Technical Note

A New Approach to Improving the Tissue Grip of the Medial-Row Repair in the Suture-Bridge Technique: The "Modified Lasso-Loop Stitch"

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Abstract: The double-row rotator cuff repair has proved to be biomechanically superior to the single-row technique. However, this has not been shown clinically. At the moment, all the methods proposed for medial-row suturing in the suture-bridge technique recommend a mattress suture or a simple stitch. The lasso-loop stitch has been proposed as a technique to improve tissue grip and has been used in open rotator cuff repairs, in biceps tenodesis, and in the Bankart procedure. We propose a method in which a modified version of this stitch can be used to repair the medial row of a double-row repair. In the "modified lasso-loop stitch," a circumferential stitch is constructed over the posteromedial and anteromedial anchor. This stitch exerts an appropriate amount of radial compression on the encased tendon as the tails of the posteromedial and anteromedial suture are fixed to the anterolateral anchor. Through this technique, the reduction force is augmented and a compression force is created, thus allowing restoration of the rotator cuff footprint. This technique provides a strong cuff-suture interface while appropriate tensioning of the modified lasso-loop stitch allows minimal strangulation of the tendon. This technique has been shown to work with and without a knot.
Key Words: Shoulder surgery—Arthroscopic repair—Surgical technique—Lasso-loop stitch—Soft-tissue fixation.

Arthroscopic rotator cuff repair is being performed by an increasing number of orthopaedic surgeons. The principles, techniques, and instrumentation have evolved to the extent that all patterns and sizes of rotator cuff pathologies, including massive tears, can now be arthroscopically repaired.[1-3]

In tendon-to-bone fixation of rotator cuff repairs, several factors contribute to the strength of the tendon repair, most notably the tendon-suture interface.[4] This interface has proved to be the weakest link of the repair.[5] The modified Mason-Allen stitch, a massive cuff stitch, and the Mac stitch have strengthened the tendon surface interface, although arthroscopic results continue to be discussed.[4,6-10]

The suture-bridge technique, a tendon-to-bone repair, has become a popular method for arthroscopic rotator cuff repair.[3] Bales and Anderson[11] described their technique for the suture-bridge rotator cuff repair. In brief, sliding stitches are placed in the medial row. Once passed through the medial row, the sutures are then tied in a horizontal mattress configuration, and the tails of the sutures are

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Table 1. *Tips, Tricks, and Pearls for Modified Lasso-Loop Stitch*

Exposure is crucial, comprising the following:
Adequate tissue debridement
Appropriate portal placement
Adequate hemostasis
Appropriate patient positioning
Appropriate portal placement is needed to facilitate easy use of the sharp grasper. This is patient specific.
A curved penetrating sharp grasper should be used when a strait sharp grasper cannot provide an appropriate angle of approach for performing the modified lasso-loop stitch.

anchored laterally to create a suture bridge and completely restore the rotator cuff footprint. The number of medial-row anchors is determined by the size of the rotator cuff tear. They have reported good results with this technique.[11]

Lafosse et al[12] have recently described a new technique designed to improve tissue grip. The "lasso-loop stitch" can be used as the lateral suture in a double-row technique, as well as in a side-to-side fashion, as with margin convergence without the aid of an anchor in the repair of a rupture in the tendon belly, in a mattress configuration for Bankart repair, and in a

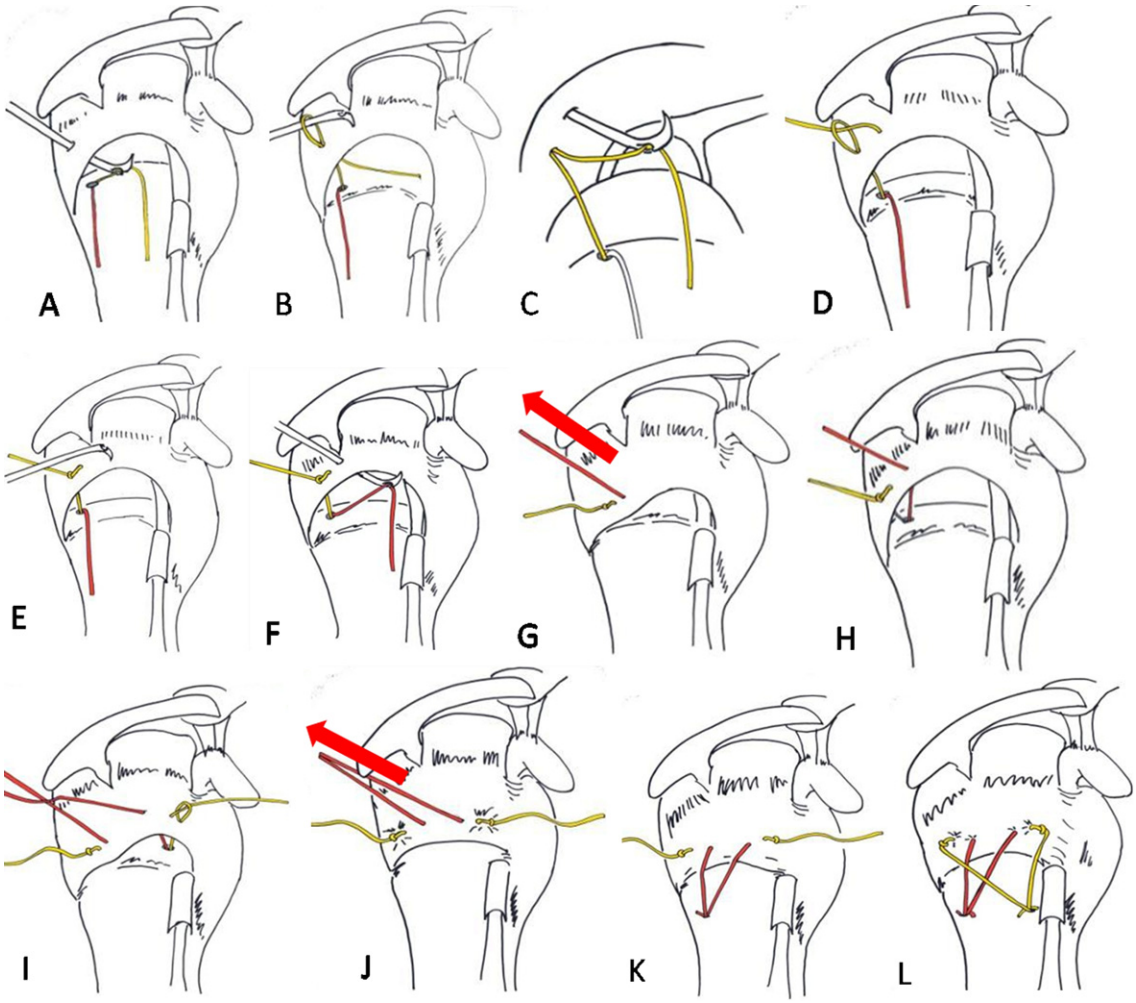

Figure 1. (A-D) The posteromedial suture is passed incompletely through the rotator cuff to create a loop on the extracapsular surface of the cuff. The sharp grasper is then passed through, and the grasper is advanced anteriorly through the rotator cuff. The free end of the intracapsular stitch is grasped and brought to the extracapsular surface. This creates the first modified lasso-loop stitch. (E, F) The posteromedial simple stitch is placed. These steps are then respectively repeated on the anteromedial row (I). (G-K) The cuff is reduced and the post (K) is created with the simple stitch. The arrows show the reduction maneuver. (L) The anterolateral anchor is in place, and the suture-bridge repair is complete. This is a representation of a right shoulder with the patient in the beach-chair position with 3 to 5 ports placed posteriorly, posterolaterally, laterally, anterolaterally, and anteriorly as needed for appropriate instrumentation.

strangulation fashion for biceps tenodesis.[12] In their technique for a double-row rotator cuff repair, the single free end of the lateral suture passes around the torn edge of the tendon and passes through the loop.[12] As a modification to this technique, the single free end of the loop must be grasped through the middle of the tendon and passed through the loop. This creates a circumferential suture-tendon interface that radially locks the fibers of the tendon within the suture loop. This technique is used for both the anteromedial and posteromedial rows of the repair, and the free ends of the suture are then anchored laterally. This modification permits the lasso-loop stitch to be a viable option for medial-row repair in the suture-bridge technique.

TECHNIQUE

Before performing a double-row repair of the rotator cuff with the suture-bridge technique, the surgeon should perform a thorough debridement of the rotator cuff, prepare the tuberosity by removing soft tissue, and plan the repair (Table 1). After debridement of the edges of the cuff from an intra-articular and extra-articular position, a thorough bursectomy is performed. An acromioplasty is performed as needed. The rotator cuff footprint is re-established by debridement of the greater tuberosity down to bleeding corticocancellous bone.[13,14]

The anchor is placed in the appropriate position in the medial row. The suture (the yellow suture in Fig 1) is incompletely passed in an inside-out fashion through the middle of the ruptured tendon. This creates a loop on the extra-carticular surface of the tendon and is accomplished by grasping the suture in the middle of the free tail as opposed to its end. The end of the suture, which is still on the caudal surface of the cuff, is passed through the tendon (anterior to but in the same sagittal plane as the extra-articular loop) with a suture passer and through the previously created extra-articular loop (Figs 2 and 3).

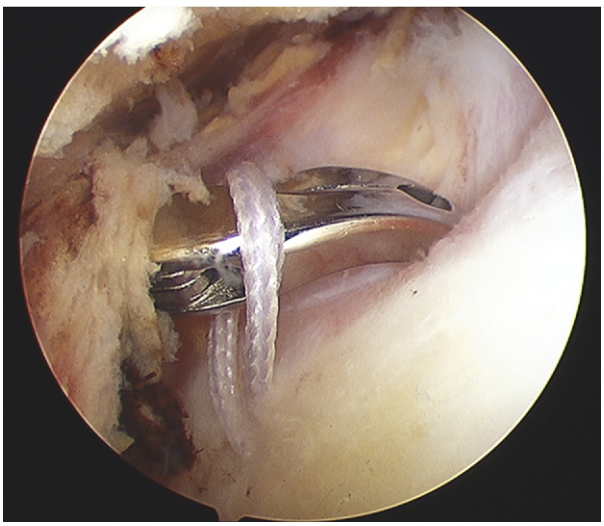

Figure 2. The sharp grasper is penetrating the rotator cuff. It should be noted that the sharp grasper is passed through the loop before penetration.

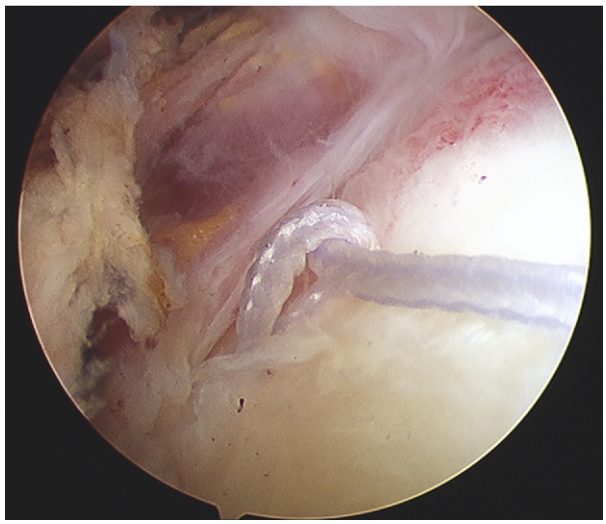

Figure 3. Completed modified lasso-loop stitch construct.

The second suture (the red suture in Fig 1) is passed through the middle of the tendon in a simple stitch fashion (anterior to but in the same sagittal plane as the first suture). These steps are repeated for the anteromedial portion of the cuff. The surgeon grasps the 2 red ends of the suture (1 from the anteromedial anchor and 1 from the posteromedial anchor) and externalizes them through the same posterior portal. This allows for posterior cuff reduction. These ends can then be fashioned with a posterolateral anchor in the standard fashion, and the posterolateral anchor can be used as a lever arm for the reduction. This suture serves as the post. The remaining 2 free ends of the suture containing the modified lasso-loop construct (the yellow suture in Fig 1) can then be fashioned to the anterolateral anchor, thus completing the cuff reduction.

When a lateral-row anchor with a durable locking system is used, it is possible to use a knotless configuration. In this scenario the 2 free ends of the non–lasso-looped suture are tensioned to reduce the cuff to the appropriate footprint. These ends are then locked in the bone with the posterolateral anchor. This is

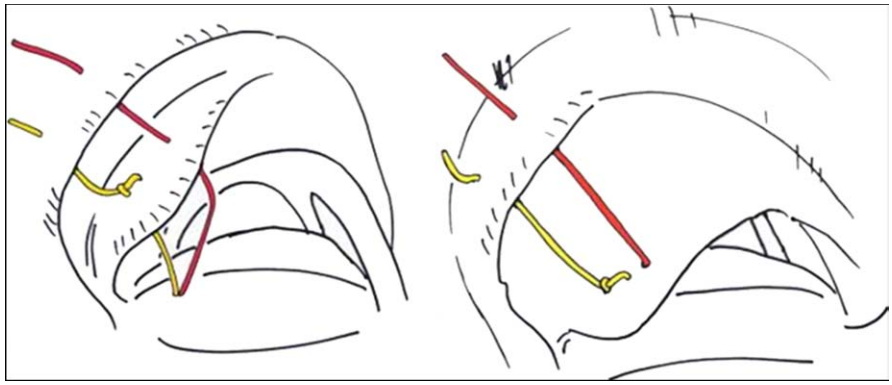

FIGURE 4. The modified lasso-loop stitch can be used to repair a double-layer defect.

repeated anterolaterally by use of the free ends of the modified lasso-looped construct. For the knotless technique to work, a high-quality anchoring system with a strong locking mechanism must be used and the patient must have good bone stock.

For a dual-layer repair, 2 modified lasso-loop stitches are placed in the deep layer with 2 separate sutures. The 2 free ends are then passed through the superficial layer as a simple suture. This allows for gapless reduction of the deep layer to the superficial layer without the use of an interval knot (Fig 4).

DISCUSSION

Arthroscopic rotator cuff repair, in particular the suture-bridge technique, has become a popular procedure because of its lower morbidity (compared with an open procedure), newer technologic advances, and its increasing ease of visualization. However, concerns regarding this procedure's tissue fixation methods have been raised.

In the suture-bridge technique, arthroscopic surgeons have been limited to the mattress stitch. This stitch has a significantly lower failure strength when compared with the modified Mason-Allen stitch, a common stitch used in an open rotator cuff procedure.[4] When compared with other stitches such as the Krackow, Bunnel, or Mac stitch (more adapted for arthroscopic repair), the modified Mason-Allen stitch has been recognized as a strong tissue-holding stitch with less strangulation.[6,8,15] However, this stitch is technically difficult to place in the arthroscopic setting.

We have not tested this suture construct biomechanically, making it difficult to draw many conclusions about potential drawbacks to this technique. A potential risk of this procedure, however, is creating a clinical dog-ear of the rotator cuff. After a loop is created with a sharp grasper, the sharp grasper is passed through the tendon again to retrieve the free end of the suture (Fig 1). If the grasper is passed through the tendon too far away from the suture loop when one is creating the modified construct, too much tendon will be taken into the modified lasso loop; a clinical dog-ear will be observed, and the tendon may not lie flat within its space.

This article illustrates a simple arthroscopic method for rotator cuff repair that incorporates the effect of the lasso-loop stitch. We have successfully used the modified lasso-loop stitch for suture-bridge rotator cuff repairs. This enables us to have appropriate tissue grip without the need for additional suture or other specific devices for suture grasping. With some precautions, this can be performed with the use of a penetrating grasper. We also advocate this stitch to be used for smaller tears to increase the strength of the repair and prevent premature failures of the weakest link in the construct, the tendon-suture interface.

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