Arthroscopic Double-Locked Stitch: A New Technique for Suturing Rotator Cuff Tears

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Abstract: There are a number of reasons for failed rotator cuff tear repair. In such cases the suture-tendon interface seems to be the most vulnerable area, especially when tendon degeneration is present. We describe a new technique, the arthroscopic double-locked suture, that increases the tendon fixation and has the added benefit of being placed parallel to the blood vessels, therefore avoiding damage to the tendon vascularization. The suture may be achieved by use of knots or knotless anchors and suture passers, without the need for any additional instrumentation. The new technique is especially helpful in cases in which the tendon is retracted and degeneration is present, impeding the use of the double-row technique or its transosseous equivalents.

Rotator cuff repairs still pose a great challenge to surgeons, especially because of dehiscence. The results do not seem to be influenced either by the approach (arthroscopic *v* open) or by the type of fixation (anchors *v* transosseous).[1]

Suture failure may occur at a number of different sites, but the tendon-suture interface seems to be the most susceptible, especially in cases with tendon degeneration.[2] A number of arthroscopic sutures have been proposed to enhance fixation, ranging from simple and mattress sutures[3] to a variety of more elaborate sutures, such as the modified Mason-Allen stitch,[4] the Mac stitch,[5] and the lasso-loop stitch.[6]

However, the healing and fixation of the tendon to the bone depend directly on the quality of the vascular supply to the affected area. Some of the sutures described earlier have been reported to damage or impair the local blood supply, especially those that place the fixation transverse to the tendon fibers because the blood vessels have a longitudinal disposition.[7]

The new suture proposed by the senior author (S.L.C.) was conceived to offer greater resistance and cause less ischemia by posing less constriction to the tendon and by being able to withstand great traction forces. This new suture offers a reliable option in those cases in which double-row or transosseous sutures are not feasible.

Surgical Technique

The double-locked suture has a fast learning curve for the trained arthroscopic surgeon. Although knotless anchors may help in the placement of the suture (Video 1), their use is not essential for the technique. The steps of the surgical technique are as follows:

1. After placement of the anchor in the desired position, one of the suture threads is first passed through the tendon, from the articular side to the subacromial side, approximately 20 mm medial to the lateral edge of the tendon, close to its myotendinous junction (Fig 1A).
2. The thread length is equalized, and a loop of the suture is placed loosely at the subacromial space (Fig 1B).
3. The extremity of the thread that lies in the subacromial space is fed through the loop, and the inferior suture is tightened, locking the first half of the suture (Figs 1C and 2A).
4. A new loop is placed 10 mm from the lateral extremity of the tendon (Fig 2B).
5. The tip of the thread is fed through the newly created loop (Fig 2C).

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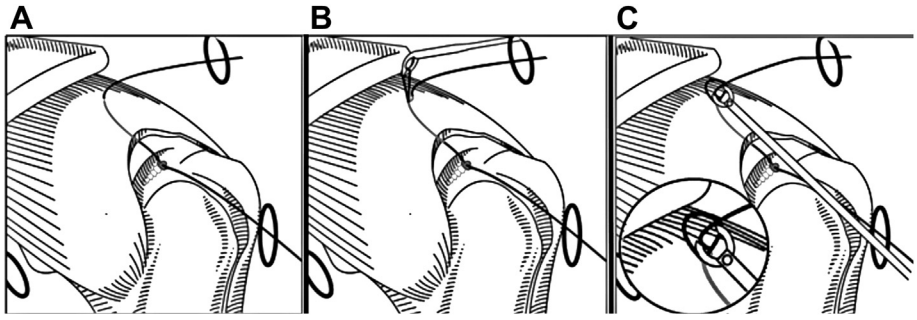

Fig 1. (A) Posterolateral view of right shoulder with rotator cuff tear. A suture anchor, fixed to the greater tuberosity, as well as one of the suture straps, is passed through the tendon next to the myotendinous junction. (B) By use of a suture passer, a loop is made through the tendon, next to the passageway of the thread. (C) By use of a suture retriever, the first strap is passed through the loop that has been created.

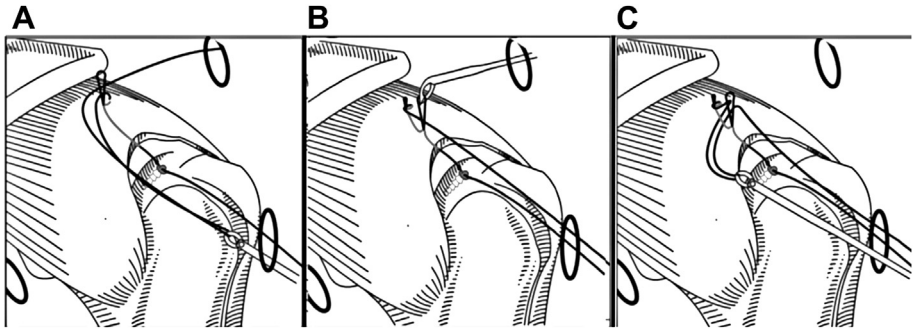

Fig 2. (A) Passing of thread through loop. (B) The first loop is locked, and a new loop is created between the first loop and the tear border. (C) The strap is passed through the second loop.

6. The surgeon tightens all the sutures, closing the lesion and creating the configuration of the arthroscopic double-locked suture (Fig 3A). Because most anchors carry 2 preloaded sutures, another of these sutures may be placed, enhancing resistance (Fig 3B).

Discussion

Arthroscopic repair of rotator cuff tears poses one of the greatest technical challenges to shoulder surgeons. It is our belief that most failed repairs are due to vascular insufficiency, especially when considering that Codman's area, the most susceptible to tears, is also the area with the poorest irrigation.[7] Anatomic studies have shown that the blood vessels supplying the rotator cuff present a parallel distribution to that of the muscle fibers, going from medial to lateral.[7] Thus transverse sutures are more likely to cause ischemia, increasing the risk of failure.

Unlike other transverse sutures, such as the Krackow stitch, the modified Mason-Allen stitch, and the Mac stitch, the newly proposed arthroscopic double-locked suture is placed parallel to the axis of the muscle fibers, preserving the microvasculature (Fig 3C) and allowing a reinforced locked suture that provides more resistance to traction forces and less chance of tendon dehiscence.[3-5,8] This technique is especially helpful to the surgeon when trying to repair poor-quality ischemic tendons in conditions that do not allow the use of other safe techniques such as the double-row technique and its transosseous equivalents.

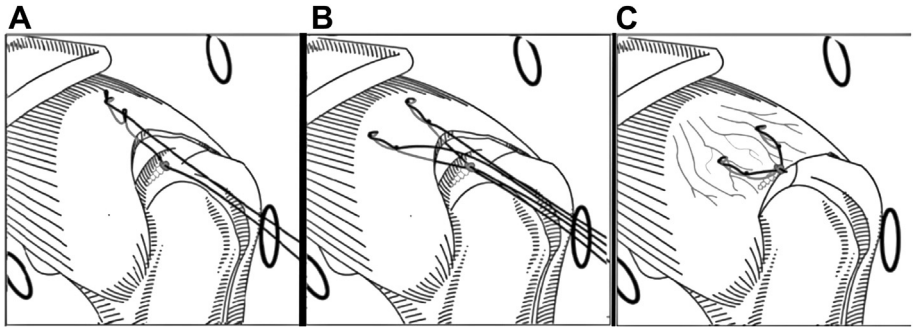

Fig 3. (A) The threads are tensioned, and the arthroscopic double-locked suture is complete. (B) By use of a suture anchor, 2 arthroscopic double-locked sutures may be created. (C) The stitches are longitudinal and parallel to the tendon vascularization, therefore constituting a nonischemic suture.

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