playing with fireworks, had been severely burned, five years previously, when his clothes caught fire. Examination, August 28, 1934, showed an extensive scar, measuring 32 cm. vertically and 20 cm. transversely, which extended from the midabdomen down to the midpoint of the left thigh. Flexion deformity of the thigh measured 30 degrees. The scar was hard, pale and greatly thickened (Fig. 1).

Operation.—August 27, 1937: Under ether anesthesia a "relaxation" incision, 12 cm. long, was made parallel to Poupart’s ligament. All the scar tissue was dissected away from the floor of the resultant elliptical wound, exposing the loose, areolar tissue overlying the femoral artery, vein and nerve. A whole-thickness graft was cut from just above the crest of the right ilium, according to a pattern of the wound, the resultant cutaneous defect being obliterated by undercutting the flaps and approximation of the edges. The graft was accurately sutured into place in the left inguinal region. A dressing, incorporating sponge rubber, was applied and immobilization was accomplished by means of a plaster hip spica. The graft was successfully transplanted, and "took" in its entirety. The patient was discharged on the seventeenth day postoperative.

Subsequent Course.—The flexion contracture of the thigh had been relieved (Fig. 2); the scar tissue above and below the graft had become softer and apparently thinner. Through the graft, the structures in the femoral triangle could be easily palpated.

Case 2.—N. Y. Hosp. No. 28343: Massive burn scar of right trunk and right thigh; causing partial scoliosis and flexion contracture of the thigh. M. C., female, age 12, had been severely burned six years previously, when her clothing caught fire. Examination, February 2, 1937, showed extensive, deep scars running from the scapular and axillary regions down the thoraco-epigastric region to the lateral and anterior aspects of the right thigh. A linear band of scar tissue was noted in the thoracolumbar region. Just inferior to the crest of the ilium, the scar was very thick and at this point it was adherent to the underlying bone (Fig. 3).

Operation.—December 21, 1937: Under ether anesthesia, "relaxation" incision, 10 cm. long, was made over the crest of the ilium. All scar tissue was dissected away from the floor of the resultant elliptical wound. A whole-thickness graft of skin, measuring 4x11 cm., was cut from the region of the left gluteal fold, according to a pattern of the wound. The graft was sutured in place and the donor site was closed by primary suture. Gutta-percha was placed over the graft and moderate pressure was made on it by tight adhesive strapping over a layer of rubber sponge. Immobilization of the extremity and lower torso was accomplished by means of a plaster hip spica. The graft was successfully transplanted (Fig. 4), except for an area, 2x2 cm. in size, in its anterior portion where complete sloughing occurred. This was apparently due to the marked ischemia of the adjacent scar. A Z-plastic operation was performed in the lateral thoracic region (Fig. 5). The patient was discharged on the twenty-fifth day postoperative.

Subsequent Course.—The scoliosis has been corrected (Fig. 5). The flexion contracture of the thigh will be cared for subsequently.

Case 3.—N. Y. Hosp. No. 182097: Annular burn scar of thigh of 22 years’ duration; with ulceration and impairment of venous circulation of the leg. F. G., male, age 34, re-
Fig. 1.—Case 1: Massive burn scar of lower abdomen and thigh. The scar was hard, pale, and approximately 2.5 cm. deep. Extension of the thigh was limited 30 degrees. On forced extension of the thigh, the scar became white in the area overlying Poupart's ligament.

Fig. 2.—Case 1: Whole-thickness graft in place where "relaxation" incision was made over Poupart's ligament. After operation, the scar became softer and thinner and extension of the thigh was no longer limited.

Fig. 3.—Case 2: Dense burn scar of right thoracic and abdominal wall and right thigh. Scoliosis and limitation of extension of the thigh were the major deformities.

Fig. 4.—Case 2: Photograph taken after operation, to show the extent of the whole-thickness graft of skin. The pull of the scar tissue band, in the anterior portion of the thigh, will be corrected at a future operation.
received severe dynamite burns of the right thigh at age 12. He was hospitalized for 13 months, during which time skin grafts were applied to the wound on several occasions, without success. Six years elapsed before the wound was entirely covered with scar epithelium. Four years ago, the patient was accidentally cut on the outer aspect of the right thigh. The ulcer which resulted persisted until the time of his admission to the New York Hospital. The patient had moderately severe diabetes.

Examination, March 3, 1938, showed an extensive deep scar of the anterior and lateral aspects of the upper right thigh. Its contractural effect was evidenced by an annular depression of the inner and posterior aspects of the thigh and the numerous large varicosities below the level of the scar. On the lateral aspect of the scar, there was a punched-out ulcer, 2x3 cm. in size (Fig. 6). Over the anterior thigh, a small sinus discharged frag-

![Fig. 5](image1)

![Fig. 6](image2)

![Fig. 7](image3)

ments of calcified fibrous tissue. Extension of the thigh in walking caused pallor of the scar.

Operation.—March 18, 1938: Cyclopropane anesthesia. After adequate dakinization of the ulceration and regulation of the diabetic state, the ulceration on the lateral aspect of the thigh was removed by an elliptical incision. The scar tissue was 1.2 cm. thick. A "relaxation" incision, 18 cm. long, was made parallel to the long axis of the thigh. The floor of the wound was freed of fibrous tissue, so that healthy, adipose tissue bulged into the defect. An elliptical free graft of the whole-thickness of skin was cut from the right lateral abdominal region according to a pattern of the wound. The donor wound was closed by linear approximation of the edges of the skin after adequate undercutting. The graft, measuring 8x20 cm., was sutured into place in the wound on the thigh and held immobilized by a dressing incorporating sponge rubber. A plaster hip spica was applied. The patient was discharged on the thirtieth day postoperative.

Subsequent Course.—On opening the dressing, 12 days after operation, it was apparent
that the graft had taken. Two small areas showed superficial sloughing. The patient was allowed to walk about after four weeks of bed rest. There was a complete release of tension in the thigh, the varicosities were less in evidence (Fig. 7), and the patient enjoyed much greater freedom of motion in the extremity.

DISCUSSION.—The interruption of a contracture due to a burn scar by "relaxation" incision, and the insertion of a whole-thickness free graft of skin, has been found to be an effective method of correcting skeletal deformity due to burn scars. This method of surgical treatment was referred to by Davis,\(^2\) as early as 1917. Since then, the surgical literature has shown so many reports of the treatment of dense burn scars by the use of pedunculated flaps of skin and subcutaneous tissue, that the impression prevails that such deformities cannot be corrected without long periods of hospitalization and operation in several stages. The method employed in these three cases is most ideally applicable to scars about the trunk and extremities in which a maximal, functional end-result is the aim, and the cosmetic result is relatively unimportant.

REFERENCES