

Index Finger Pollicization

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The thumb is a specialized organ with unique functions that cannot be replicated by any other digit. The most powerful technique for construction of a missing thumb is index finger pollicization. In this article, we outline our technique for index finger pollicization. Over a 30-year period, certain technical refinements have improved the function and appearance of these transposed digits. (*J Hand Surg* 2011;36A:333–339. Copyright © 2011 by the American Society for Surgery of the Hand. All rights reserved.)

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THE THUMB CONTRIBUTES over 50% of hand function. Its skeletal and soft tissue structure reflects a highly specialized evolutionary advancement devoted entirely to manipulation. Many of these structures are unique and not reproducible. The saddle-shaped carpometacarpal joint allows mobility in all directions. The intrinsic muscles provide a short moment-arm about the carpometacarpal and metacarpophalangeal (MCP) joints, thus affording fine manipulation and powerful pinch. The asymmetric condyles of the proximal phalanx allow the distal phalanx to pronate as the interphalangeal joint flexes, thus allowing more surface contact area for tip-to-tip prehension. The broad distal phalanx and the highly innervated pulp are also specific to the normal thumb.

Although these specialized components of the thumb cannot be reproduced, a close replica can be fashioned using the index finger. Technical maneuvers have evolved over the past 30 years to improve appearance and function. These refinements include placement of the incisions, positioning and fixation of the metacarpal head, rebalancing of the extrinsic and intrinsic muscles, and use of an adipofascial flap to improve the appearance of the thenar eminence in certain hypoplastic thumbs.

INDICATIONS

In congenital absence or hypoplasia, the unequivocal indications for index finger pollicization include hypoplastic thumb German (Blauth) types IIIB, IV, and V.^{1,2} In type IIIB thumb hypoplasia, the carpometacarpal joint is unstable. Although some surgeons, including the senior author, have noted success with vascularized metatarsophalangeal joint transfers for this condition, index finger pollicization remains the ideal reconstruction. In traumatic cases, index finger pollicization can also be indicated when the entire ray or most of the metacarpal is missing. The alternatives of toe transfer versus index finger pollicization should be carefully considered, especially in an adult whose cortical adaptation to the new thumb may not be as robust or flexible as that of a child.

CONTRAINDICATIONS

The patient has to be healthy and able to tolerate general anesthesia. The surgery is not appropriate for children with severe central nervous system deficiencies. The presence of associated congenital anomalies and syndromes should be investigated, perhaps with the aid of a geneticist. More common associations include Holt-Oram syndrome; vertebral anomalies, anal atresia, cardiovascular anomalies, tracheoesophageal fistula, and renal and limb anomalies association; and Fanconi anemia. The importance of testing for Fanconi anemia cannot be overemphasized. Although the incidence of this condition is low, the potentially devastating consequences can be thwarted with a simple blood test. In syndromic conditions or as part of radial longitudinal deficiency, the index finger is often abnormal. Although this alone is not a contraindication for pollicization, the expected functional outcome should be

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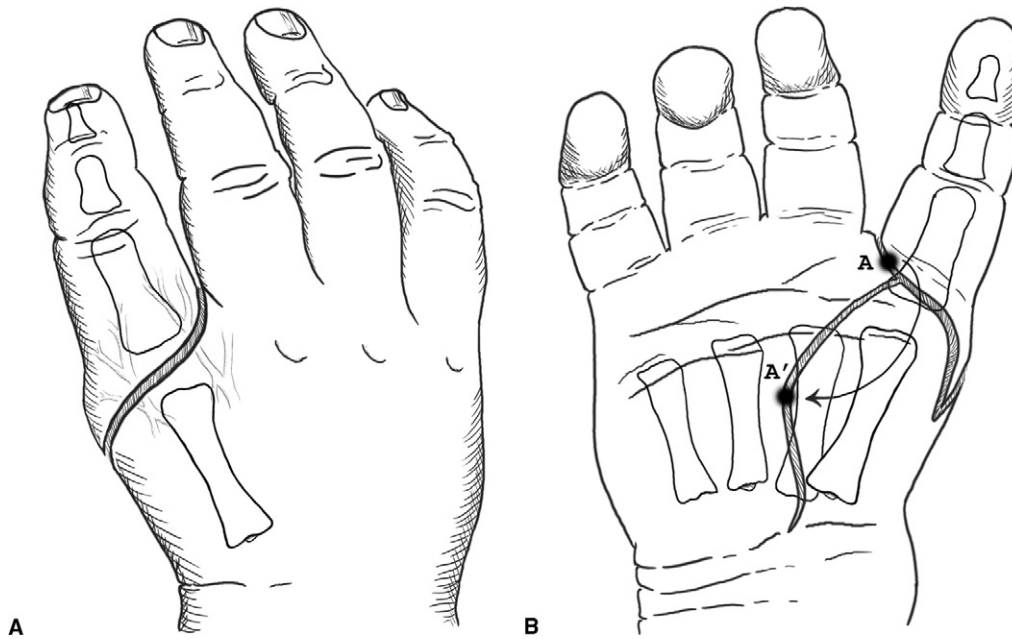


FIGURE 1: Incisions. A racquet-shaped incision is planned at the base of the index finger extending into the first web space. **A** The dorsal view. **B** The palmar view. A thenar flexion crease incision is planned in the palm. Point A at the base of the index finger will move to point A' at the thenar flexion crease incision.

stressed to the parents of the child preoperatively. A stiff index finger will make a stiff neo-thumb.^{3,4}

TECHNIQUES

Incisions

In congenital cases, adequate skin is usually present. The incisions are planned with a racquet-shaped incision at the base of the index finger and a palmar incision in the proposed new thenar flexion crease (Fig. 1).^{5,6} The palmar incision is made across the base of the index finger 1 to 2 mm proximal to the digitopalmar flexion crease. Dissection of the flap proceeds ulnarly to the long finger metacarpal level and is kept above the palmar fascia to avoid neurovascular injury. The radial dissection extends to the base of the index metacarpal to provide adequate placement of the metacarpal head. The dorsal incision extends transversely across the index finger MCP joint. Once the dermis is incised, upward traction on the skin will enable scissor dissection between the 2 layers of fat. Two large dorsal veins are usually located on either side of the MCP joint between these layers of fat. The veins are followed proximally for about 3 cm. Hemostasis must be meticulous to avoid blood staining of the tissues.

In type IIIB and IV hypoplastic thumbs, the incision wraps around the base of the nonfunctional thumb. The extra digit is then stripped of its skin, bone, tendon, and nail and is isolated as a vascularized adipofascial flap for augmentation of the thenar eminence in these deficient hands.⁷

Soft tissue dissection

Dissection through the palmar fascia reveals the common vessels and nerves to the index–long web space (Fig. 2). The distal arterial bifurcation is identified and its contribution to the long finger is ligated. Neural loops around either side of the vessel are identified and gently teased proximally. The A1 pulley is identified in the palmar digital midline and divided. The transverse metacarpal ligament within the web space is identified and divided.

Next, insertion of the intrinsic muscles to the index finger is identified, divided, and mobilized (Fig. 3). A few millimeters of distal aponeurosis are retained for subsequent suture fixation and reinsertion of these muscles. The first dorsal interosseous muscle varies in size and bulk, and in a normal index finger often has 2 parts. Along with the volar interosseous muscle and the lumbrical muscle, there can be up to 4 intrinsic muscles that require reattachment.

Skeletal manipulation

Once all of the soft tissues are adequately mobilized, the index metacarpal is exposed. Subperiosteal dissection is performed from the base of the metacarpal to the epiphysis within the metacarpal head. With the soft tissues retracted, 2 metacarpal osteotomies are performed: a transverse cut through the physis and a dorsal oblique cut through the base. The excised metacarpal is saved on the back table and its length is used to estimate the length of extensor shortening.

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