Allograft Tendon Interposition and Brachioradialis Tendon Stability Augmentation in Revision Surgery for Failed Darrach Distal Ulna Resections

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Abstract: Achilles allograft interposition is one treatment alternative for failed Darrach distal ulna resections, good results have been reported with its use but concern remains with the stability of the distal ulnar stump. The use of brachioradialis tendon passed through the radius and then divided into 2 branches to pass over the volar and dorsal aspect of the ulnar stump with the Achilles tendon interposition, seems to represent a more reliable, secure, and biological way of restoring palmar and dorsal stability to the distal ulnar stump; while it allows a better control of the tension given to the Achilles allograft interposed than that achieved when using only suture anchors as described in the original technique.

Key Words: failed Darrach, brachioradialis, Achilles allograft, interposition arthroplasty, distal ulna

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HISTORICAL PERSPECTIVE

Resection of the distal part of the ulna (Darrach’s procedure) can improve forearm rotation and pain in patients with posttraumatic stiffness, instability, nonunion, or substantial radioulnar length discrepancy with a low-complication and reoperation rate. But, when Darrach’s procedure fails, patients may experience pain, functional loss, and upper extremity disuse. Multiple treatment options for patients with failed Darrach procedure have been proposed, including implant arthroplasty, soft-tissue interpositions, Achilles tendon allograft interposition, osteoplasties, tendon transfers, wide ulnar excision, and combination of these techniques. The main objective of these techniques is to widen the space between the radius and ulna avoiding their impingement and to restore an adequate load transfer at the forearm.

INDICATIONS AND CONTRAINDICATIONS

Achilles tendon interposition is a good option in young active patients and in places where implant replacement is not available. Willis et al. in a series of 19 wrists in which a distal radioulnar joint arthroplasty was performed, reported that 2 were failures after interposition with fascia lata allograft because of instability of the ulnar stump and the patients had secondary ulnar-sided wrist pain, revision with a prosthesis allowed achieving only fair results in both cases. As to decrease the possibility of instability at the site of Achilles tendon interposition, we associated the use of brachioradialis tendon to augment the stability at the reconstructed joint. The use of brachioradialis tendon for ligament reconstruction and stability augmentation could also be a good option to associate when nonconstrained ulnar head arthroplasties are performed, because when these prostheses are used for failed Darrach procedures, the triangular fibrocartilage complex, which is needed to reinforce stability by its insertion in the head of the prosthesis, may not be present or may not be strong enough, and the stability achieved when relying on a capsular-retinacular flap alone may not be enough. Possible complications with the use of this technique are those related to the use of a tendon allograft, infection, and residual pain or instability.

TECHNIQUE

We report a case of a 42-year-old female who had had 6 previous operations at her left nondominant wrist after a distal...
radius fracture between 2001 and 2006; she presented severe
pain and significant functional limitation at the forearm
(30-degree pronation and 20-degree supination), wrist
(40-degree flexion and 20-degree extension), and hand
(metacarpopalpahalangeal joint stiffness). Preoperative
Disabilities of the Arm, Shoulder and Hand score was 86
points, and pain using a visual analog scale of pain was 9
points out of 10. At the moment of evaluation, pain and
functional limitations had taken the patient to completely
disuse her upper extremity.

Radiographic evaluation showed a previous Darrach
procedure with impaction of the distal ulnar stump against the
radius and the formation of a neojoint on the medial
cortex of the radius (Fig. 1). The patient referred severe pain
at forearm rotation and lateral compression.

The patient was placed supine, with the arm over the hand
table, under tourniquet and regional anesthesia. A previous
dorsal s-shaped incision over the distal ulna was used; the
sensory branches of the ulnar nerve and the extensor carpi
ulnaris tendon were protected. Intraoperatively, a large osteo-
phyte at the radial end of the ulnar stump was found to be the
main cause of forearm rotation loss; after the distal end of
the ulna was prepared by removing prominent bone and
creating a smooth surface for the allograft to rest against, pronation
and supination were restored. The stump had marked palmar and
dorsal ballottement. The Achilles tendon interposition techni-
que published by Sotereanos et al.2,3 was used to buffer the
ulnar stump adding significant padding to prevent palpable
crepitus during forearm rotation under compression. The
Achilles tendon allograft was prepared for implantation

FIGURE 3. Brachioradialis tendon divided into 2 hemitendons.

FIGURE 4. Hole on the radius metaphysis from the lateral cortex
to the medial cortex through which the tendon is passed to
stabilize the distal ulnar stump.

FIGURE 5. Brachioradialis hemitendons once passed through the
radius and placed volarly and dorsally around the ulnar stump to
increase stability.

FIGURE 6. A, Graphic showing Achilles tendon allograft
inserted in the interosseous space and secured by suture
anchors and brachioradialis tendon. B, Brachioradialis tendon
embracing the distal ulnar stump with the Achilles tendon
allograft interposed.
by removal of the calcaneal remnant; the distal end of the allograft is then rolled onto itself to create a large interpositional “pillow” that will act as a soft tissue buffer between the radius and ulna; and the proximal end of the allograft is then attached over and surrounding the distal ulna. Stability was increased by the creation of a radioulnar ligament using the tendon of brachioradialis: a second longitudinal radial incision over the distal third of the radius over the brachioradialis was used, the radial sensory branch was protected, the tendon was released from its muscular insertion proximally and left attached to the distal radius (Fig. 2), it was divided into 2 hemitendons (Fig. 3); and then passed through the radius metaphysis from the lateral cortex to the medial cortex (Fig. 4), through a hole performed with a 3.5mm drill, 2cm proximal to the neojoint and distal ulnar stump, where the impingement occurred. One hemitendon was passed volarly and 1 dorsally to the ulnar stump, and then placed circumferentially surrounding the ulnar stump (Fig. 5). Both tendon ends were then sutured to each other once the Achilles allograft was placed between the radius and ulna, with the forearm in neutral position and the elbow flexed, at a tension that allowed holding the ulnar stump with the interposed tendon firmly against the radius without interfering with pronation and supination; the brachioradialis tendon ends were tied on the lateral side of the ulna securing the allograft (Fig. 6).

FIGURE 7. Anteroposterior x-ray showing no impingement between both forearm bones.

FIGURE 8. Lateral view showing good alignment of the ulnar stump.

DISCUSSION

Failures after Darrach procedures are not uncommon and different salvage techniques have been described. Although this technique does not restore normal mechanics of the distal radioulnar joint, its purpose is to prevent painful convergence of the radius on the ulna and augment the stability at the distal reconstructed joint. The technique described by Sotereanos et al2 relies on suture anchors placed in the radius and passed through the ulna to provide stability of the ulnar stump (Fig. 4 of paper by Greenberg and Sotereanos3). The use of brachioradialis tendon passed through the radius and then divided in 2 branches to pass over the volar and dorsal aspect of the ulnar stump with the Achilles tendon interposition, seems to represent a more reliable, secure, and biological way of restoring palmar and dorsal stability to the distal ulnar stump; while it allows a better control of the tension given to the Achilles allograft interposed than that achieved when using only suture anchors. The use of brachioradialis has the advantage of preserving the distal insertion of its tendon on the radius, and that it can be tunneled at different levels according to the type of reconstruction performed.

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REFERENCES


