



How to Decrease Suture Tangling When Performing Supraspinatus Repair With a Single–Working Portal Technique

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Abstract: Arthroscopic rotator cuff repair is one of the most common procedures in shoulder surgery. Some complications occur related to portal incisions, such as infection, bleeding, increased surgical time, and surgical scar. By using 1 lateral working portal with decreased suture tangling, surgical complications can be reduced and rehabilitation and patient satisfaction can be enhanced.

Arthroscopic rotator cuff repair techniques yield fewer surgical wound complications, faster rehabilitation, and better visualization.^{1,2} Arthroscopic rotator cuff repair can now be performed with the patient in the beach-chair or lateral decubitus position. Standard posterior and anterior portals are established.³ An anterior portal is often created. The posterior portal is the main viewing portal, whereas the lateral portal is the major working portal. To perform arthroscopic repair more comfortably, an anterior portal or other portal is created to assist in the operative procedure. Creating more portals risks more complications, such as neurovascular injury, skin problems, and infection.⁴

The fewer portals a surgeon creates, the more difficult arthroscopic surgery is to perform. We propose a surgical technique with fewer portal complications from the use of 2 portals, but this technique is still applicable to many patients who have supraspinatus tears (Video 1).

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Setup and Preparation

The patient is placed in the beach-chair position. The operative arm is allowed to move freely without traction, and the shoulder should be able to passively rotate

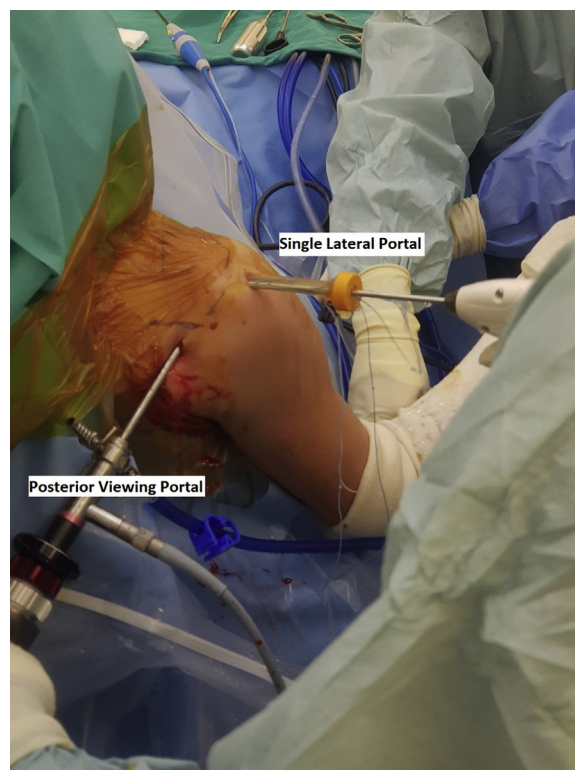


Fig 1. A preloaded suture passer is applied via a lateral portal. A posterior view of the right shoulder is shown, with the patient in the beach-chair position.

in internal, external, and abduction motions. Surgical scrubbing and disinfection of the whole arm are performed from proximal to distal, and the surgical field is draped with sterile cloths.

Surgical Technique

After anatomic bony landmark identification, a posterior portal is inserted inferiorly and medially to the posterior acromial border. An arthroscopic examination is performed. The torn rotator cuff is often noticeable from intra-articular viewing. A supraspinatus hole opening through the subacromial space with a completely torn supraspinatus muscle can be seen. When the supraspinatus muscle is incompletely torn, a thin muscle fiber can be seen from fluid flushing.

The posterior viewing portal is moved to access the subacromial space to identify the torn supraspinatus from the bursal side. After pointing the needle at the lesion from the skin, we cut the skin with a surgical knife, dilate an entry portal with a dilator, and insert a cannula. A radiofrequency coagulator and arthroscopic shaver are applied to debride soft tissue and create a wider subacromial space. We can rotate internally or externally to assess the torn area and the size of the lesion. The supraspinatus footprint is debrided with a

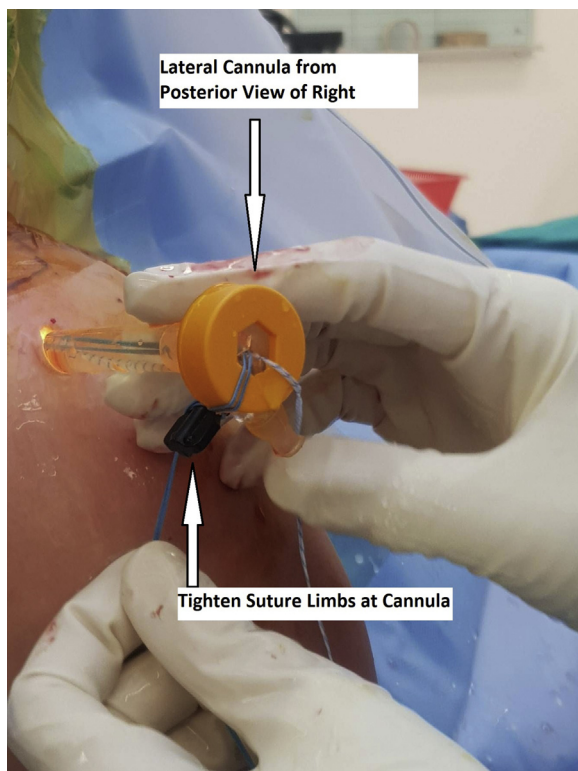


Fig 2. After finishing the first horizontal mattress suture, we tighten the first 2 limbs firmly with a cannula externally to decrease the risk of suture limb slacking and tangling. A posterior view of the right shoulder is shown, with the patient in the beach-chair position.

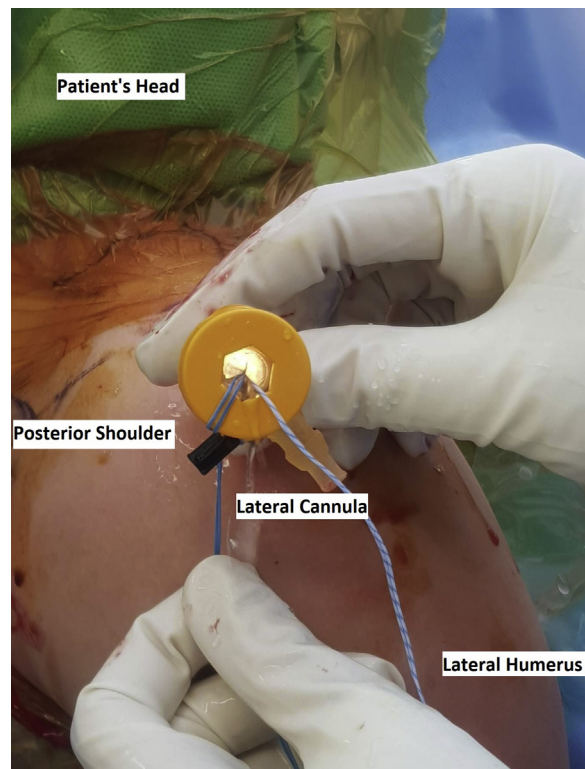


Fig 3. After finishing the first horizontal mattress suture, we tighten the first 2 limbs firmly with a cannula externally to decrease the risk of suture limb slacking and tangling. A lateral view of the right shoulder is shown, with the patient in the beach-chair position.

shaver. After we clean the subacromial space, an arthroscopic portal is inserted at the lateral acromion.

We use 1 medial-row suture anchor and 1 lateral-row suture anchor. The medial-row suture anchor (CrossFT, 4.5 mm; ConMed, Utica, NY) is inserted via the lateral portal with the arm in slight abduction and external rotation to allow the best visualization of the supraspinatus footprint and the lowest repair tension at the lateral edge of the articular cartilage of the humeral head. The proximal stump is repaired with a preloaded suture passer (FIRSTPASS MINI suture passer; Smith & Nephew, Andover, MA) (Fig 1). Using a horizontal mattress technique, we suture from front to back (i.e., in an anterior-to-posterior direction). After finishing the 2 anterior horizontal mattress sutures, we tighten the first 2 limbs firmly with a cannula externally to decrease the risk of suture limb slacking and tangling (Figs 2 and 3). An arthroscopic retriever is used to realign the suture strands. We then perform placement of 2 posterior horizontal mattress sutures. Surgical knots are tied from anterior to posterior. An all-PEEK (polyether ether ketone) knotless suture anchor (Pop-Lok; ConMed) is inserted in the lateral row next to the medial suture anchor in the coronal plane (Fig 4). All of the suture limbs—2 anterior and 2 posterior suture



Fig 4. An all-PEEK (polyether ether ketone) knotless suture anchor (PopLok) is inserted in the lateral row next to the medial suture anchor in the coronal plane. A posterior view of the right shoulder is shown, with the patient in the beach-chair position.

limbs—are retrieved and loaded in an all-PEEK knotless suture anchor. Finally, the viewing camera is inserted via the lateral portal to assess repair alignment, and skin closure is performed [Table 1](#).

Postoperative Care

The patient's shoulder is immobilized in an arm sling for 2 weeks in all ranges of motion while the elbow and wrist joints are allowed to be fully used. After 2 weeks,

Table 1. Critical Steps

1. Create a posterior viewing portal.
2. Perform an arthroscopic examination and locate the lesion (if applicable).
3. Move the posterior portal to the subacromial space area.
4. Create a lateral portal.
5. Apply a radiofrequency coagulator and arthroscopic shaver to clear soft tissue.
6. Insert a cannula.
7. Insert a suture anchor.
8. Repair the torn supraspinatus with a preloaded suture passer.
9. Tighten the suture strands with the outer surface of a cannula when they are not used to reduce suture tangling.
10. Insert a lateral-row suture anchor.

Table 2. Advantages, Disadvantages, Pearls, and Pitfalls

Advantages

- Minimization of skin and soft-tissue trauma from anterior portal
- Avoidance of cephalic vein injury
- Minimization of postoperative pain
- Better cosmetic outcome
- Shorter surgical time from creation of fewer portals and skin closure
- One cannula with lower operative cost

Disadvantages

- Difficult suture strand management
- Difficult instrument insertion in cannula

Pearls

- The first group of suture limbs should be tightened firmly with a cannula externally.
- The suture strands should be retrieved frequently when performing each step.

Pitfalls

- The suture strands might not be retrieved because the surgeon thinks the strands are not tangled, but in fact, they are twisting together. As additional steps are performed, management of the suture strands becomes more complicated.

the patient is encouraged to perform pendulum exercises. In the third week, passive and active ranges of motion are initiated, and rehabilitation is started to increase motion until the sixth week, when the patient is allowed to perform full motion of the shoulder. A full return to sport is expected after 6 months postoperatively.

Discussion

Arthroscopic rotator cuff repair is reputed to be a minimally invasive procedure owing to small incisions with better cosmetic outcomes, decreased postoperative pain scores, and quicker rehabilitation times. However, some complications related to shoulder arthroscopic procedures still occur.⁵⁻⁷ Skin infection is also a significant concern for all surgeons. The most common bacterial infection is *Propionibacterium acnes* from the skin.⁸ With more extensive surgical wounds, more skin complications occur. An infection can be a serious complication and require aggressive treatment. One study reported an anterior-portal infection that required debridement and removal of all suture materials.⁹ Bleeding and nerve complications can occur increasingly with a higher number of portal skin incisions.^{10,11} Surgical scar is also a complaint, especially from an anterior shoulder surgical wound, which is easily seen.

The use of more portals can assist surgeons in suture management, visualization, and soft-tissue handling. Our 2-portal technique may require more advanced surgical experience. The surgical suture can be easily tied with surrounding soft tissue or with other surgical materials. Thus, we recommend using a suture retriever

frequently and holding the other suture threads tightly when performing management of each suture Table 2.

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