Technical Note

X-Grab: An Arthroscopic Maneuver to Efficiently and Accurately Track the Post for Knot Tying

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Abstract: Numerous studies have analyzed techniques for producing reliable and efficient arthroscopic knots. All aspects have been explored, from the biomechanics and strength to the ability to teach and replicate at all levels of training. This technique article describes an additional maneuver (X-grab) for efficiently marking the post side of the arthroscopic knot without having to do this separately outside of the joint. This is most useful for procedures such as rotator cuff repair and capsular repair or plication in hip arthroscopy in which the location of the knot (i.e., the post) is critical. The aim of this Technical Note is to describe the X-grab maneuver, which shortens this process to a single step, limiting the see-sawing of sutures and over-instrumentation of the joint seen with other techniques.

Over the past 4 decades, arthroscopy has become the predominant modality for many prior procedures only performed in an open manner in orthopaedics. With its increasing popularity, a natural push for increased efficiency through both techniques and technology has been met with industry support to advance the field of arthroscopy substantially. One of the initial hurdles when converting from open procedures was arthroscopic knot tying. Extensive research has been performed on the strength and reproducible nature of various arthroscopic knots.[1,2] However, there has been no description of a retrieval technique for labeling the post and tail components of the knot when retrieving sutures to tie knots where the location of the knot is critical. Our goal with this article is to describe an easy, 1-step technique (X-grab maneuver) to achieve this.

From American Hip Institute Research Foundation, Chicago, Illinois, U.S.A. (W.T.H., A.E.J., J.S.O., I.D-A., A.C.L., B.G.D.); and American Hip Institute, Chicago, Illinois, U.S.A. (A.C.L., B.G.D.).

The authors report the following potential conflicts of interest or sources of funding: A.C.L. receives food and beverage support from Arthrex, Iroko, Smith & Nephew, Stryker, Vericel, and Zimmer Biomet; receives grant support from Arthrex and Stryker; receives travel and lodging support from Arthrex and Stryker; receives consulting fees from Arthrex and Graymont Medical; and receives education support from Medwest and Smith & Nephew, outside the submitted work. In addition, A.C.L. is Medical Director of Hip Preservation at St. Alexius Medical Center and a clinical instructor at the University of Illinois College of Medicine. B.G.D. reports that the American Orthopedic Foundation provides grant support that pays staff and expenses related to all research. In addition, B.G.D. receives consulting fees from Arthrex, Medacta, and Stryker; receives research support from ATI Physical Therapy; receives research and education support from Arthrex, Medacta, and Stryker; receives educational support from Arthrex, Breg, Medwest Associates, St. Alexius Medical Center, and Ossur; receives royalties from Amplitude, DJO Global, Medacta, Stryker, and Orthomerica; receives speaking fees from Arthrex; receives travel and lodging support from Arthrex, Medacta, Stryker, and Prime Surgical; receives food and beverage payments from Arthrex, DJO Global, Medacta, Zimmer Biomet, DePuy Synthes Sales, Medtronic, Trice Medical, and Stryker; receives honoraria from Medacta; receives nonconsulting payments or fees from Stryker; and has a medical directorship with St. Alexius Medical Center, outside the submitted work. Moreover, B.G.D. has patents issued and receives royalties for the following: method and instrumentation for acetabular labrum reconstruction (8920497), licensed by Arthrex; adjustable multi-component hip orthosis (8708941), licensed by Orthomerica and DJO Global; and knotless suture anchors and methods of suture repair (9737292), licensed by Arthrex. Finally, B.G.D. is a board member of the American Hip Institute Research Foundation, AANA Learning Center Committee, Journal of Hip Preservation Surgery, *and* Arthroscopy *and has had ownership interests in the American Hip Institute, Hinsdale Orthopedic Associates, Hinsdale Orthopedic Imaging, SCD#3, North Shore Surgical Suites, and Munster Specialty Surgery Center. Full ICMJE author disclosure forms are available for this article online, as supplementary material.*

Received December 2, 2021; accepted January 15, 2022.

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2212-6287/211722

https://doi.org/10.1016/j.eats.2022.01.014

Surgical Technique

The patient is initially positioned per the surgeon's preference for the arthroscopic procedure. All critical portions of the case are completed prior to the arthroscopic knot-tying component. Any of a variety of looped suture graspers can be deployed. We prefer a straight-shaft WishBone looped grasper (Arthrex, Naples, FL); however, there are other straight-handled looped graspers with both vertical and horizontal orientations. Additionally, there are looped graspers that have tooth components such as the KingFisher (Arthrex). We discourage the use of such graspers for removing suture because doing so can disrupt the integrity of the suture if it is damaged by the teeth.

Initially, it is important to obtain a view that shows both the grasper and each end of the suture. If not, after grabbing the first suture, it can be pulled toward the second suture to obtain this view. Prior to grabbing the first suture, the surgeon must orient himself or herself to the static and dynamic arms of the looped grasper. The static arm is the portion of the device that does not move when opened and closed. The dynamic arm is the side that opens and closes. The dynamic arm will be closest to each suture as it is being grabbed. Specifically, graspers used for hip arthroscopy are often longer and have angulation toward the dynamic side, which makes their use easier for retrieval purposes. Either side of the suture (No. 2-0 coated Vicryl [polyglactin 910]; Ethicon, Raritan, NJ) can be grasped first. Beginning with 1 end, the surgeon grabs the suture with the dynamic arm. During the transition to the second suture limb, the surgeon rotates the grasper while closed 180°, adjusting the eyes of the arthroscope as needed for visualization. This moves the first suture from the dynamic side to the static side, but it remains in the closed loop of the grasper. Now, with the dynamic side once again free and facing the second

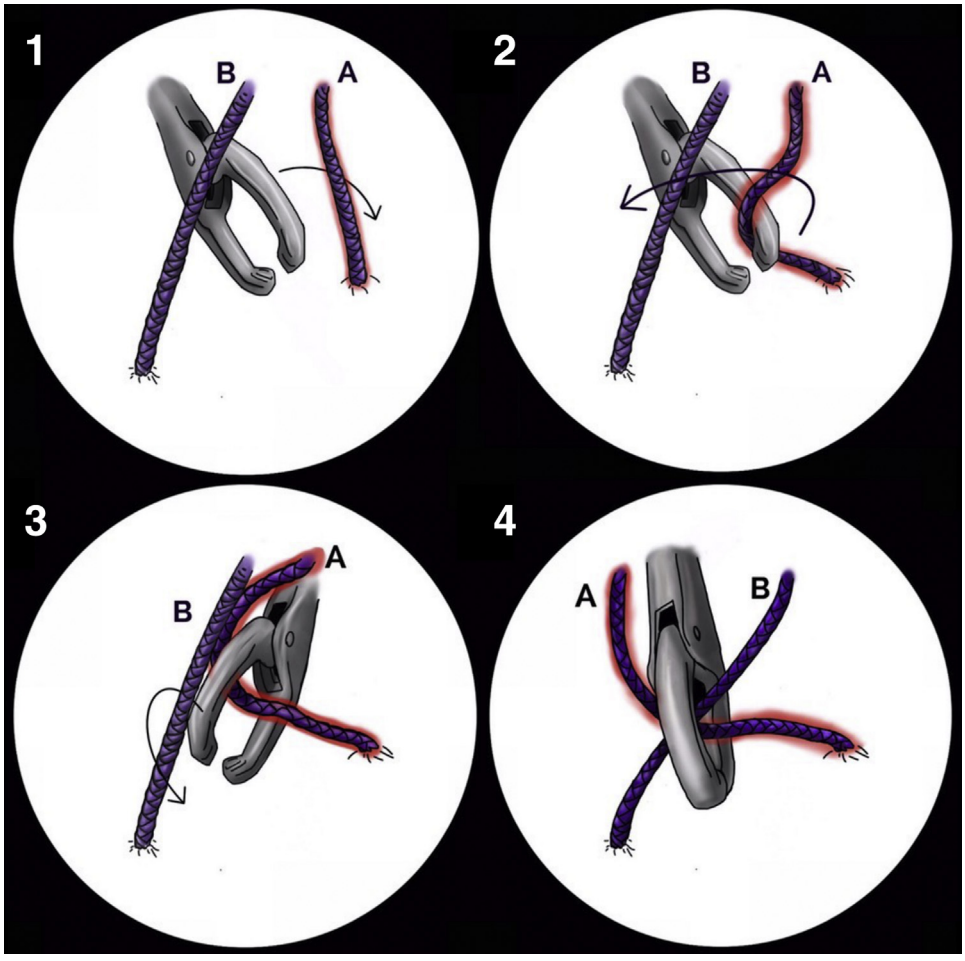

Fig 1. Steps involved in the X-grab arthroscopic maneuver to efficiently and accurately track the post for knot tying. (1) The looped grasper is introduced into the joint with both arms of the suture (A and B) visualized. (2) Suture A is grasped with the dynamic side of the retriever. (3) Suture A is maintained within the grasper and shifted through rotation to the static side while the dynamic side is positioned close to suture B. (4) Suture B is grasped with the retriever now containing both arms of suture in an X configuration.

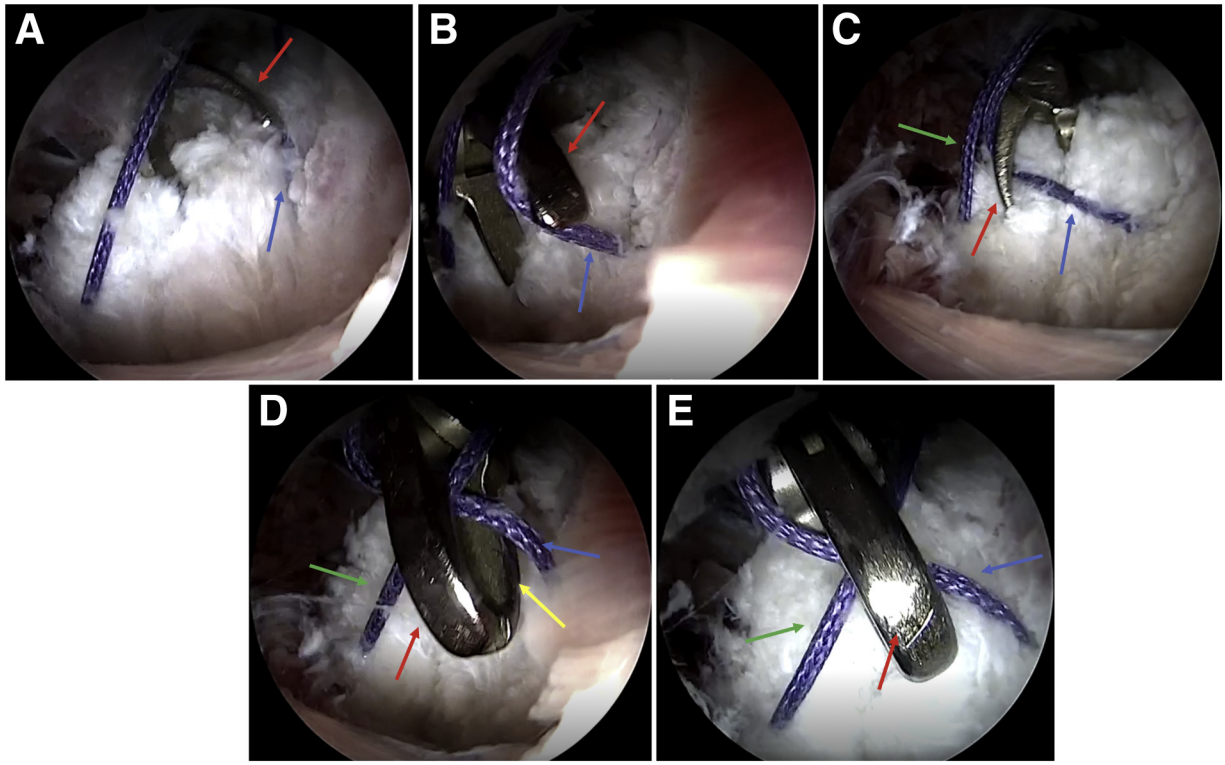

Fig 2. Figure depicting a left hip arthroscopy. (A) The dynamic arm (red arrow) of the looped grasper moves toward the first limb (blue arrow). (B) The dynamic arm (red arrow) grasps the first limb of suture (blue arrow). (C) After the first limb (blue arrow) is grasped, the dynamic arm (red arrow) rotates toward the side of the second limb (green arrow) of suture, maintaining a closed loop, retaining the first limb. (D) The looped grasper is opened with the first limb (blue arrow) now on the static side (yellow arrow) and the dynamic side (red arrow) once again opening and grabbing the second limb (green arrow). (E) Both the first limb (blue arrow) and second limb (green arrow) of suture are grasped within the closed loop just prior to retrieval and tying outside of the respective portal.

suture, the surgeon grabs it and makes sure to close it immediately, leaving both strands within the closed loop. At this point, the surgeon can lock the grasper if it has that functionality to prevent accidental loss of suture. The sutures will now be crossing in the orientation of an X. As the grasper is removed from the working portal, the loop between the 2 sutures and the tip of the grasper will be closed. When both limbs of suture are fully retrieved out of the cannula or portal, the surgeon can then place the index finger of his or her opposite hand in the middle of this now closed circuit, pulling toward the side with the suture end in the desired location for the knot to be tied. For example, this could be more anterior or posterior for medial-row rotator cuff repair or on the capsular versus femoral side of a capsular repair or plication in hip arthroscopy, as shown in Video 1. Figures 1 and 2 present several illustrations of this technique.

Discussion

The described technique simplifies labeling the post and tail components when tying arthroscopic knots. Previously, this would require removing each strand in 1 or 2 steps and then see-sawing the components to determine which strand correlates with a specific location of the suture in the joint. Being intentional about the location of the post sets the position of the knot, which is necessary with many procedures. Two examples are medial-row rotator cuff repair and hip capsule closure or plication.[3-5] In addition to setting the post with 1 step, by removing both ends of the suture at the same time, the possibility of unloading the anchor by accident is eliminated. The pros and cons of our technique are presented in Table 1, and technical pearls are presented in Table 2. This technique is limited to procedures that

Table 1. Pros and Cons of X-Grab Maneuver

Pros
Reduces operative time
Improves accuracy of post location for arthroscopic knots
Reduces need for cannula because sutures are removed simultaneously through single soft-tissue window
Decreases over-instrumentation of joint
Cons
Initial learning curve
Technically more demanding

Table 2. Technical Pearls of X-Grab Maneuver

The dynamic arm of the suture grasper should be used for individual strands.
Prior to releasing the grasper, the surgeon should place his or her index finger between both strands and pull toward the strand he or she desires to label the post.
The post should be shortened to just longer than the length that the knot will travel to diminish the stress of sliding longer distances than necessary.

require knot tying. With increasing knotless anchor technology, the need for this maneuver may be reduced.

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