

# Single-Stage Separation of 3- and 4-Finger Incomplete Simple Syndactyly With Contiguous Gull Wing Flaps: A Technique to Minimize or Avoid Skin Grafting

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**Purpose** Staged separation of 3- and 4-finger syndactyly is commonly performed owing to concerns about vascular supply to the central digit and availability of flap skin. We performed single-stage separation of patients with incomplete syndactyly of multiple digits with adjacent contiguous dorsal gullwing flaps and avoided skin grafts in the majority of cases.

**Methods** Seventy-four webs of 31 patients with more than 2-finger incomplete syndactyly were included. Median age at surgical separation was 12 months (range, 5–123 months). All cases were incomplete syndactyly that did not extend to the fingernail level, with no bony involvement. A dorsal gullwing flap was used for all cases, which reconstructed the interdigital webs and partly covered the lateral side of the proximal phalanx. The technique relies on perfusion of the flap through the dorsal metacarpal artery perforator to aid flap mobility and double radial and ulnar z-plasties on each side of the flap to aid flap advancement. Skin grafts were needed if there were any remaining skin defects.

**Results** In 30 of 31 cases, a single-stage procedure was accomplished. One case was staged owing to abnormal digital arterial anatomy found on exploration. No skin graft was required in 21 out of 31 patients (67.7%). Median postoperative follow-up was 12 months (range, 6–36 months). All finger web depths were normal or slightly deepened.

**Conclusions** One-stage separation for 3- and 4-finger syndactyly with a dorsal gullwing flap is feasible and safe as long as at least 1 proper digital artery is preserved in each finger. The need for skin grafting is minimized. (*J Hand Surg Am.* 2017;42(4):257–264. Copyright © 2017 by the American Society for Surgery of the Hand. All rights reserved.)

**Type of study/level of evidence** Therapeutic IV.

**Key words** Syndactyly, Poland syndrome, congenital hand, synbrachydactyly.

SEPARATION OF 3- AND 4-FINGER syndactyly has traditionally been performed in 2 or more stages at intervals of 3 to 6 months owing to concerns about vascular supply and a shortage of flap

skin.<sup>1,2</sup> During the procedure, skin grafting is usually required for coverage of the lateral skin defects at the base of the fingers. Multiple surgeries and the donor site required for skin grafting are associated with

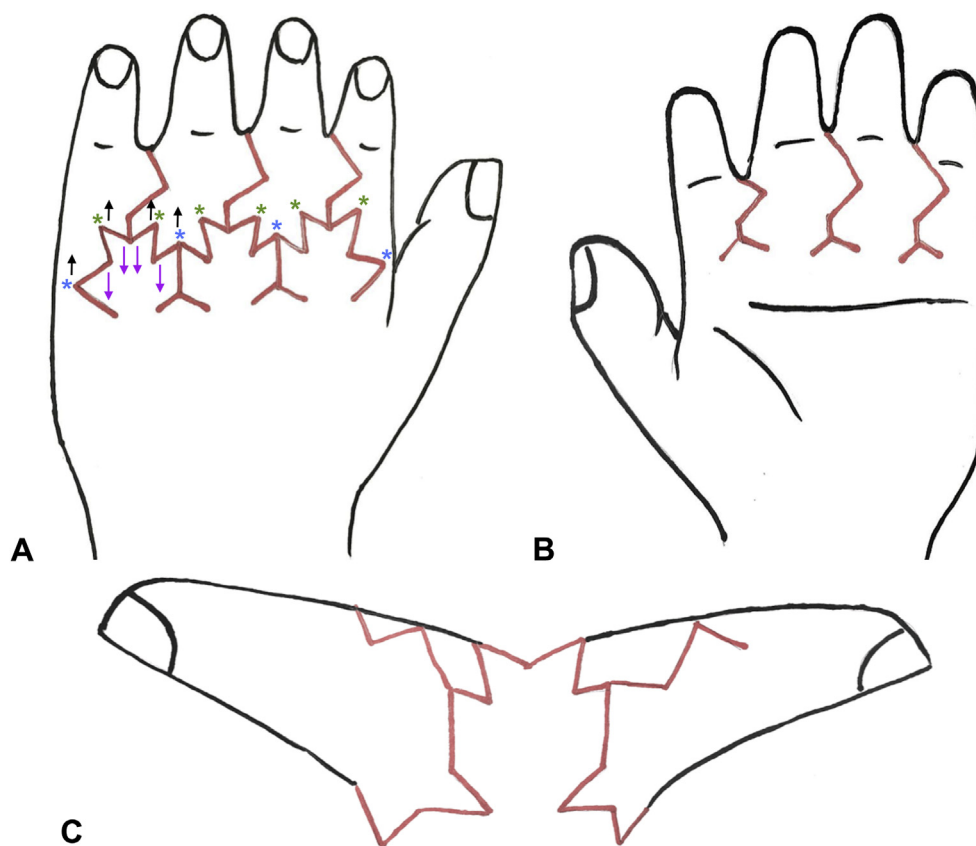
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**FIGURE 1:** Dorsal gullwing flap design. **A** Dorsal view. **B** Palmar view. **C** Web space view. The “wings” of the design resurface the base of the proximal phalanx and the entire flap is mobilized and advanced based on the dorsal metacarpal artery perforators. Double z-plasties are performed at the radial and ulnar borders of each flap, such that each corner advances from the point marked by the blue asterisk to the green asterisk. Black arrows show how a flap is advanced distally and transposed with its corresponding flap (purple arrow), which is brought proximally for each z-plasty.

additional postoperative pain and distress to patients. In addition, repeated exposure of the child to anesthetic agents from multiple surgeries is undesirable.

Single-stage separation of multiple-digit syndactyly has been described in Apert syndrome with good results.<sup>3,4</sup> In some cases, the use of preoperative computed tomography angiography was useful to better delineate abnormalities in the vascular anatomy.<sup>4</sup>

Whereas skin grafting is used by most surgeons following syndactyly release, a number of authors have described different flaps for web reconstruction that obviate or minimize the need for skin grafts.<sup>5–11</sup> These techniques use local tissue rearrangement to move skin distally to reconstruct the web space. The presence of the constant, reliable dorsal metacarpal artery perforator just proximal to the web space allows increased mobility of skin and subcutaneous tissue, facilitating web reconstruction.

In our experience, patients with incomplete syndactyly of multiple digits, particularly those with Poland syndrome, usually have excess skin along with

short fingers and redundant skin on the dorsum of the hand. This is particularly evident with concomitant brachydactyly and facilitates single-stage reconstruction without the need for skin grafts. Symbrachydactyly is characterized by brachydactyly, syndactyly (mostly simple and incomplete), and hypoplasia of the hand.<sup>12–15</sup> This kind of anomaly is usually seen in patients with Poland syndrome.<sup>16,17</sup>

We describe a new technique for web reconstruction using a dorsal contiguous gullwing flap that allows for single-stage separation of 3- and 4-finger syndactyly with no or limited requirement for skin grafting and describe our outcomes in a series of patients with symbrachydactyly.

## MATERIALS AND METHODS

### Patients

A retrospective review was performed of 31 patients with 74 syndactylous webs (excluding the first web)

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