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Arthroscopic Acromioclavicular Repair with Tendon Graft

with the ZipTight™ Fixation System
with ZipLoop™ Technology

Surgical Technique
by Dr. Miguel García Navlet

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Figure 1

Figure 2

Introduction

Tearing of the acromioclavicular and coracoclavicular ligaments causes a characteristic deformity in the upper part of the shoulder and a varying clinical picture based on the degree that these ligaments are involved.[1] But more factors must influence the appearance of these symptoms since we cannot predict whether patients will make satisfactory progress with conservative treatment.[2]

We have considered two fundamental questions about the surgical indication in complete injuries of both ligamentous complexes. On one hand, there is the potential alteration of the shoulder biomechanics compromising the future of the shoulder and on the other, there is scant knowledge about the potential for scarring of the coracoclavicular and acromioclavicular ligaments. It is known, based on scientific publications on the subject, that the scarring of ligaments will not produce normal tissue, but will produce scar tissue with worse biomechanical characteristics than the original.[3] The addition of autologous collagen could be one of the options for improving the quality of that scarring.[4]

In line with the document by the ISAKOS Upper Extremity Committee published in February 2014,[4] it is necessary to identify patients with a Type III injury who will make little progress and would need to be surgically stabilized.

The ZipTight system (Figure 1) is a sliding suture system, self-locking and knotless, that uses Ziploop technology together with a titanium washer which is implanted using open or arthroscopic surgical techniques at the level of the clavicle and coracoid, and once the joint is reduced, should permit stable fixation until the ligaments have healed.

The double-loop implant generally designated for chronic cases is used for this technique (Figure 2).

Figure 3

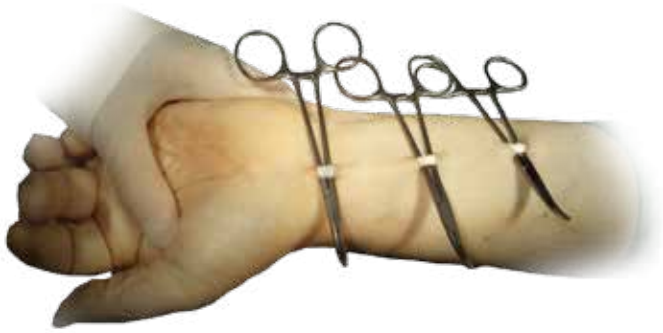

Figure 4

Pre-Operative Planning

Our preference for this technique is the "beach chair" position with the arm in slight forward flexion of 20º-30º held in place by a simple traction system weighing about 2-3 kg (Figure 3).

After preparing the sterile field leaving the operative upper limb free before the traction is placed, proceed to harvest the graft of the palmaris longus muscle by making three small incisions along its trajectory on the anterior surface of the forearm (Figure 4).

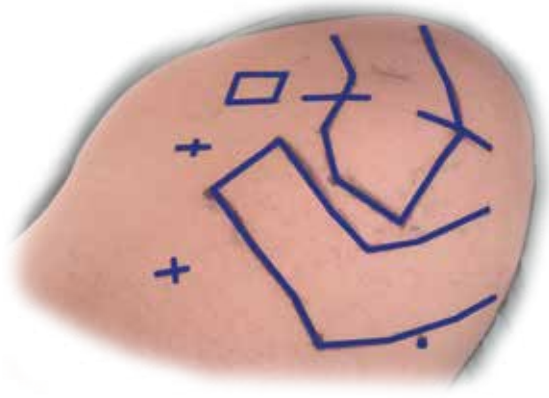

Figure 5a

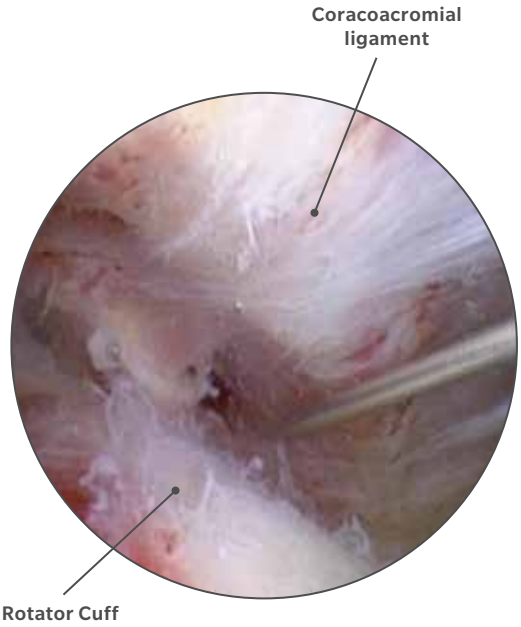

Figure 5b

Incision

A arthroscopic glenohumeral examination is performed to determine the existence of associated injuries that require treatment.

Then the subacromial arthroscopy is performed with an anterolateral viewing portal (2-3 cm from the lateral acromial edge) and an anterior working portal guided by a spinal needle (Figure 5a).

A subacromial bursectomy is performed in order to obtain a correct view of the coracoacromial ligament which will be our main reference (Figure 5b).

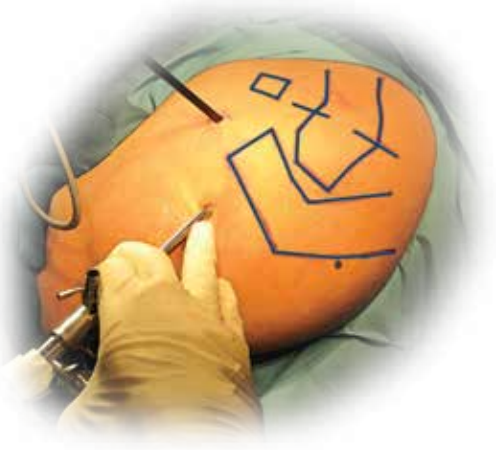

Figure 6

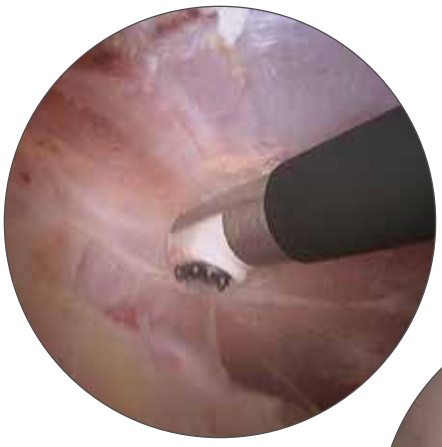

Figure 7

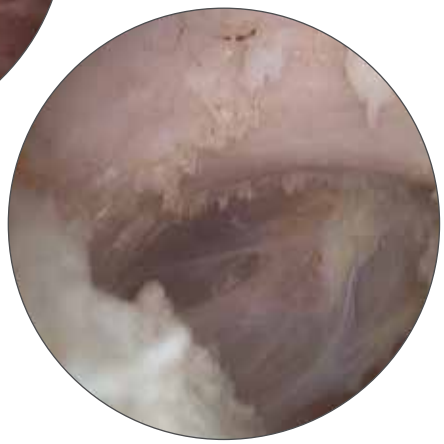

Figure 8

Surgical Technique

The surgical technique is divided into 4 phases:

- **Phase 1:** Locate the coracoid base.
- **Phase 2:** Insert the ZipTight implant in the coracoclavicular region.
- **Phase 3:** Placement of coracoclavicular graft (reduction of 1st loop).
- **Phase 4:** Acromioclavicular reduction and stabilization (reduction of the second loop).

Phase 1:

Locate the coracoid base

In the subacromial space, with the arthroscope in the lateral position and the anterior working portal (Figure 6) guided by the coracoacromial ligament, we direct the arthroscope medially to the attachment of the ligament on the coracoid (Figure 7).

In the posterior region, behind the coracoid, remove the synovial tissue between the rotator interval and coracoid bone as well as the synovial tissue surrounding the subscapularis tendon in this area using a shaver and a RF device for a careful bleeding control, until a clear view of the base of the coracoid is obtained. (Figure 8).

Note: Remember that the main blood vessels and nerves of the arm are medial to the coracoid.

Figure 10

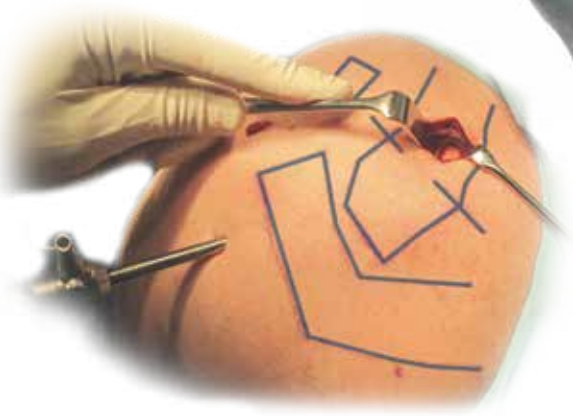

Figure 9

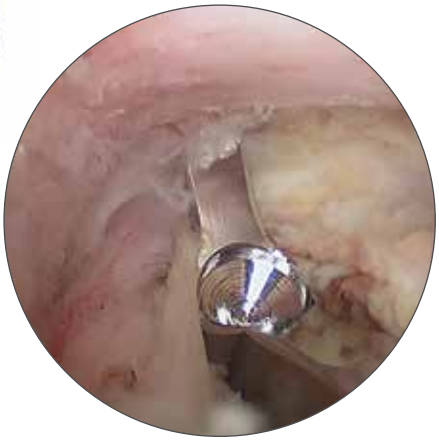

Figure 11

Phase 2:

Insert the ZipTight implant in the coracoclavicular region

The skin incision can be limited to a 2 cm incision in the upper collar bone region at approximately 3 cm from the distal edge of the clavicle (Figure 9).

The preference is a more extensive incision vertically in line with the coracoid bone and following the Langer lines, which is more aesthetic, to ensure an adequate approach to the acromioclavicular joint and 4 cm of the distal clavicle.

The deltoid trapezius fascia must be carefully opened until the acromioclavicular joint is reached from which we remove the remaining meniscal tissue.

Place a desired point and shoot guide at an angle of 70-90º with the bullet supported on the collar bone and the tip of the guide in the lower part of the coracoid base under arthroscopic control (Figures 10 and 11).

Figure 12

Figure 13

Phase 2 (cont.):

Insert the ZipTight implant in the coracoclavicular region (cont.)

If the clavicle is severely displaced, withdraw the arm traction to facilitate the correct placement of the guide.

The point where the clavicle insertion is made can be a central point between both ligaments (3 cm from the distal edge of the clavicle) or in the insertion of one of the two ligaments. For this surgical technique, the preference is the insertion at the conoid ligament, locating it at about 4.5 cm or at the posterior vertex of the distal curve of the clavicle, with a posterior to anterior and medial to lateral angle. Drill a 2.4 mm guide wire through the bone (Figure 12) ensuring that there is sufficient bone wall in the clavicle and coracoid.

Ream the 4.5 mm tunnel with the cannulated bit through the clavicle and coracoid until the bit emerges in the lower region of the coracoid (Figure 13).

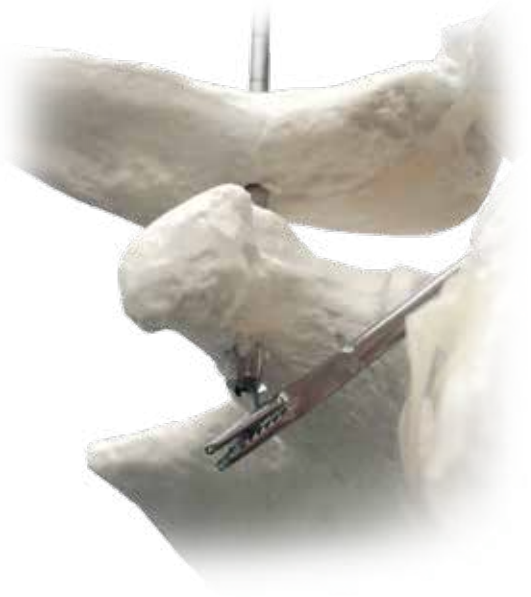

Figure 14

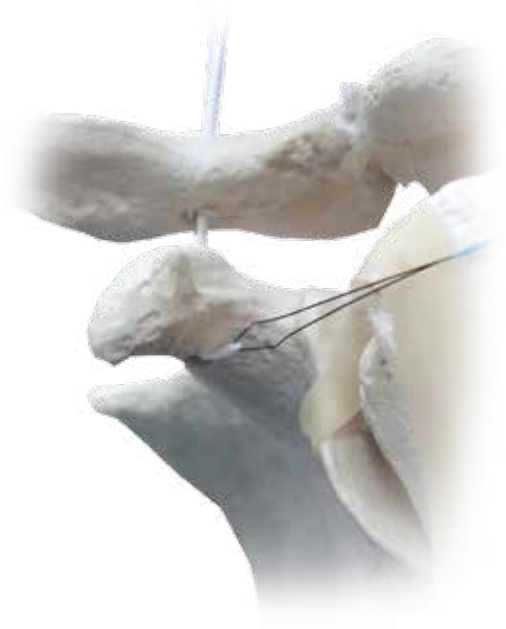

Figure 15

Phase 2 (cont.):

Insert the ZipTight implant in the coracoclavicular region (cont.)

Remove the guidewire, leave the 4.5 mm reamer in the tunnel, and pass a transport suture or Nitinol loop through it to the subcoracoid space (Figure 14). The suture or Nitinol loop is then retrieved with grasper forceps from the anterior portal and withdraw the 4.5 mm reamer, leaving the Nitinol loop in place.

Thread the end of the ZipTight implant's passing sutures through the end of the transport suture or Nitinol loop in the clavicle region (Figure 15) and pull this to retrieve the passing suture from the implant in the subcoracoid region.

Figure 16

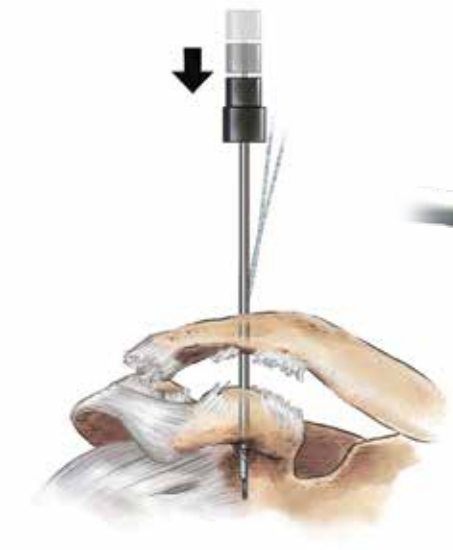

Figure 17

Figure 18

Phase 2 (cont.):

Insert the ZipTight implant in the coracoclavicular region (cont.)

Pass the implant (Figure 16) through the clavicle and coracoid, by pulling the implant's passing sutures from the arthroscopy anterior portal until the exit of the titanium implant in the subcoracoid region is confirmed.

Another option is to use the pusher/plunger. After inserting the implant into the tip of the device, push it through the clavicle and coracoid (Figure 17). Push the plunger to the base of the pusher to deploy the button.

At this point, use grasper forceps or a thread catcher to help the implant rotate in this region and ensure its correct placement (Figure 18).

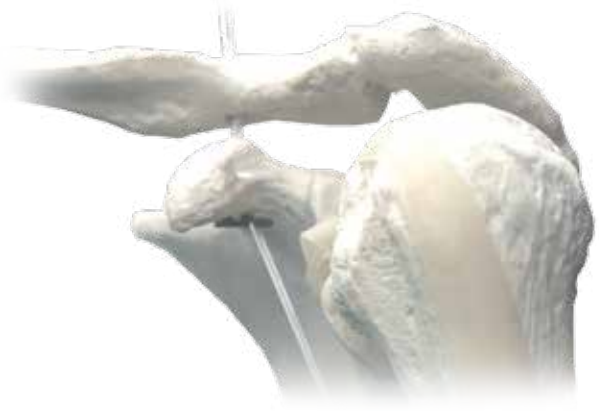

Figure 19

Figure 20

Phase 3:

Placement of coracoclavicular graft (reduction of 1st loop)

Once the titanium implant is locked on the coracoid, make an incision above the clavicle that will be used to pass the graft (Figure 19).

Place the tendon graft in the first loop of the implant. The second loop is protected by a plastic sleeve (Figure 20) that will be used to reduce the clavicle at a later step.

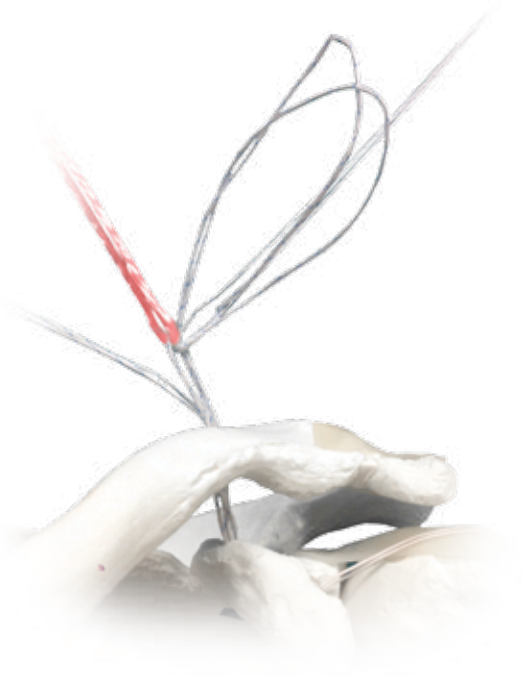

Figure 21

Figure 22

Phase 3 (cont.):

Placement of coracoclavicular graft (reduction of 1st loop) (cont.)

Even though the 1st loop may be positioned in the middle of the graft, we prefer to leave one end of the graft slightly longer for posterior support of the acromioclavicular joint (Figure 21).

Pull on the tension strands (which are tied to each other) (Figure 22) to reduce the graft to its position inside the socket in the coracoid. The graft should occupy the coracoclavicular space and exit through the tunnel in the clavicle.

Figure 23

Figure 24

Phase 3 (cont.):

Placement of coracoclavicular graft (reduction of 1st loop) (cont.)

Release the second loop from its plastic sleeve and place the circular washer inside the second loop (Figure 23).

Use the blue sutures in the washer to maintain the stability of the implant while the tension strands are retracted. Alternatively, a hemostat can help hold the implant steady on the tensioning strands.

The double loop goes between the two slots of the washer (Figure 24).

Pull the sutures to partially close the 2nd loop and facilitate working with the washer.

In this double implant, the washer has one smooth surface and another side with teeth which must be oriented toward the clavicle for a better grip on the tendon and the implant itself.

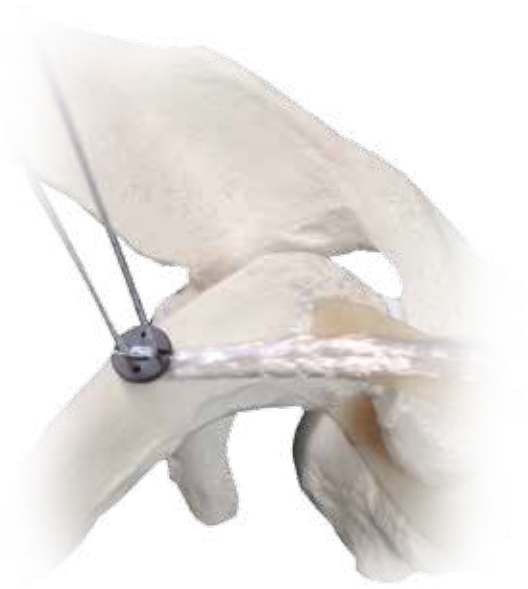

Figure 25

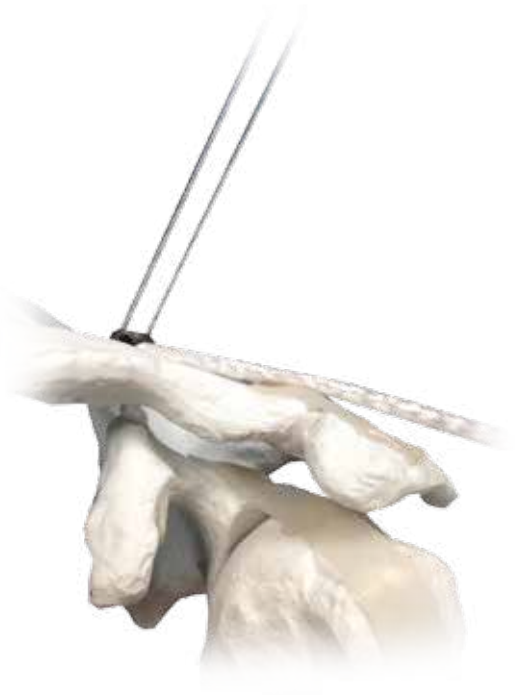

Figure 26

Phase 4:

Acromioclavicular reduction and stabilization (reduction of the 2nd loop)

Maintain tension on the graft by means of forceps or a suture. To reduce the acromioclavicular dislocation, release the traction and push the elbow upwards and the clavicle downwards. Stabilize the clavicle by pulling on the tensioning strands from the 2nd loop. The washer will engage the clavicle as the sliding loop is shortened and the clavicle should be fixed in its usual anatomical position. Control the proper reduction under direct and arthroscopic visualization (Figure 25).

Ensure that the blue suture in the washer is withdrawn before its final compression. Use intraoperative fluoroscopy visualization in case of any doubt.

Remove the white implant passing suture from the coracoid and cut the passing sutures from both loops in the clavicle.

The washer secures the graft. Use the long end of the tendon to strengthen the acromioclavicular capsule repair at the posterior or superior side. Attach the tendon to the clavicle and the capsule on the acromial side with a transosseous suture (Figure 26).

Close the acromioclavicular capsule and the deltoid trapezius fascia.

Figure 27

Postoperative period

Keep the shoulder in a splint to assist the ligament healing process for 4-6 weeks.

During this period, it is essential to prevent the weight of the arm and the scapula from stretching the repair site, so the splint must support the weight of the arm. While sitting, the patient should lean on their elbow to support arm weight.

Avoid activities that involve exertion for 3-4 months.

*Example of shoulder splint, Shoulder Brace model made by DonJoy. Picture supplied by Don Joy.

INDICATIONS FOR USE

The ToggleLoc™ System devices are designed for anchoring soft tissue to bone in the following indications:

Shoulder
Bankart repair
SLAP lesion repair
Acromioclavicular recovery
Capsular elevation/capsulolabral reconstruction
Deltoid muscle repair
Rotator cuff tear recovery
Biceps tenodesis

Foot and Ankle
Medial/lateral repair and reconstruction
Repair of the central and front part of the foot
Hallux valgus reconstruction
Metatarsal ligament/tendon repair or reconstruction
Achilles tendon repair
Fixation in high ankle sprains (syndesmotic sprains) and for assistance in connection with Weber B and C ankle fracture traumatology components **(only for ToggleLoc with Tophat**)

Elbow
Medial/lateral repair and reconstruction
Repair of the central and front part of the foot
Reattachment of the biceps tendon

Knee
Repair/reconstruction of the ACL (anterior cruciate ligament) / PCL (posterior cruciate ligament)
ACL/PCL patellar bone-tendon-bone grafts
ACL double-tunnel reconstruction
Extracapsular repair: MCL (medial collateral ligament), LCL (lateral collateral ligament) and oblique posterior ligament
Iliotibial band tenodesis
Patellar tendon repair
VMO (Vastus Medialis Obliquus) advance
Closing of joint capsule

Hand and Wrist
Repair of the collateral ligament
Reconstruction of the scapholunate ligament
Reconstruction of the volar plate

Hip
Acetabular labral repair

CONTRAINDICATIONS

1. Infection.
2. Patient disorders such as limitation in blood supply and insufficient bone or soft tissue quantity or quality.
3. Patients with mental or neurological diseases which make them unwilling or unable to follow the rehabilitation instructions postoperatively.
4. Reaction or sensitivity to foreign bodies. If adverse reaction or sensitivity to foreign objects is suspected, the pertinent tests should be performed before implanting the device.

Notes

References

1. Warth RJ, Martetschläger F, Gaskill TR, Millett PJ. Acromioclavicular joint separations. Curr Rev Musculoskelet Med. 2013;6:71-78.
2. Beitzel K, Mazzocca AD, Bak K, *et al.* ISAKOS upper extremity committee consensus statement on the need for diversification of the Rockwood classification for acromioclavicular joint injuries. Arthroscopy. 2014;30:271-278.
3. Chamberlain CS, Crowley EM, Kobayashi H, Eliceiri KW, Vanderby R. Quantification of collagen organization and extracellular matrix factors within the healing ligament. Microsc Microanal. 2011;17: 779-787.
4. Kinneberg KR, Galloway MT, Butler DL, Shearn JT. Effect of implanting a soft tissue autograft in a central-third patellar tendon defect: biomechanical and histological comparisons. J Biomech Eng. 2011;133:091002.

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