

Biceps Transfer to FDP–FPL Tendon Augmented with Fascia Lata to Restore Hand Function in Neglected Fracture Treated by Traditional Bone-setters

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Summary: Neglected bone fractures owing to the traditional bone-setter practices could lead to devastating complications. We aimed to describe the procedure and outcome of fascia lata augmentation for a forearm massive soft tissue loss case. Here, we report a case of a 14-year-old boy who presented to our hospital with a history of neglected right forearm fracture 4 years prior. He had been treated by a traditional bone-setter instead of seeking professional medical help, which resulted in wide-spread infection requiring debridement and, eventually, massive soft tissue loss, wrist radial deviation deformity due to epiphyseal growth arrest, and loss of all right-hand function. Intervention performed was biceps transfer to flexor digitorum profundus (FDP) and flexor pollicis longus (FPL) tendon augmented with fascia lata with anterior capsulectomy, bilobed flap, and transfixing wire of wrist joint, followed by ulnar centralization with wrist arthrodesis. The patient reported satisfaction postreconstruction, owing to the enhancement of hand function and appearance. He also showed significant improvement in activities of daily living and penmanship, and was even able to continue his old hobby as a traditional puppeteer. Autologous fascia lata tendon transfer connecting biceps to FDP and FPL tendon alongside ulnar centralization with wrist arthrodesis is a novel technique that has promising results to improve hand function and appearance. (*Plast Reconstr Surg Glob Open* 2023; 11:e5406; doi: [10.1097/GOX.0000000000005406](https://doi.org/10.1097/GOX.0000000000005406); Published online 17 November 2023.)

Forearm fractures are one of the most common fractures in pediatric populations, emphasizing the necessity for proper management to avert complications that could impede their growth and development.¹ In developing countries such as Indonesia, most cases of closed fracture in pediatric populations would first be presented to traditional bone-setters, known as nonmedically trained individuals practicing folk-medicine, often combining so-called knowledge with mystical beliefs.² This may lead to devastating bone and soft tissue infection, followed by irreversible necrosis and contracture.^{3,4}

Previously, fascia lata transfer has been used in soft tissue reconstructions, such as during upper brachial plexus injury as the extension of trapezius tendon,⁵ flexor reconstruction after a high-voltage trauma,⁶ and in abductor injury by transferring gluteus maximus and tensor fasciae latae to the greater trochanter.^{5,7} We report a patient with extensive soft tissue and motor function loss of the right forearm who underwent biceps transfer to flexor digitorum profundus (FDP) and flexor pollicis longus (FPL) tendon augmented with fascia lata followed by deformity correction.

CASE DESCRIPTIONS

A 14-year-old boy presented to our hospital with massive right forearm soft tissue loss, radial deviation, and loss of hand function. He had a history of a closed fracture on the middle third of the right radius and ulna. His family initially brought him to a traditional bone-setter, where the injury site was forcefully manipulated and prescribed for unknown combinations of medicinal drugs and herbal

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Fig. 1. Clinical picture of the patient's right forearm and hand depicting loss of mass, significant scarring, and radial sided deformity.

ingredients, resulting in an extensive soft tissue infection. This underlying cause of infection differentiated the case from the common Volkmann ischemic contracture. When the patient was finally brought to an orthopedic surgeon for soft tissue debridement, significant tissue loss had caused severe deformity of his forearm, in addition to loss of function to grasp and pinch. Returning right dexterity was crucial, especially due to social and cultural norms.

PHYSICAL EXAMINATION

On presentation, the patient's right forearm region showed massive muscle mass loss, leaving tendons enclosed with extensive scarring, combined with damaged radial diaphysis and epiphyseal growth arrest. This deformity resulted in a smaller and shorter forearm length compared with the contralateral side, radial deviation of the wrist, and loss of overall function (Fig. 1).

Sensory and vascular supply of the entire forearm and hand were spared, despite weak palpable pulsations in both the radial and ulnar arteries. Active and passive ranges of motion of the elbow and fingers were normal, but wrist range of motion was limited due to stiffness.

THERAPEUTIC INTERVENTION

A multidisciplinary team discussion was held involving the patients' parents, who gave full consent to the procedure. This case report was assembled according to the 2020 Surgical Case Report (SCARE) guideline.⁸

The patient underwent two-step surgical reconstruction aimed at recovering the hand function and appearance. The first procedure was bicep transfer to the FDP and FPL tendon with fascia lata augmentation. Longitudinal



Fig. 2. The FDP and FPL tendons were secured at the level of proximal to palmar wrist crease.

incisions were made at two locations; a proximal incision at the elbow crease for support and isolation of the biceps tendon, along with a distal incision at the lateral edge of the flexor carpi radialis tendon for support and isolation of the FDP and FPL tendons, which were then sutured together as one (Fig. 2).

This case required a 15-cm-long graft based on the distance size between the tendons of biceps and FDP-FPL. A subcutaneous tunnel was bluntly established between the two incisions to enable fascia lata graft gliding. The proximal portion was sutured to the biceps tendon, whereas the distal portion was sutured to the FDP and FPL tendons (Fig. 3).

The graft was placed under tension, whereas the elbow was flexed at 90 degrees to ensure sufficient functional excursion. The tenodesis effect was adjusted during surgery to enable passive finger extension when the elbow is fully extended. Deformity correction was performed afterward using anterior capsulectomy, a bilobed flap to provide soft tissue correction, and a transfixing wire. After the initial procedure, the patient was given a long-arm posterior splint and 6 months of routine elbow flexion and hand gripping exercises with weights, before more complicated tasks were introduced. Sufficient correction was then achieved with ulnar centralization and arthrodesis. The radial deviation deformity was corrected from 70 degrees to 20 degrees. Subsequently, a volar splint was applied for 2 weeks, followed by continuation of the previous rehabilitation program.

DISCUSSION

Restoration of hand motor function in our study possessed several unique challenges, including extensive forearm soft tissue loss, along with suboptimal vascular and sensory functions. For cases of muscle loss and/or



Fig. 3. Fascia lata is sutured proximally to the biceps tendon and passed through a subcutaneous tunnel, directed toward and sutured to the FDP and FPL tendon.

dysfunction, several reconstruction options are considered, such as nerve transfer, nerve graft, rotational muscle transfer, free functional muscle transfer, and tendon transfer.⁹

Although rotational muscle transfer and free functional muscle transfer could provide soft-tissue coverage and functional restoration, they require longer duration of surgery and are associated with complications, including functional losses on the donor site, which outweighs the benefit.^{10,11} Besides, both muscle transfer approaches were also unattainable in this case due to inadequate local donor muscle volume and vascular supply. When nerve graft or muscle transfer for functional restoration is not feasible, tendon transfer is an alternative that could provide rapid and consistent recovery, especially in cases of forearm muscle deficits.¹²

Goubier et al had successfully used the tensor fasciae latae to attach the biceps and FDP tendons, resulting in a partial but strong hand occlusion.¹³ Consequently, we refined the approach by incorporating not just the FDP for tendon transfer but also the FPL, which led to distal interphalangeal joint flexion for effective hand grip (FDP) and enhanced pinch strength (FPL). Additionally, our patient experienced radial epiphyseal plate growth arrest, causing a 25-degree radial deviation measured by goniometer, which reduced 20% of hand strength.¹⁴ Wrist deformity correction with arthrodesis and ulnar centralization was essential, not only for aesthetic appearance, but also to enhance the hand's strength and functionality. The patient's ability to write, grasp, and lift a bottle, and the patient's self-care improved after arthrodesis (final Sollerman score 56 of 80 points and final DASH score of 44%) (Fig. 4). He was



Fig. 4. Postoperatively, the patient is not only able to perform grip and pinch, but also starts to write down sentences.

also capable of performing a traditional puppet show. No adverse events were reported.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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