Subscapularis Repair With the Suture Shuttle Loop Technique

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Abstract: Successful techniques for arthroscopic repair of subscapularis tendon tears have been previously described in the literature. Recommendations regarding portal placement, tissue mobilization, and suture passage have been published. We present a novel technique that uses a shuttle suture passed with the Viper suture passer (Arthrex, Naples, FL) through a standard anterior arthroscopy portal. The described technique easily passes a suture through the subscapularis tendon while the surgeon visualizes suture placement from the posterior portal.

Arthroscopic repair of subscapularis tendon tears was first published by Burkhart and Tehrany in 2002. The efficacy of arthroscopic subscapularis tendon repair has been validated with case series, a cohort study, and a systematic review. All reported arthroscopic techniques use suture anchors for tendon repair. However, variations in patient positioning, accessory portal placement, arthroscopic cameras (30° vs 70°), and suture-passing techniques have been described. In addition to adjusting the arm position for improved visualization and working area, some authors have advocated coracoplasty.

The technique described in this report uses a single anterior portal and a 30° arthroscopic camera to repair the subscapularis tendon. The senior author prefers placing horizontal and vertical mattress sutures from a double-loaded suture anchor for arthroscopic repair. However, we believe that this technique can be used with any suture method including simple and mattress techniques.

Technique

A standard posterior viewing portal is established with a 30° arthroscopic camera. The anterior working portal is created after localization with a spinal needle. An 8-mm × 3-cm PassPort anterior cannula (Arthrex, Naples, FL) is placed in the working portal. The arm is maximally internally rotated to improve visualization of the subscapularis footprint. The subscapularis footprint is debrided until bleeding bone is visualized. Anterior, superior, and posterior adhesions are released from the subscapularis tendon as described by Burkhart and Brady. The coracohumeral and middle glenohumeral ligaments are released as necessary to improve mobilization. An accessory anterolateral portal may be established to assist in tendon liberation and suture management if necessary.

A double-loaded suture anchor is placed into the subscapularis tendon footprint. After retrieval of a single limb of suture from the anchor, the suture shuttle is loaded in the Viper suture passer (Arthrex) (Table 1). By use of an Orthocord No. 2 free suture (DePuy Mitek, Raynham, MA), the shuttle suture is loaded, creating equal limbs on either side of the Viper’s jaw. The Viper is passed through the anterior cannula, and the subscapularis tendon is grasped at the desired location. The self-grasping needle is deployed, an anterior-to-posterior shuttle loop is created, and the shuttle suture is retrieved through the anterior portal (Fig 1). The suture limb from the anchor is passed through the shuttle loop outside the cannula, and both limbs of the shuttle suture are pulled simultaneously. This “shuttles” the anchor limb through the subscapularis tendon and out the anterior portal (Fig 2). One must ensure that the anchor is not unloaded while shuttling. A simple knot can be tied at this time, or a mattress stitch can be created by repeating the aforementioned technique with the other limb of the previously passed suture.

We perform our arthroscopic subscapularis repair with the combination of horizontal and vertical stitches. After passage of all limbs, the horizontal stitch is tied first between the vertical stitch limbs. Next, the vertical stitch is tied over the top of the horizontal stitch.
Anatomic repair may then be confirmed through the posterior portal (Fig 3, Video 1). If direct visualization of the repair is required, the arthroscopic camera can be placed in the anterior portal for confirmation.

**Discussion**

Multiple techniques of arthroscopic subscapularis tendon repair have been described in the literature.\(^1\^-\(^9\)\) Subscapularis repair is technically demanding because of obstructive anatomy, difficult visualization, and instrumentation. Suture shuttle systems such as the 30° SutureLasso (Arthrex) are commonly used. This technique requires retrieving a monofilament suture or loop to shuttle the suture through the subscapularis tendon. The technique described earlier uses a single-step shuttle suture and retrieval method, thereby improving surgical efficiency. Although the Viper suture passer is not novel with regard to subscapularis repair, we believe that the shuttle loop technique has not been described in the literature previously.

The limitations and risks associated with the technique are limited in the senior author’s experience. The limitations of this technique are not exclusive to the shuttle loop technique and include irreparable subscapularis tears, poor tendon quality, and advanced glenohumeral degenerative disease. The risk of unloading the suture anchor is not specific to this technique, and we recommend paying the necessary attention to the suture limbs within the anchor during surgery.

**Table 1. Key Points of Shuttle Loop Technique**

1. Retrieve a single limb from the implanted suture anchor.
2. Place an Orthocord No. 2 suture in the Viper’s jaws at the middle of the free suture.
3. Deploy the Viper suture passer in the subscapularis tendon to create an anterior-to-posterior shuttle loop (Fig 1).
4. Pull the Viper back through the anterior portal.
5. Place the suture anchor limb inside the shuttle loop.
6. Pull both limbs of the shuttle loop to pass the anchor stitch through the tendon (Fig 2).

**Fig 1.** Viper Suture passer creating an anterior-to-posterior suture shuttle loop (purple suture), horizontal mattress stitch (blue and white suture), and vertical mattress stitch (solid blue suture) in a right shoulder, with the patient in the lateral decubitus position, viewed through the posterior portal.

**Fig 2.** Suture shuttle loop passing Orthocord No. 2 (purple) through the subscapularis tendon in a right shoulder, with the patient in the lateral decubitus position, viewed through the posterior portal.

**Fig 3.** Subscapularis tendon repair visualized in a right shoulder, with the patient in the lateral decubitus position, viewed through the posterior portal.
suture passage. Potentially, the suture limb can become free of the shuttle loop. Although this has not occurred in our experience, one must only retrieve the suture limb as if a multiple-step suture passage and retrieval technique is being employed.

The shuttle loop technique with the Viper suture passer is a novel and effective method to perform arthroscopic subscapularis tendon repair. The technique described allows for 1-step shuttle loop passage and retrieval while one is visualizing suture placement from the posterior portal. No additional instruments are required for the shuttle loop technique. Only a standard Viper suture passer and a free Orthocord No. 2 suture are necessary to produce a suture shuttle loop. Because the same Orthocord can be reloaded into the Viper for multiple suture shuttle loops, we believe that this technique is both efficient and cost-effective.

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