

A Technique Using an Easy-to-Fabricate Cannula to Manage Sutures and Aid Graft Passage in Arthroscopic Superior Capsular Reconstruction



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Abstract: Arthroscopic superior capsular reconstruction has become a popular technique used to restore shoulder function in superior cuff deficiency. Passage of the graft via the portal sites is prone to entanglement with sutures and graft twisting. To make shuttling of the graft easier, and reduce the risk of suture entanglement, we developed a technique involving fabricating a suture management cannula from a simple sterile 10-mL syringe. The benefits of this technique are that it allows multiple sutures to be managed easily, avoiding entanglement of the graft during passage and attachment.

Superior capsular reconstruction has become a popular technique within specific clinical indications.¹ Patients with a deficient supraspinatus tendon may benefit from this procedure. The technique was initially described by Teruhisa Mihata et al.² using fascia lata autograft attached to the superior glenoid margin and the greater tuberosity of the humerus. Dermal allografts have become the most popular graft choice in North America.³

Passage of the graft can be difficult arthroscopically. While some surgeons may choose to pass the graft into the joint before passage of sutures, our preference is to shuttle the graft using sutures passed into the medial border. Suture management can therefore be challenging, and tangling of the graft with the multiple shuttling sutures should be avoided. To overcome this

potential difficulty and to make shuttling of the graft into the joint easier, we used a 10-mL 3-part Luer lip syringe (BD Plastipak, Becton, Dickinson, Oxford, United Kingdom) to create a cannula that allows passage of the graft while managing sutures to avoid tangling.

Surgical Technique

First, a sterile 10-mL syringe is opened. The plunger is then removed, and the nozzle is cut off using a scalpel.

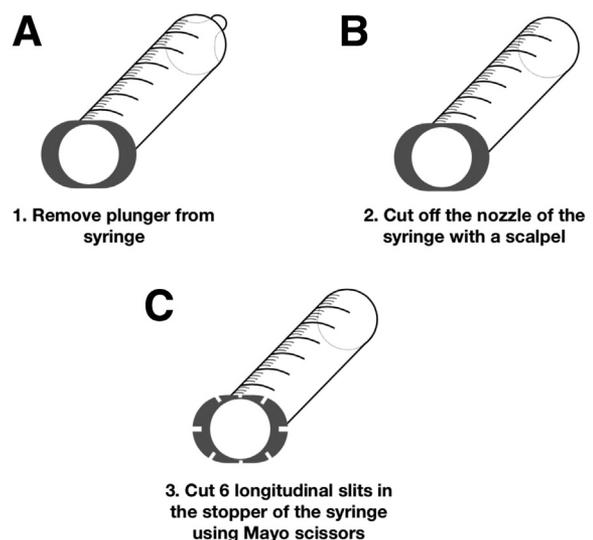


Fig 1. Creating the suture management cannula from a sterile 10-mL syringe. (A) Remove the plunger. (B) Use a scalpel to cut off the nozzle. (C) Cut 6 longitudinal slits into the stopper using Mayo scissors.

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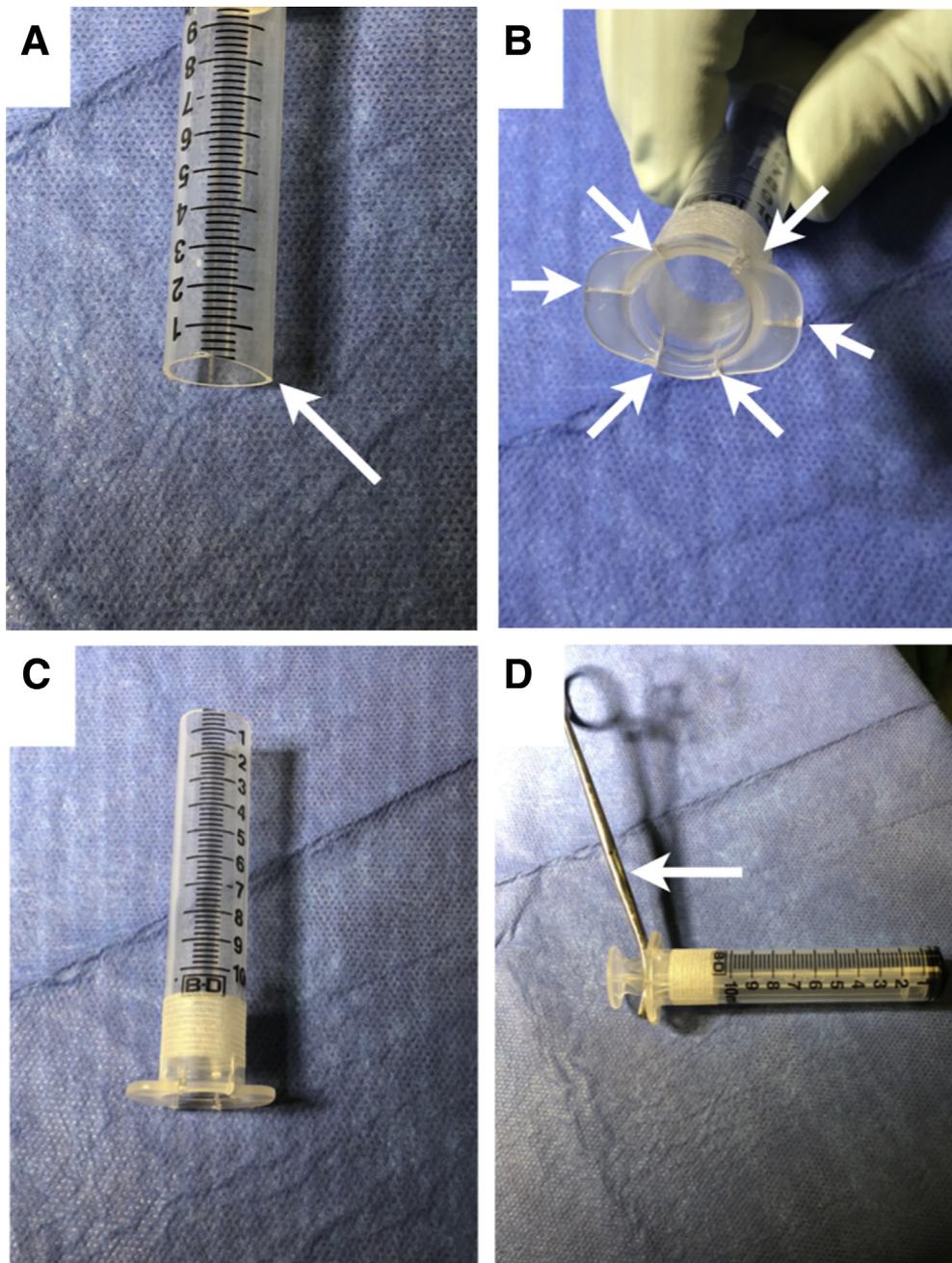


Fig 2. Digital photographs of the suture management cannula from a sterile 10-mL syringe. (A) The cut end of the syringe (white arrow). (B) The longitudinal slits (white arrows) in the stopper with (optional) steristrip to avoid propagation. (C) The completed suture management cannula. (D) The plunger reinserted and held with a clamp (white arrow) to allow passage into the joint via the portal site.

Then 6 slits are cut into the stopper of the syringe, as shown in [Video 1](#) (time 00:25), in the 1, 3, 5, 6, 7, 9, 11, and 12 o'clock positions ([Fig 1](#)). An optional one-half-inch steristrip can be placed around the base of these longitudinal slits to avoid propagation. The plunger is then placed back into the syringe, acting as a trocar to allow easy passage into the joint via the portal site ([Fig 2](#)), as shown in [Video 1](#) (time 00:42).

Once placed into the joint, the plunger is removed and the sutures are retrieved through the cannula. Careful management of suture retrieval is required, placing each suture into the corresponding slit. The 3

medial shuttling sutures are placed in the slits in the 1, 11, and 12 o'clock positions. The side-to-side sutures passing through the infraspinatus and supraspinatus are placed in the slits in the 3, 5, 7, and 9 o'clock positions. The sutures from the humeral suture anchors are placed in the slits in the 6 o'clock position. Sutures are secured into the corresponding slits after suture retrieval through the cannula ([Fig 3](#)).

The graft is then placed on the patient, and a suture passer is used to pass the sutures to the corresponding areas of the graft, as shown in [Video 1](#) (time 01:13). Prior to shuttling, the sutures inside the cannula are

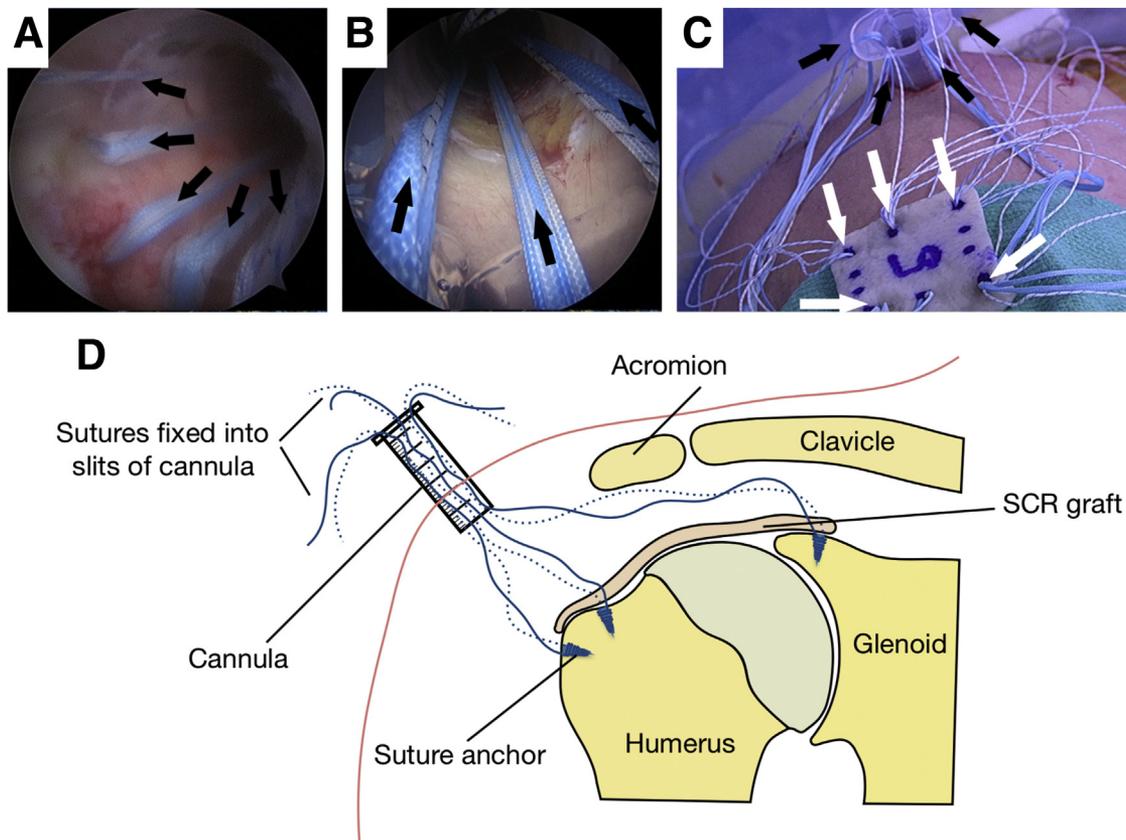


Fig 3. Arthroscopic suture management during superior capsular reconstruction (SCR) using the suture management cannula in a right shoulder. (A) Arthroscopic view of right shoulder (viewing from posterior portal) showing the sutures passing inside the cannula (black arrows). (B) Arthroscopic view of right shoulder using 70° arthroscope placed in posterior portal showing the sutures inside the cannula (black arrows), noting their peripheral position, allowing graft passage without tangling. (C) Showing the graft outside the patient with all shuttling sutures passed through the graft (white arrows) and secured into the cannula's corresponding slits (black arrows). (D) Illustration of a right shoulder showing the glenoid and humeral suture anchors with their corresponding sutures retrieved through the cannula and secured in place.

inspected to ensure no crossover or tangling is occurring inside the cannula (Fig 3). The graft is then shuttled via the cannula using a looped grasper holding the medial border of the graft in the middle, as shown in Video 1 (time 01:30). The outlet of the cannula is visualized from the viewing portal inside the joint as the graft is passed into the shoulder.

Discussion

Massive rotator cuff tears with significant immobility, poor tendon quality, or deficiency can be a surgical challenge. Many surgeons are now using biological grafts to either augment repairs in a bridging fashion or perform a superior capsular reconstruction. These techniques can be performed open or arthroscopically. There are many ways to pass these grafts arthroscopically, usually via a cannula. Some surgeons prefer to pass the graft before passing any sutures, while others prefer to pass the sutures through the graft outside the patient and then shuttle the graft through a cannula.

After passage into the joint, the graft is secured using either a knotless technique or by tying knots.^{4,5}

The process of passing the graft, either before or after passing sutures, is fraught with potential difficulties. The graft may twist on itself or become tangled among the sutures. Most techniques use 2 or 3 suture anchors on the superior glenoid margin and either a single or double row of anchors on the greater tuberosity of the humeral head. As such, there are many sutures passing through anchors and out of the portal sites. The advantages of the suture management cannula described in this Technical Note are that it avoids the graft and sutures becoming entangled within the cannula or inside the joint. Thus, by reducing the likelihood of entanglement or twisting, this technique may prevent unwanted delays during surgery.

There are potential disadvantages to this cannula. One reason why the risk of suture and graft tangling is reduced is the lack of dam, which allows visualization of the sutures inside the cannula to ensure twisting is avoided. The disadvantage of having a cannula without

a dam is that the rate of flow out of the joint is increased. However, we have not noticed this to be a problem in terms of visualization arthroscopically. Second, the fabrication of the suture management cannula takes around 3 to 5 minutes. This adds a short amount of time to the operation as the surgeon's assistant is preparing the cannula. However, we believe that the ease and speed in which this cannula allows graft passage, which can be a challenging step in this procedure, outweighs the added few minutes of preparation time.

There are a couple of potential risks and limitations to this cannula system. Occasionally, the slits created may propagate when the sutures are being secured into them. To avoid this, we occasionally place a one-half-inch steristrip around the slits to prevent this occurring. Another potential risk is injury to the deltoid muscle. However, this is common to all cannulas. The inner diameter of a 10-mL syringe is 14 mm, and the outer diameter is 16 mm. Care is taken to perform a multilayer closure of all portal sites at the end of the procedure. The 10-mL syringe used to create this cannula is smooth and does not have a thread to screw into

the portal site. Therefore, one limitation of this cannula is that it may slide in and out of the patient. To reduce this risk, we retrieve the humeral suture anchor sutures first and secure them into the 6 o'clock slit to tether the cannula to the patient. Another limitation is the higher flow rate as mentioned previously due to an absence of a dam in the syringe. We have not found this to be a problem since using this cannula technique.

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