Modified Anti-pronation DRUJ Instability Splint

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Marisol Monasterio, MOT, OTR, CHT
Kathy E. Brou, OTR, CHT
Reconstructive Orthopedic Center of Houston, Houston, Texas, USA

THE DISTAL RADIOULNAR JOINT

The Distal Radioulnar Joint (DRUJ) is a diarthodial trochoid joint that allows rotation and translation of the radius in relation to the ulna. In pronation, the radius translates volarly and proximally in relation to the ulna, whereas the ulna translates dorsally and distally in relation to the radius. The area of contact between the radius and the ulna decreases from 60% to 10% when moving from neutral to extreme supination and pronation because of the lack of bony congruency due to the unique radii and curvature of the radial sigmoid notch and the ulnar head.[1] The lack of bony congruency creates a highly mobile DRUJ in comparison to the Proximal Radioulnar Joint.[2] There are six soft tissue structures that augment the DRUJ stability. Those six soft tissue structures are the Triangular Fibrocartilage Complex (TFCC); ulnocarpal ligaments: Ulnolunate, Ulnotriquetal, and Ulnocapitate; the Pronator Quadratus; the Extensor Carpi Ulnaris tendon sheath; the Interosseous Membrane; and the Joint Capsule.[1–3]

Due to the lack of bony congruency, DRUJ dysfunction is common. DRUJ dysfunction may be caused by traumatic or degenerative tears of the TFCC.

FIGURE 1. *Thermoplastic material molded on the ulnar forearm border covering ½ mid-aspect of the forearm.*

Treatment options depend on the severity of the tear, the structures involved, and the timeline of presentation after injury. The patient can be treated nonoperatively in both degenerative and traumatic cases, or may undergo surgical management. Initial conservative treatment typically involves immobilization in an anatomically correct position. This position helps to approximate the torn vascular edges making it more conducive for healing. Painful symptoms that are also caused by central tears are treated similarly with immobilization, edema control, and then followed by strengthening of the dynamic stabilizers.[3]

Most preoperative protocols call for immobilization in a long arm Munster cast with the elbow at 90° and the forearm/wrist in neutral for six weeks, and then a thermoplastic ulnar gutter splint is used for the following six weeks.[3,4]

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Correspondence and reprint requests to Marisol Monasterio, MOT, OTR, CHT, Reconstructive Orthopedic Center of Houston, P.A., 4126 SW Freeway #330, Houston, TX 77027. e-mail: <venezuela-2@hotmail.com>.

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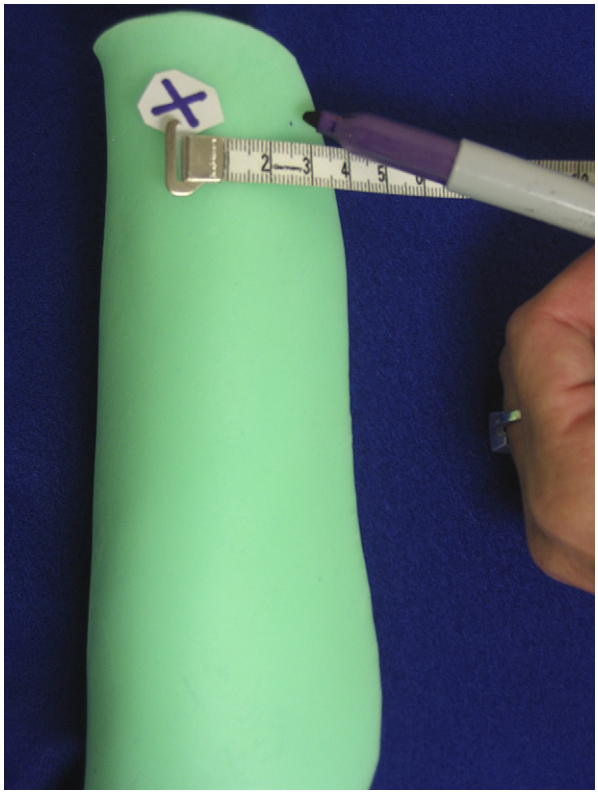

FIGURE 2. *Place the splint on the patient and using the dorsal distal ulnar head as a landmark, measure approximately 3 cm from the dorsal distal ulnar head, moving transversely and radially toward the mid forearm on the splint. Mark (with a permanent marker) this position and then punch a 1/8 in hole.*

FIGURE 3. *One inch strap threaded through the oblong opening from the inside of the splint to the outside, leaving the end with the 1/8 in hole available to be riveted to the splint and the D-ring.*

The Modified Anti-Pronation DRUJ Instability Splint

The Modified Ulnar Gutter Forearm-based Splint uses a static progressive strapping component that helps to stabilize the distal dorsal ulnar head into a more volar/proximal position by limiting pronation. The specific design of the splint positions the forearm in neutral rotation restricting pronation.[1] This allows the DRUJ ligaments to heal by increasing contact between the radial sigmoid notch and the ulnar head, and by preventing distal ulna migration.[2] The patient will have less ulnar sided wrist pain by adjusting the amount of tension over the ulnar head with the use of the strap and padding.[3] The proprioceptive input assists in limiting pronation, while allowing the patient to be able to perform activities of daily living (ADL).

Materials

1. 7 × 10 in Thermoplastic material
2. Approximately 2 × 2 in perforated thermoplastic material
3. 12—2 in Strap
4. 31—1 in Strap
5. 1—1 in D-ring
6. 6 in—Adhesive *Velcro* Hook
7. 1 × 2 in *Contour* foam
8. Permanent marker
9. Rivets and rivet setter
10. Hole punch
11. Fabrication time: Approximately 1½ hours.

Fabrication Procedure

1. Heat the thermoplastic material until soft. Mold it from the distal ulnar wrist crease to the proximal ulnar forearm (along the ulnar border) covering the mid-aspect of the forearm. (Note: use material that has good memory). (Figure 1).
2. Place the splint on the patient. Using the dorsal distal ulnar head as a landmark, measure approximately 3 cm medially and mark with a permanent marker. Then, punch a 1/8 in hole (Figure 2).

FIGURE 4. *Soft padding stuck to the strap in alignment with the ulnar head.*

FIGURE 5. *Splint finished with 2 in strap placed proximally.*

3. From this hole, make a 1 in longitudinal opening, which runs parallel to the ulna approximately 5 mm toward the dorsal distal ulnar head prominence in the splint. (Note: We used a two-hole punch to make the oblong opening, smoothing it out by heating the edges with hot water.)
4. Make a 1/8 in hole in one end of the 1 in strap approximately 1 cm from its end. Thread *this* strap through the oblong opening from the inside of the splint to the outside, leaving the end with the 1/8 in hole available to be riveted to the splint on the outside. (Do not rivet the strap yet).
5. Fabricate a 2×2 cm piece of perforated material around a 1 in D-ring and two hole punch at the center aspect. Rivet the D-ring and the strap to the splint with a fast setting rivet (Figure 3).
6. Pad the 1-in strap area with a 1×2-in contour foam in alignment with the ulnar head. This will help to prevent a pressure sore (Figure 4).
7. Apply 1.5-in adhesive hook *Velcro* to the palmar/distal end of the splint to secure the 1 in strap and a 3 in adhesive hook on the proximal end of the splint to secure the forearm strap.
8. When you have completed the splint fabrication, apply the splint on the patient so that 1 in strap starts out on the dorsum of the distal wrist and runs inside the splint, around the wrist to the volar aspect, and then passes through the D-ring for a counterforce action. The end of the strap is attached to the *Velcro* piece at the palmar side of the splint (Figure 5).

Protocol

The patient is instructed that the splint does not block end range supination and pronation but, provides them with sensory input as to when they could be pushing the joint too far. The sensory feedback from the splint occurs at about 30° of forearm rotation. For best results, we encourage the patient to wear the splint for six to eight weeks. We also teach how to substitute at shoulder, to avoid rotation of the forearm. The splint allows the wrist to flex/extend and radial/ulnar deviate within restraints of splint.

At six to eight weeks, we begin active range of motion of the forearm for supination/pronation. At eight to ten weeks, we begin gentle progressive strengthening of the wrist, forearm, and grip.

Precautions and Conclusions

Special attention should be given to observe for pressure sores and hypersensitivity of the dorsal ulnar and radial sensory nerve branches. If the patient is hypersensitive, change the 1 in strap for a 2 in strap. Patient safety and comfort can be controlled by the amount of pressure that he or she provides to the distal ulna head. We also re-enforce educating the patient on how to use the splint so they can avoid end range forearm rotation.

Patients have reported that this splint has been effective in helping to train them not to exceed 30° of forearm rotation during ADL. As a result from a decrease in irritation to the ulnar wrist structure, soft tissue healing is promoted.

The simple fabrication, of this low profile splint, is a great clinical tool for conservative DRUJ treatment and it is easy for the patient to use. This splint is also less bulky than the sugar tong splint thus allowing greater ADL function. Because of these factors, we have also noticed better patient compliance.

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