

Technical Note

The Triad Knot: A New Sliding Self-Locking Knot

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Abstract: Tying secure knots is essential in arthroscopic surgery. A new slip knot for arthroscopic shoulder surgery is described. Locking of the knot is accomplished by pulling the post strand. Knot tying is simple and a low-profile, secure knot is produced. **Key Words:** Knot—Shoulder—Suture anchor.

Most currently used repair and reconstruction techniques in arthroscopic shoulder surgery necessitate the use of sutures and suture anchors.¹ The use of suture anchors has improved the results of arthroscopic glenohumeral and subacromial shoulder operations. To achieve successful reapproximation of soft tissue to bone or soft tissue to other tissue, among other factors, an appropriate knot should be chosen for a given anchor and a given suture material.² A suture-anchor construct can fail in several interfaces, e.g., the anchor-bone, the anchor-suture, and the suture-tissue interface, and the knot itself.³ Several knots are available to the shoulder surgeon including sliding and non-sliding knots. A knot should have several properties to make it useful, but tying various satisfactory knots may represent a technical challenge. Knot tying should not be difficult to master or time consuming to perform and the knot should not be bulky to avoid knot impingement.^{4,5}

We are introducing a new sliding, self-locking knot,

the “Triad” knot, which we have used in arthroscopic Bankart and rotator cuff repair (Fig 1). This knot was initially used by one of us (I.H.). The knot is characteristic because it is tightened by pulling the post strand unlike most sliding knots, which are tightened by pulling the non-post strand.

DESCRIPTION OF THE KNOT

Untangling the sutures using the knot pusher is done first. As a general rule, the suture limb passing through the soft tissue is designated as the post. A knot pusher is threaded on the initially shorter post strand and a clamp is placed on its free end. The 2 suture limbs are held parallel while the non-post strand forms a loop and is held close and parallel to the 2 other strands (Fig 2). The 3 strands are pinched between the thumb and the index finger. The free end of the non-post loop is crossed 3 times around (over and under) the 3 strands and finally passed through the loop (Fig 3). The loop serves as an internal locking mechanism, holding together and compressing the successive loops wrapped around the 3 strands (1 post, 2 non-post). Slack is removed from the sutures, the post strand is pulled, and the knot pusher guides the knot down the arthroscopic cannula to the soft tissue (Fig 4). Pulling on the non-post strand is not necessary. Once the knot is seated, the knot pusher maintains pressure on the knot while tension is applied on the post strand so that the initially formed loop locks the

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Cite this article as: Yiannakopoulos CK, Hiotis I, Antonogiannakis E. The triad knot: A new sliding self-locking knot. Arthroscopy 2005;21:899.e1-899.e3 [doi:10.1016/j.arthro.2005.04.100].

0749-8063/05/2107-4336\$30.00/0

doi:10.1016/j.arthro.2005.04.100

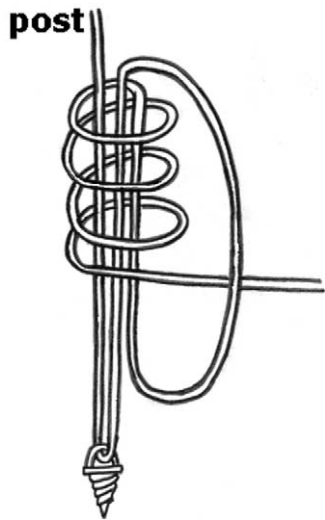


FIGURE 1. A drawing of the Triad knot.

knot (Fig 5). The knot pusher is backed off and the morphology of the knot is assessed. No pastpointing is necessary at this stage to lock the knot. One underhand and 2 overhand half hitches are tied to secure the knot, the suture tails are cut with scissors, and the knot is complete.

DISCUSSION

Knot tying is essential in arthroscopic shoulder surgery to achieve adequate tissue approximation, which leads to a successful surgical outcome. Mastering knot tying techniques is an essential step in practicing arthroscopic shoulder surgery.

A knot must have several properties.^{2,5} It should be secure and have a low profile to avoid slippage and displacement and impingement as well. Slippage results in loss of tissue approximation and eventually to

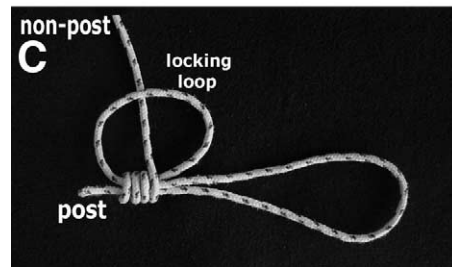
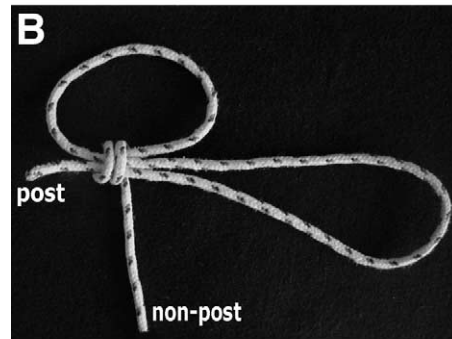
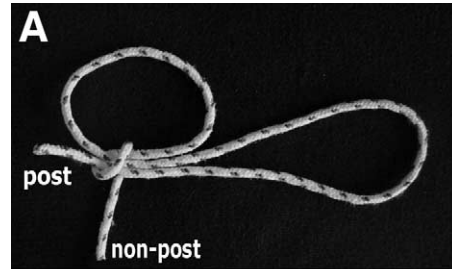


FIGURE 3. Three overhand throws are made around all 3 suture strands: (A) the first throw, (B) the second throw, and (C) the third throw.

clinical failure, and impingement may cause secondary injuries or pain.³ Nonabsorbable braided polyester sutures are preferred because they are easier to use and knots tend to lay down better and be more secure;

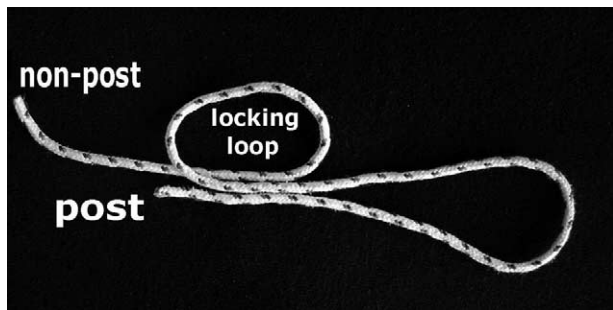


FIGURE 2. The non-post strand is folded to form a loop. Three parallel suture strands are formed.

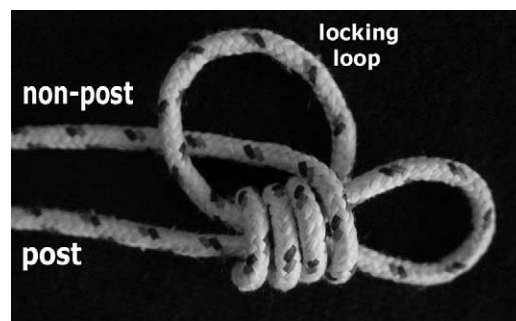


FIGURE 4. The knot is advanced and seated.

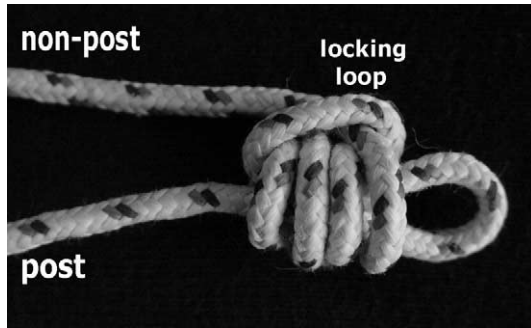


FIGURE 5. Locking of the knot is accomplished by pulling the post until the loop of the non-post strand secures the 3 loops. Two additional alternating half hitches complete the Triad knot.

however, these sutures may become frayed with handling.⁴

The Triad knot affords adequate loop security and is easy to tie. Contrary to most sliding knots, the Triad

knot is tightened by pulling the post strand only, taking advantage of a loop that is formed around all half hitches. A secure, low-profile repair can be created while premature locking or inadequate knot seating is avoided.

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