Soft Tissue Release and Bilobed Flap for Severe Radial Longitudinal Deficiency

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Purpose To report the hand position, range of motion, functional results, and radiographic outcomes associated with treating radial longitudinal deficiency with release of constricting or deforming soft tissue and resurfacing of the radial skin deficiency with a bilobed flap.

Methods We recalled and reviewed patients with at least a 3-year follow-up who had undergone soft-tissue release and coverage with a bilobed flap. The study group consisted of 16 patients and 18 wrists. All patients underwent follow-up examination and radiographs. Outcome measures using Pediatric Outcomes Data Collection Instrument (PODCI), Disabilities of the Arm, Shoulder, and Hand (DASH), and visual analogue scale (VAS) scores were recorded.

Results At a mean of 9.2 years follow-up, the average final resting wrist radial deviation angle was 64° compared with 88° preoperatively. The average active wrist flexion-extension arc was 73°. Average DASH score was 27 (range, 5–54). PODCI global was 88 (range, 75–97), PODCI happiness was 86 (range, 70–100), and VAS overall satisfaction (range, 0–10) was 1.2 (range, 0–8). At final follow-up, no physeal growth arrests were noted on radiographs, and no patients to date have required ulnocarpal arthrodesis.

Conclusions Soft-tissue release and coverage with a bilobed flap should be considered in the treatment algorithm for patients with radial longitudinal deficiency. Outcome measures show that these patients maintain useful active motion, and along with their parents, are satisfied with both the appearance and function. Some recurrence of radial deviation was noted, which was similar to results previously reported following centralization/radialization procedures, although with a lower inherent risk of both physeal injury to the ulna and stiffness. In addition, potential future procedures are not compromised by this surgical approach. *(J Hand Surg Am. 2015;40(5):894–899.*

Type of study/level of evidence Therapeutic IV.

Key words Radial longitudinal deficiency, radial dysplasia, bilobed flap.

Radial dysplasia is a congenital longitudinal deficiency and presents as a spectrum from mild shortening to complete absence of the radius with or without thumb hypoplasia.[1] Bayne and Klug[2] provided a radiographic classification of radial dysplasia that has been modified by James[3] and Goldfarb.[4] The optimal treatment of the severely radially deviated wrist in radial longitudinal deficiency (RLD) has yet to be determined. Many procedures have been used for improving hand position including soft-tissue releases, intra-articular and extra-articular skeletal realignment, and muscular rebalancing and free skeletal transfer.[2,5–9] Centralization and radialization, with or without distraction, are the procedures that are most commonly used. Unfortunately, both centralization and radialization have high rates of recurrence,[10] stiffness,[11] and

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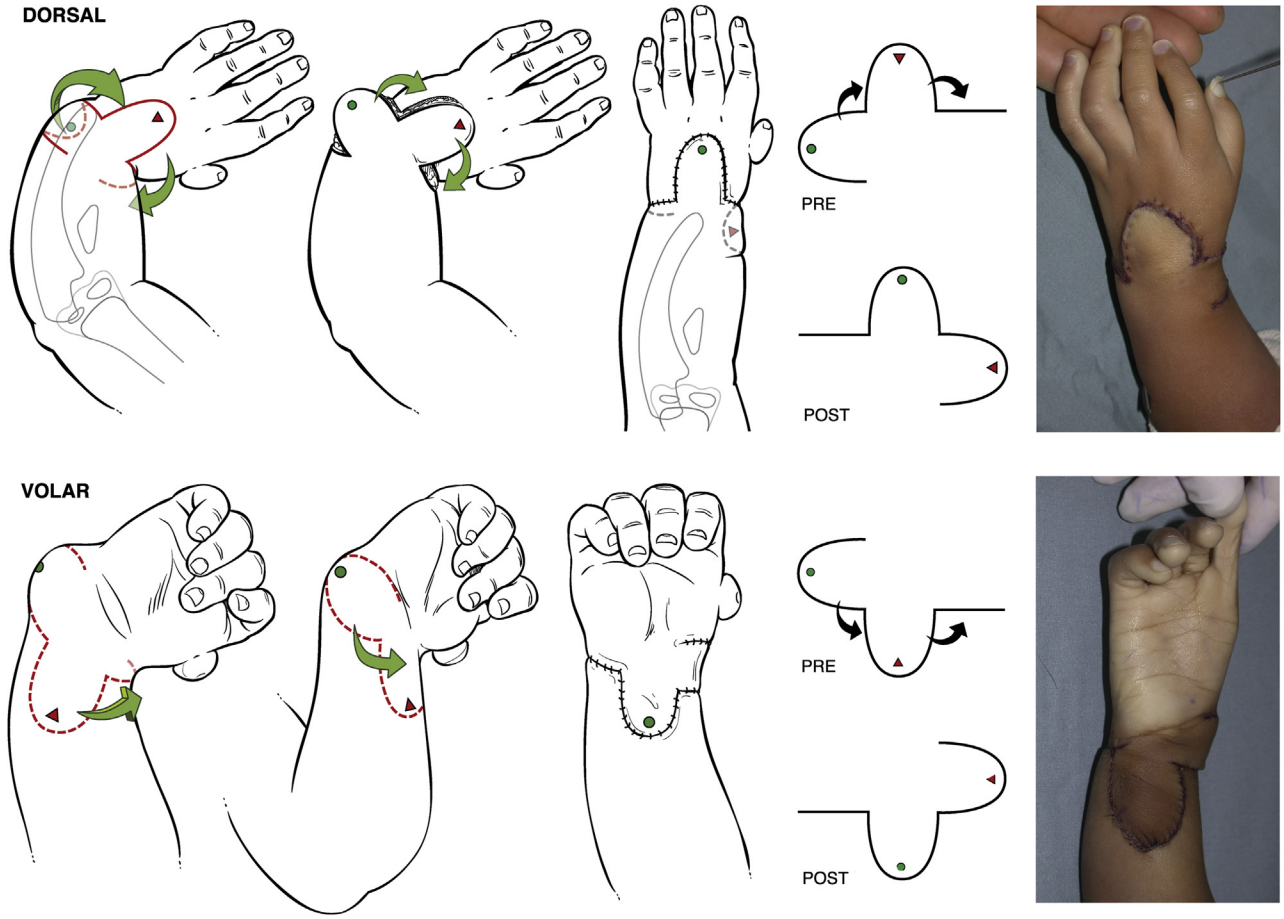

FIGURE 1: Diagrammatic representation of the planning and rotation for volar and dorsal bilobed flaps with clinical photographs of the final closure. (Diagram in part reproduced with permission from Wiesel SW. *Operative Techniques in Orthopaedic Surgery*. 2nd Ed. Philadelphia, PA: Wolters Kluwer; 2015. ISBN: 9781451193145. In press. Copyright © 2015 Wolters Kluwer.)

ulnar physis injury resulting in an additionally foreshortened forearm.[12] Because of these risks we instead use the technique of soft-tissue release with bilobed flap as our preferred initial procedure. This study examines the hand position, range of motion, functional results, and radiographic outcomes for these patients.

MATERIALS AND METHODS

Following institutional review board approval, we identified, recalled, and reviewed patients who had received a soft-tissue release with bilobed flap for RLD at least 3 years previously. Twenty-five patients met the inclusion criteria and were invited to participate. Two were excluded as they did not have a severe wrist deformity preoperatively, and 3 were excluded because they had undergone a subsequent metatarsophalangeal joint transfer for skeletal augmentation, and 4 were not available to participate. Sixteen patients with 18 wrists met inclusion criteria and were included in the study cohort.

Medical records were reviewed for each patient identifying associated diagnoses, thumb involvement, preferred prehension pattern, and bilateral versus unilateral RLD. Thumbs were classified according to the modified Blauth classification.[13–15] Preoperative clinical measurements including range of motion and clinical photographs were also reviewed.

Surgical method

A soft-tissue release was performed in each case[5] with a dorsal or volar bilobed flap to transpose the excess ulnar-sided soft-tissue to the radial side of the wrist. The technique, in brief, is the identification of the point of maximal skin deficiency on the radial side of the ulnocarpal articulation. A longitudinally oriented rotation flap from either the dorsum of the hand or the volar aspect of the distal forearm is marked. A second transversely oriented flap of equal dimension is then marked on the ulnar aspect of the joint, leaving a wide base between the 2 flaps (Fig. 1). The flaps are raised from the investing fascia of the