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Appendix

Surgical Procedure and Postoperative Care

All surgeries were performed by 1 of 2 senior, fellowship-trained orthopaedic hand and upper extremity surgeons (R.W.C. and A.L.O.) using a previously described technique[2], which is summarized as follows:

After the patient was anesthetized, dynamic fluoroscopic examination was performed to confirm a suspected diagnosis of IOM rupture and passively evaluate range of motion of the wrist, elbow, and forearm[2]. Wrist arthroscopy was performed to evaluate and treat pathology at the wrist. The most common findings at this stage were central tears of the triangular fibrocartilage complex (TFCC) and the lunotriquetral ligament, which were debrided, while peripheral TFCC tears were repaired arthroscopically. Following arthroscopy, a joint-leveling ulnar shortening osteotomy (USO) was performed utilizing 1 of 2 standardized techniques, with the goal of achieving negative postoperative ulnar variance of ≥1 mm.

In 19 patients, the USO was performed using a 3.5-mm 6-hole dynamic compression plate (DCP; Synthes) in a standardized fashion: a 10-cm incision was made over the subcutaneous border of the ulna, and the ulnar shaft was exposed subperiosteally in the flexor carpi ulnaris-extensor carpi ulnaris interval. The dorsal ulnar sensory nerve was preserved distally. The plate was then positioned over the ulna so that 3 holes were distal to the planned osteotomy site, 2 holes were proximal, and the 6th hole was directly over the osteotomy site. Once the position of the plate was deemed appropriate, it was fixed with 3.5-mm cortical screws in 2 of the distal screw holes. We then fixed the Synthes AO compression-distraction device proximally on the ulna, allowing the free arm of the device to engage the most proximal hole of the plate. Next, 1 of the 2 distal screws was removed, which allowed the plate to be rotated out of the field. An oscillating saw was then used freehand to create an oblique 45° osteotomy, and a

wafer of bone was removed corresponding to the amount of shortening required. The compression device was then used to close the osteotomy gap, and an interfragmentary screw was placed spanning the osteotomy site, followed by the remaining screws. Fluoroscopy was used liberally throughout the USO procedure to ensure that the distal radioulnar joint (DRUJ) was reduced and cortical opposition was adequate at the osteotomy site.

After use of the DCP for USO was phased out of the senior authors' practice, the remaining 14 patients in this study had USO performed with a dedicated USO plating system (TriMed). Surgical exposure was performed in a similar fashion as just described for the Synthes DCP. The TriMed osteotomy plate was then placed over the ulna with the oblong slotted hole positioned just distal to the planned osteotomy site. A 3.2-mm cortical screw was placed eccentrically in the slotted hole at a position furthest from the planned osteotomy site, and the 3 proximal screw holes were filled with 3.2-mm cortical screws. A combination drill guide was placed on the plate, and Kirschner wires were inserted to prevent rotation. Using a series of resection guides, osteotomy cuts were made with the plate in place, and a compression clamp was placed in holes located on the edge of the plate and used in a similar fashion as the AO device to compress the osteotomy site. The drill guide was again placed on the plate, and with the oblique drill hole now perpendicular to the osteotomy site, a 2.3-mm drill was used for the lag screw hole, and a lag screw of appropriate length was inserted, compressing the osteotomy site. The remaining screw holes were then filled with 3.2-mm cortical screws. Fluoroscopy was also used to ensure proper osseous apposition at the osteotomy and to ensure the DRUJ remained reduced.

Following USO, a bone-patellar tendon-bone (BPTB) allograft or autograft was obtained and prepared by burring the osseous ends of the graft until a smooth surface was achieved. After BPTB graft preparation, a trough was created using a burr on the ulna, orthogonal to the USO plate. One

end of the graft was secured into the ulnar trough with a 3.5-mm screw. The free end of the graft was then passed with a Kelly clamp radially to the proximal part of the radius beneath the radial wrist extensors and digital extensors, emerging at the brachioradialis-extensor carpi radialis longus interval. The graft was oriented to approximate a 21° angle to the long axis of the shaft to recreate the position of the native interosseous membrane central band. With the forearm in neutral to mild supination to tension the graft, the graft was secured into a trough made on the proximal part of the radius at the level of the pronator with a 3.5-mm screw. After wound closure, the patients were managed with a long arm splint in 90° of elbow flexion for 10 to 14 days postoperatively. At that point, they were transitioned to a thermoplastic splint and were started on light elbow and wrist range-of-motion exercises under the guidance of a therapist. At 4 to 6 weeks, patients began active range of motion with therapy, and generally did not begin active forearm rotation until 8 weeks postoperatively. Radiographs were made and a clinical examination was performed at each follow-up visit.