

Arthroscopic Reconstruction of the Triangular Fibrocartilage Complex

Chapter 11 Using a Free Tendon Graft

Introduction

Instability of the distal radioulnar joint (DRUJ) results from injury or laxity of the ligaments responsible for stabilizing the joint. Of these, the triangular fibrocartilage complex (TFCC) plays a crucial role in maintaining DRUJ stability. It may be impossible to repair the TFCC due to degenerative changes in the TFCC, or the repair might be inadequate to maintain DRUJ stability if the extrinsic stabilizers are also torn (e.g., radioulnar ligament [RUL] interosseous membrane). In such patients, DRUJ reconstruction is possible provided there are no arthritic changes in the DRUJ. This technique, using a free tendon graft, was first described by Mansat et al in 1983¹ and was modified and popularized by Adams and Berger in 2002.² This procedure is used to reconstruct the ligament and restore function, thus providing multidirectional stability. A tendon graft, preferably from the palmaris longus (PL), is woven through transosseous tunnels in the distal radius, converging at the fovea through a distal ulnar transosseous tunnel. This procedure can be performed as an open surgery or as minimally invasive arthroscopically assisted surgery. The arthroscopic technique uses several incisions, the length of which depends on the surgeon's experience in protecting the underlying structures. A more experienced surgeon will use shorter incisions.

Operative Technique

Patient Preparation

The procedure comprises two steps: (1) harvesting the tendon graft and (2) reconstructing the TFCC. In the first step the hand is flat on the table arm. During the second step, 5 to 7 kg axial traction is applied to the hand with Chinese finger traps. A pneumatic tourniquet is applied, and the arm is fixed to the table. The entire procedure is carried out under regional anesthesia.

Harvesting the Tendon Graft

The tendon graft must be strong and long enough to stabilize the DRUJ and thin enough to pass through the bone tunnels. Usually, a PL tendon graft suffices. If the PL is absent, a hemi flexor carpi radialis or a plantaris tendon graft may be harvested. The PL tendon graft is harvested through a small incision at the distal flexion crease of

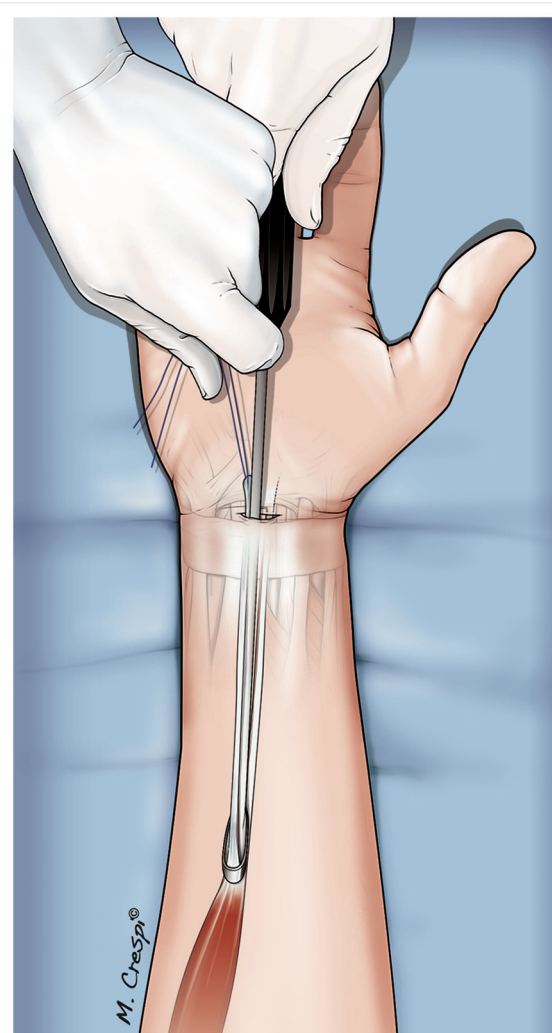


Fig. 11.1 Drawing showing the harvest of a palmaris longus tendon graft. The severed distal end of the tendon is secured by a suture passed through the eyelet of the tendon stripper. With tension maintained on the tendon, the tendon stripper is pushed down subcutaneously to the musculotendinous junction to harvest a full-length graft without requiring another incision.

the wrist joint at the base of the carpal tunnel. A tendon stripper is used to harvest the graft (Fig. 11.1). A grasping suture is applied to the two ends of the tendon graft using 4-0 Ethilon (Ethicon, Somerville, New Jersey,

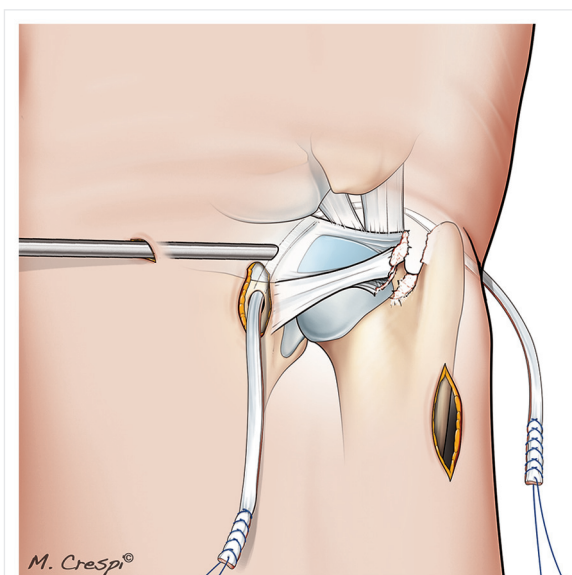


Fig. 11.2 Drawing of the tendon passing through a tunnel in the distal radius.

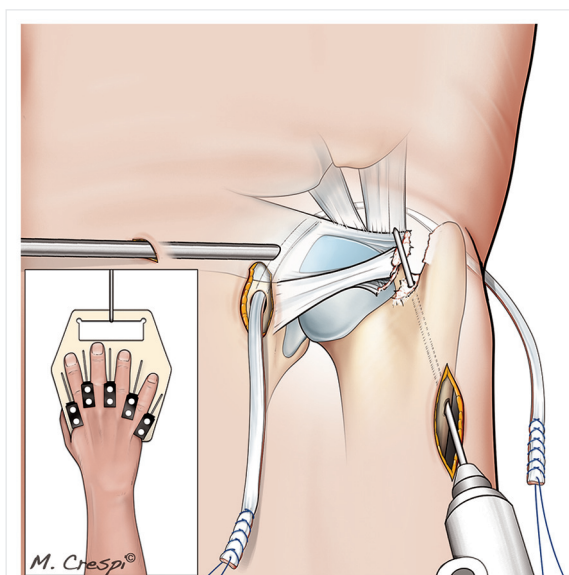


Fig. 11.3 Drawing showing the guidewire being positioned in the center of the fovea.

USA) or similar nonbraided suture. The suture is passed several times (Krackow suture), ~1.5 cm on both ends of the tendon graft to create a strong, grasping suture construct, and the ends of the suture are left long for retrieval while passing the tendon graft through the transosseous tunnels.

Making the Radial Tunnel and Passing the Tendon Through

In this step, axial traction is applied to the wrist. The incision used for harvesting the tendon graft is extended proximally on the volar aspect to expose the ulnar corner of the distal radius, and retractors are positioned to improve the exposure. A second incision is made at the same level on the dorsoulnar aspect of the wrist to expose the ulnar and distal edge of the dorsal surface of the radius. A guidewire is inserted from dorsal to palmar using a protective sleeve. Care is taken to protect the soft tissues, particularly the median nerve. The guidewire is inserted several millimeters proximal to the lunate fossa and radial to the articular surface of the sigmoid notch. The wire is inserted parallel to the articular surfaces of the distal radius and the sigmoid notch. Fluoroscopic views confirm proper guidewire position, and the tunnel is created with a cannulated drill, exiting through the palmar incision. A 2.5 mm cannulated drill bit usually suffices. Next the tendon graft is introduced from the dorsal side and retrieved through the volar side (**Fig. 11.2**).

Preparation of the Graft Area in the Triangular Fibrocartilage Complex

In this step, the TFCC is visualized arthroscopically. Debridement is performed using a shaver and basket punch forceps to visualize the fovea and the ulnocarpal articulation. The scope is introduced through the 3–4 radiocarpal portal, and the 6R or the 4–5 portal is used for the shaver. Once the fovea is cleared of scar tissue and is well visualized, the forearm is supinated, and a small incision is made slightly proximal to the 6U portal. A 1 to 1.5 cm incision is required to identify and protect the dorsal sensory branch of the ulnar nerve. A periosteum elevator is used to clear the soft tissue on the medial aspect of the ulna through the incision.

Creating the Ulnar Tunnel

A guidewire is inserted in the ulna obliquely and distally toward the fovea (**Fig. 11.3**), most often in a proximal to distal direction. Alternatively, the guidewire can also be passed through the 6R portal in a distal to proximal direction. A targeting device facilitates this step. A cannulated 3.2 mm drill bit is used from proximal to distal to create the tunnel. The size of the tunnel is critical, and care must be taken not to fracture the ulna. Arthroscopic control helps verify the correct entry and exit of the guidewire at the fovea.

Passing the Graft through the Ulnar Tunnel

Once the bone tunnel is drilled under arthroscopic control, joint lavage is performed. A fine, straight mosquito

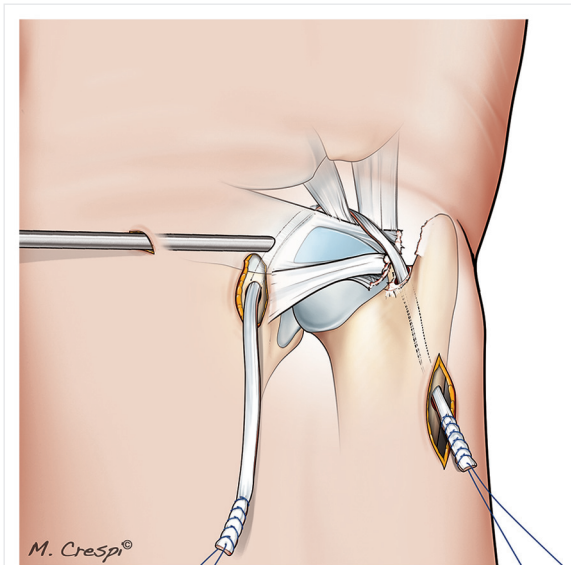


Fig. 11.4 Drawing showing the volar end of the tendon graft being passed through the ulnar tunnel at the fovea.

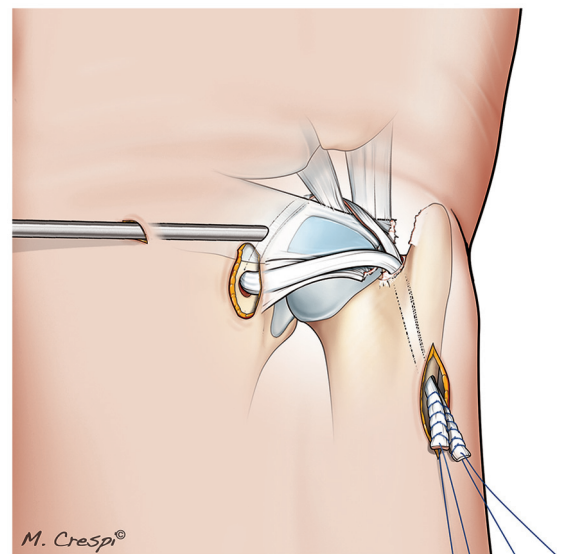


Fig. 11.5 Drawing showing the two ends of the tendon passing through the ulnar bone tunnel. The two bands of the tendon graft then reconstruct the palmar and dorsal portions of the triangular fibrocartilage complex, and the entry into the bone tunnel re-creates the foveal insertion.

forceps is inserted through the tunnel from proximal to distal. The two ends of the PL graft are introduced into the joint. The volar end of the tendon graft is passed through a small hole created in the capsule, ulnar and distal to the radial tunnel at the radial insertion of the TFCC. The space is slightly distal to the edge of the radius, and the suture ends are introduced into the joint. The suture is retrieved with a fine mosquito forceps and passed through the ulnar bone tunnel. The tendon end is then pulled into the joint. It is important to pass the volar end of the tendon graft before passing the dorsal end; otherwise the dorsal stump might block the arthroscopic visualization (**Fig. 11.4**).

Next, a window is created: a small hole is made in the dorsal capsule, distal and ulnar to the radial bone tunnel, and the dorsal end of the tendon graft is introduced into the joint while the suture ends are grasped with a fine mosquito forceps. The suture is then passed into the bone tunnel through the distal ulna in the same manner.

Passage and Fixation of the Graft

Both ends of the tendon are inserted into the joint, and the suture ends are pulled through the bone tunnel. It is easier to pass both ends of the tendon graft simultaneously, although it might be necessary to pass one end at a time (**Fig. 11.5**).

Once both ends of the tendon graft are inserted into the bone tunnel and retrieved on the medial aspect of the ulna, traction is applied to stabilize the tendon under tension. The axial traction applied to the wrist is released,

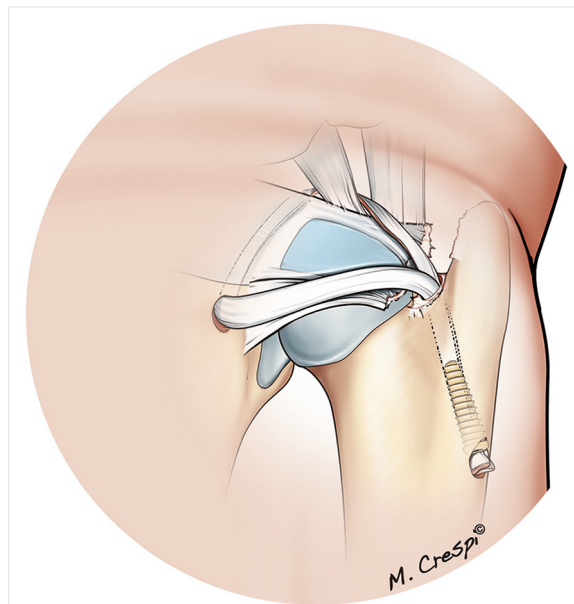


Fig. 11.6 Drawing showing fixation of the tendon ends by an interference screw.

and the graft is fixed under tension using an interference screw (**Fig. 11.6**). One can also fix the tendon to the distal ulna or pass it around the distal end of the ulna before fixing it with a suture anchor. This technique requires a long tendon graft.

Closure and Postoperative Care

All incisions are closed with interrupted sutures. Postoperatively a sugar-tong splint is applied to prevent pronosupination of the forearm and flexion-extension of the wrist joint for 6 weeks. Elbow flexion-extension can be performed. After removal of the splint, physiotherapy is initiated. Strenuous work and lifting weights are prohibited for another 6 weeks.

Conclusion

Arthroscopic reconstruction of the TFCC is the method of choice to stabilize the DRUJ in chronic injuries of the TFCC when repair is no longer possible and arthritic changes

have not set in. This technique is difficult and has a steep learning curve. With rare indications, it should be performed by surgeons experienced in arthroscopic surgery of the wrist. Nevertheless, when well done, this technique provides good stabilization of the DRUJ while maintaining good mobility of the wrist in all directions.

References

1. Mansat M, Mansat Ch, Martinez Ch. L'articulation radio-cubitale inférieure. pathologie traumatique. Paris, France: Le Poignet, Ed Masson; 1983:187–195
2. Adams BD, Berger RA. An anatomic reconstruction of the distal radioulnar ligaments for posttraumatic distal radioulnar joint instability. *J Hand Surg Am* 2002;27(2):243–251