Ulnar Collateral Ligament Reconstruction Using the ToggleLoc With ZipLoop for Ulnar Side Fixation

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Over the past 25 years, several reconstruction techniques have been described. The first successful technique, by Jobe et al in 1986, included a figure-of-8 graft configuration with 2 bone tunnels on the humerus and 1 bone tunnel on the ulna. Other techniques have used a single ulnar and humeral socket with interference screw fixation, a “docking technique” on the humerus using a bone bridge, or other variations and combinations of these.

Proposed advantages of this approach include a more isometric tunnel position on the ulna, a method for retensioning the graft after completing ulnar and humeral fixation, avoidance of tunnel complications associated with the Jobe et al technique, and method simplification.

SURGICAL TECHNIQUE

Positioning and Approach
The patient is positioned supine with the arm placed on an attached hand table. After induction of anesthesia, a sterile pneumatic tourniquet is inflated to 250 mm Hg. A palmaris longus or gracilis autograft is harvested in the usual fashion and moved to the back table for preparation. Next, a 10-cm curved incision along the long axis of the arm is made on the medial elbow, centered just anterior to the medial epicondyle. The medial antebrachial cutaneous nerve may lie in close proximity in the distal portion of the incision.
sion. It is identified and protected. Next, the flexor–pronator mass is longitudinally split at a point approximately two-thirds posterior in its thickness, near the anterior fibers of the flexor carpi ulnaris, respecting the internervous plane (Figure 1).5 The native ligament, located deep to this layer, is inspected. Any areas of ossification are debrided. The ligament is then split in its mid-portion and elevated sharply proximally and distally to expose the anatomic attachment sites on the humerus and ulna. The ulnar nerve is identified and protected.

**Ulnar Tunnel Placement**

After identifying the center of the anterior bundle attachment site on the sublime tubercle of the ulna, approximately 5 mm distal to the joint line, a guide pin is passed (Figure 2). The guide pin is directed at approximately a 45° angle distal to the long axis of the ulna, anterior to posterior, slightly medial to lateral (Figure 3). Once the position has been verified, a 6-mm acorn reamer is used to drill up to, but not through, the far cortex. Reamer size may vary slightly based on the thickness of the graft construct to be passed. A 4.5-mm reamer is used to complete the tunnel through the far cortex of the ulna, and final tunnel length is measured (Figure 4). Tunnel length averages 25 to 35 mm depending on the size of the patient and the angle used for drilling.

**Humeral Socket Placement**

On the humerus, a docking technique is performed as described by Rohrbough et al.5 The origin of the ulnar collateral ligament on the medial epicondyle is identified. A 4.5-mm drill bit is used to create a single osseous tunnel, taking care to leave the proximal humeral cortex intact. A curette is used to slowly enlarge and deepen the humeral socket, and the final socket depth is measured. Typically, a humeral socket depth of 15 to 20 mm is achieved. From the supracondylar region of the distal humerus, two 2-mm drill holes are placed from the humeral cortex directed into the humeral socket. A 10-mm bone bridge between the 2 drill holes is maintained (Figure 5). It is important to direct the communicating tunnels into the most proximal portion of the humeral socket, to ensure that graft will be pulled as far into the tunnel as possible.

**Graft Preparation**

First, the total length of graft required is calculated based on the lengths of the humeral socket, ligament span, and ulnar tunnel. A minimum of 15 mm of graft in both the humeral and ulnar tunnels and an average ligament span of 25 mm result in a recommended minimum graft length of 55 mm. In most cases, a graft of 60 mm is preferable. It is important to avoid an excessively long graft, as this can lead to bottoming out within the ulnar tunnel and an inability to adequately tension the construct.

**Quadrupled Palmaris Autograft**

If adequate length of graft is available (20-22 cm), a quadrupled palmaris longus may be used. Each end is whipstitched using FiberWire (Arthrex, Inc, Naples, Florida) or MaxBraid (Biomet) sutures. The graft is then folded over, and a third whipstitch is placed in the resulting loop. Next, the graft is folded over a second time, and the ZipLoop device is placed in the loop (Figure 6A).
Tripled Palmaris Autograft

For a graft that is too short for quadrupling, a 3-ply configuration may be used. After whipstitching both ends, the graft is folded into thirds. Another whipstitch is placed into 1 of the resultant loops. A ZipLoop is placed in the loop of the doubled-over graft (Figure 6C). Using a beath pin, the ZipLoop–graft complex is passed through the ulnar tunnel, and the loop is cinched until 15 mm of graft is pulled into the tunnel (Figure 7). Verify that the ZipLoop has been deployed on the far cortex before cinching down the first portion of the graft (Figure 8). Next, sutures at the proximal end of the graft are passed through the 2.0-mm tunnels with a suture passer, and the graft is docked within the full length of the humeral tunnel. The sutures are tied over the bone bridge after removal of any interposed soft tissues (Figure 9). After cycling and application of a mild varus stress at 45° flexion, the graft is tensioned by further cinching the ZipLoop, and the sutures are trimmed (Figure 10). Finally, after reconstruction, the split in the native ligament is repaired, and the graft limbs are sutured to itself and the native ligament using 2.0 MaxBraid or FiberWire sutures.

Clinical Experience

To date, 7 patients at our institution have been reconstructed with this technique and continue to be followed for a clinical outcomes study. Four patients were reconstructed with a 2-ply gracilis autograft, 2 patients had a 4-ply palmaris autograft, and 1 patient had a 3-ply palmaris autograft. Of the 7 patients, 5 had an ulnar nerve transposition at the time of ulnar collateral ligament reconstruction. No intraoperative complications were observed. Postoperative follow-up ranging between 2 and 9 months is currently available. All patients are progressing according to our standard rehabilitation protocol. One patient experienced symptoms of ulnar neuritis postoperatively and was treated with an ulnar nerve transposition 4 months after the primary procedure.

Discussion

The Biomet Sports Medicine ToggleLoc with ZipLoop Technology offers a reasonable alternative for ulnar fixation and potential improvements over previous ulnar collateral ligament reconstruction techniques in its ability to reconstruct the anterior band ulnar collateral...
ligament anatomy and iso-
metric tension pattern. We
are not aware of any specific
contraindications to its use
in ulnar collateral ligament
reconstruction candidates. A
basic science study examining
the biomechanics of this tech-
nique was recently completed
at our institution. The results
showed that the ZipLoop con-
struct reproduced valgus-load
displacement curves equiva-
lent to the native ligament
and was biomechanically equiva-
lent to the Jobe et al5 recon-
struction method.

Further, this technique min-
imizes the risk of fracture and
may potentially prove useful
as a salvage technique in cas-
es where intraoperative ulnar
fracture (of the sublime tuber-
cle) has occurred, such as with
the Jobe et al5 technique. Us-
ing the ZipLoop, it is possible
to control the amount of graft
within the tunnel effectively
and to tension the graft after
it has been secured on both
sides, advantages not possible
with other techniques. Finally,
we have found that it is tech-
nically less demanding than
techniques such as the Jobe et
al5 transosseous technique.

Potential disadvantages of
the current technique include
a slightly more complicated
graft preparation step for de-
termining the best configura-
tion (2-, 3-, or 4-ply), as well
as the additional cost of the
ZipLoop device. As with all
techniques, there is a learning
curve for proper tunnel place-
ment and trajectory, and it is
important to understand the
proper tunnel placement and
graft preparation rationale to
ensure a solid outcome. Ongoi-
ing clinical studies at our insti-
tution will better establish
long-term patient outcomes;
however, initial short-term re-
results have been promising.

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