Treatment of an Avulsed Skin-Flap Involving the Circumference of the Entire Lower Leg: *

A Case Report

ELIZABETH CORYLLOS, M.D.,** OLGARD DABBERT, M.D.,*** EDWARD TRACEY, M.D.,*** HOWARD RICHMAN, M.D.,† DONALD A. DAVIS, M.D.††

From the Department of Surgery, New York University Postgraduate Medical School, New York City

Introduction

THE EARLIEST FORM of surgical treatment —even in prehistoric times—and the form which is becoming increasingly important now, as the extent of mechanization increases, is the care of traumatic wounds.

Among about ten million accidental injuries a year in the United States, many are fatal or result in prolonged morbidity, with permanent disability, which might have been avoided had the primary treatment been more radical and definitive.

The different types of wounds influence the method of treatment. In the avulsion-type injury, with which we are presently concerned, it has been found [1-4, 6] that excision of all damaged tissue with immediate application of a full-thickness skin graft decreases the duration of disability and improves final results.

We have found the procedure recommended by Farmer [1, 2] most effective in avulsion injuries of the skin and subcutaneous tissues which result in pedicled tissue flaps. It does not matter whether these are large, involving a good portion of an arm or leg, or small, involving a finger tip.

Soon after injury these flaps almost always have good color and on pressure prompt capillary refill is found. If the greatest length does not exceed the width of the base, the flap can be returned to its bed after thorough cleansing, and sutured in place with a good result. When the flap length exceeds the width of the base the result is rarely good. Large flaps show duskiness and swelling of the terminal portions from as early as 3 to 4 hours after injury. If the flaps are returned intact to their original beds, then by the end of the first week areas of swelling and cyanosis are present; eventual slough is inevitable. It may be another two or three weeks before these areas can be excised; even then, the sites usually are not sufficiently clean and free of infection for immediate grafting. Kennedy [3] describes the mechanism of the death of such flaps:

> "At the original injury, veins and lymphatics are interrupted. Venous thrombosis takes place for an unknown distance. The arterial circulation continues to function and, with the flap sutured into its former bed, blood enters the flap readily while its means of return has been diminished. This results in edema. Also there will be death of some fat cells and reaction to this will increase edema. Undamaged veins and lymphatics will be pressed on, diminishing further the return circulation. As edema increases, the arteries are ultimately pressed on and less blood enters the flap until lack of oxygenation causes death of tissue."

This mass of devitalized tissue provides an ideal culture media for any bacteria,

* Submitted for publication June 15, 1959.

** Senior Resident in General Surgery.

*** Interns in General Surgery.

† Instructor in Clinical Surgery.

†† Professor of Clinical Surgery.

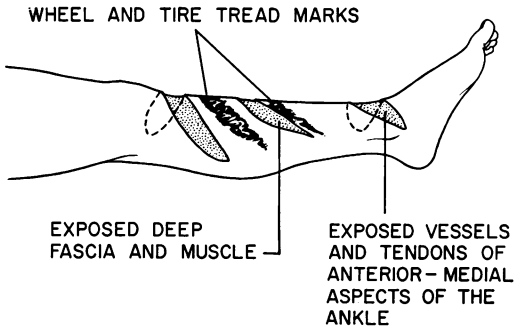

FIGURE 1.

even of the lowest pathogenicity, which may be present in the area.

The procedure most effective in these injuries is complete separation of the avulsed flap at the time of injury, usually accompanied by the excision of all subcutaneous fat down to the underlying deep fascia or aponeurosis, if this was not avulsed in continuity with the flap. The free skin is completely defatted and sutured back into place as a free full-thickness graft. If areas of skin have not been crushed, there frequently is complete healing in ten to 14 days. Even if the graft does not take entirely, areas where the skin may have been deeply traumatized can be excised and covered with small split thickness grafts (as in the case presented).

We have used this procedure successfully in the treatment of avulsed flaps from finger tips and in the extensive injuries, such as the one cited, where the entire lower leg was involved.

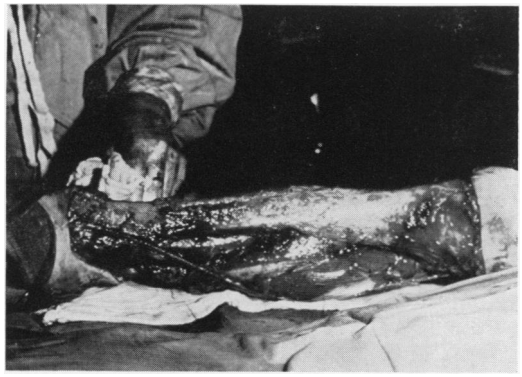

FIGURE 2.

Case History

(#3439-59) D. T., a nine-year-old boy, was admitted to Bellevue Hospital, January 9, 1959. While crossing the street, he was sideswiped by a truck. His left leg was run over by the rear wheel before the driver could stop. This resulted in a full-thickness avulsion of the skin and subcutaneous tissues of the circumference of his leg from the level of the popliteal space posteriorly and the patella anteriorly to just proximal to the malleoli of the ankle distally. No subcutaneous tissue was left on the leg. Parts of the deep fascia were avulsed including part of the muscle insertions on the medial aspect of the lower half of the tibial shaft. There was no bony injury. The cylindrical avulsed skin flap remained attached in two areas at the knee and in one site at the ankle

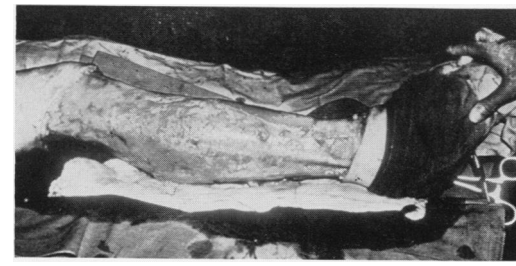

FIGURE 3.

(Fig. 1). The gloved hand could be inserted into the flap at the knee and passed around the circumference of the leg to the ankle.

In the operating room, under general anesthesia, the patient having received general supportive measures for shock, including 475 cc. of blood, the wound was thoroughly cleansed and irrigated. Operation was begun about 3½ hours post injury; already there was cyanotic mottling of most of the avulsed area. This was most intense and most edematous in the middle third of the leg, where there was a large area of homogeneous bluish-purple discoloration and pitting edema. The attachments at the knee and ankle were divided and a longitudinal incision from the knee to the ankle was made so that the flap could be removed in one sheet. This was then tacked down to a sterile table, fat side up, and defatted with scalpel blades and scissors (Fig. 2, 3). The denuded leg was irrigated and loose muscle fragments on the medial aspect were debrided. The fascia was intact over the posterior and lateral muscle compartments, but avulsed over the antero-medial

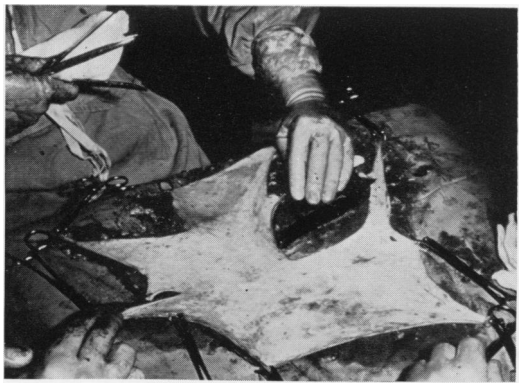

FIGURE 4.

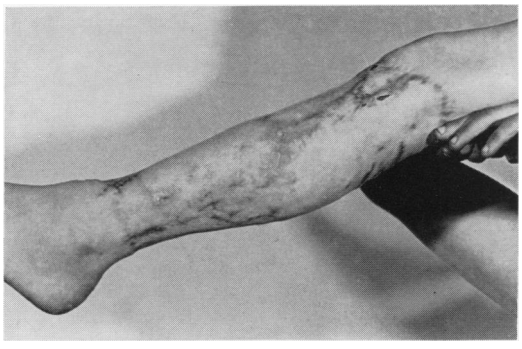

FIGURE 5.

FIGURE 6.

FIGURE 7.

aspect. This area was debrided and irrigated with saline solution. The bleeding from the avulsed muscle insertions into the medial aspect of the lower half of the tibia was controlled by gentle pressure. The medial fascia was loosely reapproximated with 3-0 chromic catgut.

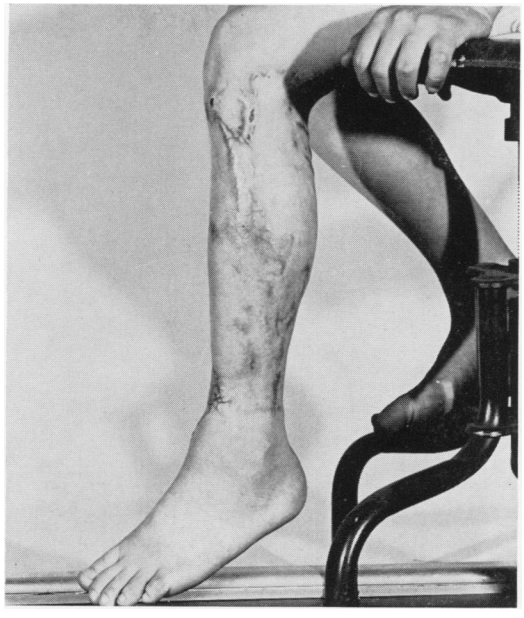

FIGURE 8.

The skin flap (Fig. 4) was then sutured back in place, using 4-0 silk, and trimmed, cut and repositioned to fit snugly on the denuded leg. No drainage perforations were used. A bulky pressure dressing of plain gauze and leg rolls into which multi-eyed catheters were inserted was applied, and the leg was immobilized in a posterior molded splint, extending to the gluteal fold. Acetic acid (0.5%) continuous soaks were started six hours postoperatively via the multi-eyed catheters.

He was given intravenous penicillin and chloromycetin; later, oral chloromycetin. The leg was kept elevated. The highest temperature was 38.6° C. on the second postoperative day, and remained between 37.5° C. and 38.3° C., until the 35th postoperative day, after which it remained below 37.2° C.

The graft had taken except for small areas abraded by direct contact with the tire treads. Small split thickness grafts were placed on the granulations on the 46th postoperative day.

The estimated area of the original flap saved was 80 per cent. The skin of the involved area closely resembles his normal skin on the opposite leg, and is soft and clean with normal hair growth. He was discharged home on the 61st postoperative day and has done well since (Fig. 5–8).

Summary

A case of extensive avulsion of a skin flap involving the circumference of the lower leg in a nine-year-old boy is presented. The original avulsed skin was defatted and laid back as a free full-thickness graft over the denuded area. Seventy-five to 80 per cent of the flap survived. The areas which failed were successfully covered by split-thickness grafts. The patient's postoperative course was benign and uncomplicated.

Bibliography

1. Farmer, A. W.: Treatment of Avulsed Skin Flaps. Ann. Surg., **110**:951, 1939.
2. Farmer, A. W.: Whole Skin Removal and Replacement. S. Clin. North America, **23**:1440, 1943.
3. Kennedy, R. H.: Present-Day Early Care of Traumatic Wounds. Surg. Clin. of North America, **35**:355, 1955.
4. Medl, W. T.: The Management of Avulsed Pedicled Skin. Am. J. Surg., **97**:447, 1959.
5. Medl, W. T.: Personal Communications.
6. Mulholland, J. H. and J. W. Mahoney: Massive Avulsion of Skin. Am. J. Surg., **83**:359, 1952.