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Flexion contractures of fingers: Contracture elimination with trapeze-flap plasty

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ABSTRACT

Scar flexion contracture of fingers is one of the most serious consequences of hand burns and patient disability after burn. Many kinds of reconstructive techniques are currently used and new procedures are being investigated. The author presents a new method of finger contracture reconstruction developed in the process of burn reconstructive operations on hands of over a thousand patients. Finger flexion contractures are caused by a semilunar fold, both sheets of which are scars. The sheets have a surface deficiency in length, which causes a contracture, and excess of skin in width, which allows contracture elimination with local flaps. The length deficiency extends from the crest of the fold to the joint rotation axis and has a trapezoid form. To compensate for skin deficiency and to address the contracture, it is necessary to convert both fold sheets into trapezoid flaps by radial incisions. Because the fold is of semilunar (crescent) shape, the flaps accept a trapezoid form. One or several pairs of the flaps are mobilized with the split fat layer from the fold's crest to the joint rotation axis level. The oppositely transposed flaps fully or partially cover the wound in the proximal interphalangeal (PIP) zone first. The remaining smaller wounds are covered with full-thickness skin grafts. The flaps have a reliable blood circulation; partial flap loss is an exception. The flap's surface does not decrease, the skin grafts shrink insufficiently, and the distant results, as a rule, are good. Two hundred and seventy-five patients were operated upon. Scar contractures were satisfactorily addressed in all patients. Incomplete extension was found in 46 patients; this was caused by interphalangeal joint injuries (ligaments, capsule, cartilage), ankylosis or boutonniere deformity.

1. Introduction

Scar flexion contractures of the fingers are a significant complication of burns of the hand, and they are a common cause of hand disability. The restriction of finger motion is a direct indication to reconstruction. Flexion contracture of the fingers poses a challenge for surgeons. The task of surgical treatment consists of complete contraction elimination by lengthening the flexion surface of a finger and skin resurfacing, as well as the restoration of hand function without

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contracture recurrence. To accomplish these tasks, various reconstructive techniques are used, and most of them were tested before suggesting a new method in this article. The results were unsatisfactory. Pursuing a more effective method for treating such contractures, a trapeze-flap plasty method was developed which became the preferred reconstructive technique. This paper describes the technique for finger flexion contracture reconstruction with trapeze-flap plasty.

2. Materials and methods

2.1. Patients

Two hundred and seventy-five patients (178 males and 97 females, ages from 6 to 64 years) with flexion contractures (total of 887 fingers) were reconstructed. In 32 patients finger contractures were on both hands. In 87 cases the palm contracture and volar syndactyly developed. All patients sustained partial deep and full-thickness burns from 8 to 58% (mean = 31%) of the total body surface area. Three types of finger scar flexion contractures were diagnosed: medial, total, and edge. Among 887 contracted fingers, 801 (90.3%) finger contractures were of medial type, 54 (6.1%) contractures were of total type, and 32 (3.6%) contractures were of edge type. All medial contractures were operated upon using trapeze-flap plasty. Follow-up results were observed from 6 months to 15 years after surgery. Full finger active flexion and active (passive in case of boutonniere deformity) extension was classified as good result.

2.2. Anatomical features of medial finger flexion contractures

Ninety percent of finger contractures were caused by the scar's fold located along flexion surface of fingers (Fig. 1A). The fold had a semilunar (crescent) shape. Both fold sheets of medial contractures were scars. The scar fold was located against only one interphalangeal (IP) joint, mostly proximal interphalangeal (PIP) joint, or it occupied both IP joints, or all flexion surface (Fig. 1A). Scar sheets of the fold spread from the fold's crest up to the joint rotation axis level. The crest of the fold corresponded to the medial line of finger flexion surface (medial contracture). The widest part of the fold was usually situated against the PIP joint or the middle phalanx. The scars fold's sheets have the skin surface deficit in length which

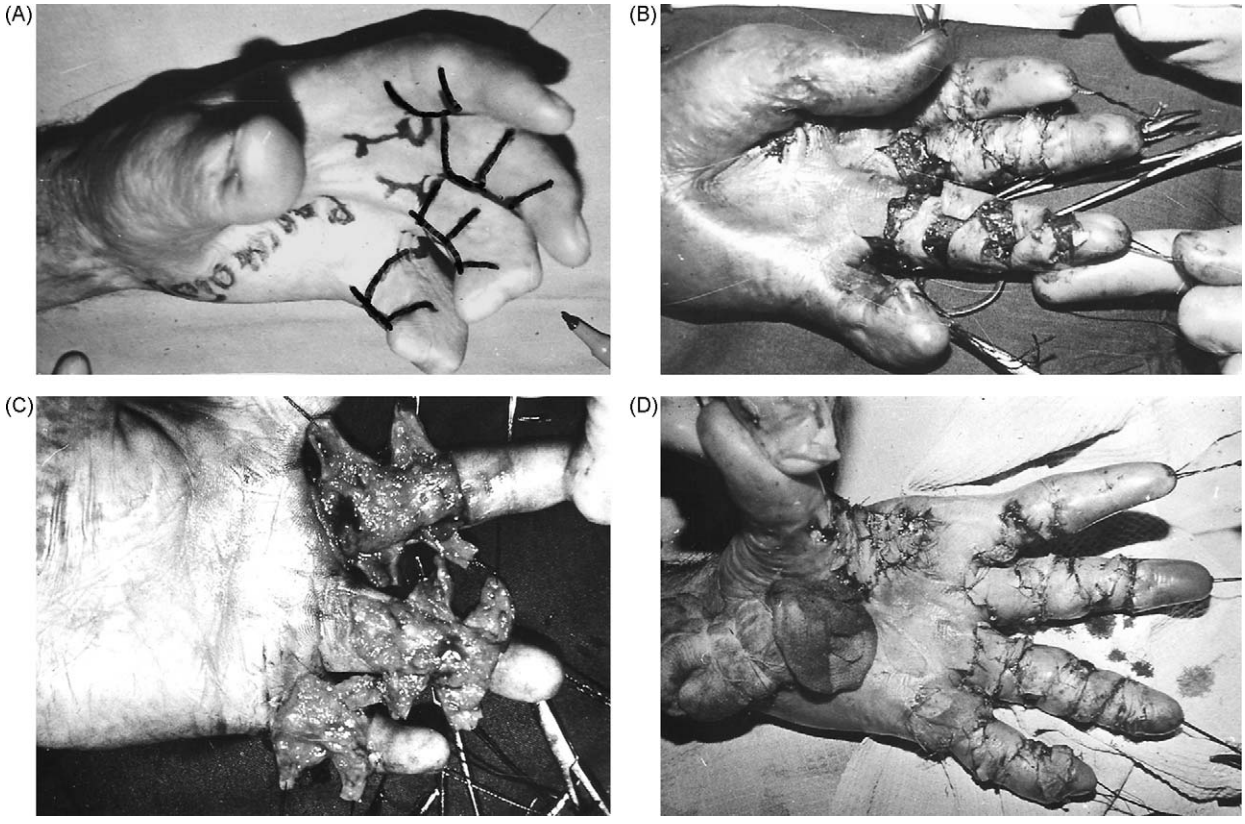

Fig. 1 – Postburn finger flexion contracture elimination with trapeze-flap plasty. (A) before reconstruction: crescent-shaped fold along middle line finger's flexion surface, both fold sheets are scars (medial contracture); planning: radial lines mark the flap contours along all sheets from folds' crest to joint axis level; (B) after radial incisions and finger extension, the flaps and wounds accepted trapezoid shape (trapeze-shaped sheet surface deficit in length); (C) trapezoid flaps mobilized with split subcutaneous fat layer; contracted finger flexion surface delivered from scars; after finger extension the tendon sheets did not expose, fat layer preserved their integrity; (D) opposite transposed flaps covered IP joint zones, small wounds at proximal phalangs covered with full-thickness skin grafts; thumb adduction and thenar contractures eliminated simultaneously.