Technical Note

The Use of the Supraclavicular Fossa Portal in Arthroscopic Rotator Cuff Repair

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Summary: Advances in arthroscopic technology allow rotator cuff repair through a minimally invasive approach. However, fixation of the rotator cuff tendon to suture anchors can be tedious and time consuming. The supraclavicular fossa portal allows improved access to the tear for passing suture. The authors describe the relevant anatomy, positioning, and surgical technique for use of the supraclavicular fossa portal to simplify arthroscopic rotator cuff repair. Key Words: Arthroscopy—Shoulder—Rotator cuff.

Neviser originally described the superior medial (supraclavicular fossa) portal for use as an accessory portal in shoulder arthroscopy. The advantage of this portal was entry into the shoulder joint through the muscular portion of the supraspinatus, thus avoiding penetration of the rotator cuff tendon. Further anatomic studies showed that proper placement of this portal was dependent on the degree of glenohumeral abduction. Humeral abduction greater than 45° was associated with a significant occurrence of rotator cuff penetration when entering the joint. The routine use of this portal has fallen out of favor due to frequent rotator cuff penetration and the increased use of more easily established portals.

Although the use of the supraclavicular fossa portal may be technically difficult for intra-articular applications, we have found a useful application in the subacromial space for arthroscopic rotator cuff repair. This report describes both the relevant anatomy and surgical technique for using the supraclavicular portal in arthroscopic rotator cuff repair.

MATERIALS AND METHODS

Ten fresh-frozen cadaveric shoulders were used to further define the relevant anatomy and positioning necessary for use of the supraclavicular portal. All specimens included the entire scapula, the lateral half of the clavicle, and the superior half of the humerus along with all neurovascular structures. There were 5 left and 5 right specimens; data on age and gender were not available.

The shoulders were positioned on the dissecting table to allow easy access to the supraclavicular portal while keeping the scapula in a neutral position. The portal was established 1 cm posterior to the clavicle and 1 cm medial to the acromion in the “soft spot.” A clamp was then placed on the humerus so that traction could be maintained at various degrees of humeral abduction.

Dissection was then performed to remove skin and subcutaneous tissue so that the shoulder musculature was exposed. The supraclavicular portal was then established with a straight trocar. A sufficient amount of anterior and lateral deltoid was removed from its insertion to allow visualization of the subacromial...
space. The acromioclavicular joint was left intact. A clamp was placed on the lateral acromion to control scapular rotation. A mark was made on the humeral head 1 cm medial to the anatomic insertion of the supraspinatus tendon to simulate the position necessary for suture retrieval with arthroscopic repair. The angle of the trocar, in relation to the scapular spine, required to reach the mark on the humerus was recorded at 0°, 30°, and 60°, of humeral abduction. Following this, the trocar was positioned perpendicular to the scapular spine and advanced vertically through the supraspinatus muscle belly and into contact with the scapula. Dissection was then performed to identify structures at risk with this aberrantly placed portal.

**RESULTS**

The supraclavicular portal was easily identified in all specimens (Fig 1). Hypertrophic acromioclavicular joints did not preclude the use of the portal. The trapezius muscle was penetrated in all specimens to gain access to the subacromial space. The approach angle necessary to reach the previously marked position on the humeral head was then recorded in relation to increasing humeral abduction (Table 1). In the neutral position (0° abduction), the average angle was 7.2°; at 30° abduction, the angle increased to 19.7°; and at 60° abduction, the angle was 30.8°. It became easier for the trocar to reach the location of the rotator cuff insertion with increased humeral abduction.

Meticulous dissection around the vertically oriented trocars revealed a complete penetration of the supraspinatus muscle belly in all specimens. The trocar contacted the body of the scapula superior to the spinoglenoid notch in all specimens. The suprascapular nerve was in close proximity to the trocar and was even penetrated by the trocar in 3 specimens. The average distance to the nerve was 3.1 mm with a range of 0 to 12 mm.

**OPERATIVE TECHNIQUE**

**Positioning**

We use the lateral decubitus position for shoulder arthroscopy. The patient is placed on the nonoperative side with an axillary roll, and a deflated beanbag is used to support the patient in this position. The operative extremity is placed in 60° to 70° of abduction with 10° to 20° of forward flexion. Ten to 12 lb of traction is applied to improve access to the joint and subacromial space.

**Portals**

Our arthroscopic evaluation for rotator cuff tears begins with an intra-articular examination. Standard posterior and anterior portals are established to examine the shoulder joint. All pathology is addressed. The rotator cuff insertion is examined for a partial- or a full-thickness tear.

After examination of the shoulder joint, the arthroscope is removed and placed into the subacromial space. A Wissinger rod is used to establish an anterior portal, and an outflow cannula is inserted. A lateral portal is also created 1.5 to 2 cm distal to the lateral acromion in line with the posterior aspect of the clavicle. This portal is enlarged with a blunt trocar. A
bursectomy is performed for visualization. If indicated, an acromioplasty is performed at this time. The rotator cuff tear is then examined for repairability and configuration. If deemed repairable, either by margin convergence or directly, the rotator cuff insertion on the humerus is debrided and lightly decorticated for tendon reattachment.

**Tendon Repair**

For margin convergence repairs, 8-mm clear cannulas are placed through the anterior and posterior portals into the subacromial space. The arthroscope is placed into the lateral portal. Nonabsorbable suture is then passed from anterior to posterior through the tendon using a penetrating suture passer. The convergence sutures are placed progressively from medial to lateral and tied arthroscopically from posterior. The side-to-side repair is continued laterally until the tension in the cuff becomes significant and suture will no longer hold.

For fixation of the cuff tendon laterally, suture anchors are placed through the lateral portal and the arthroscope is moved posterior to visualize their insertion into bone. Occasionally, it is necessary to establish percutaneous accessory portals to obtain the necessary 45° medially directed angle of insertion (deadman’s angle) for proper anchor placement into the previously decorticated bone.

**Supraclavicular Fossa Portal**

With the arthroscope posterior, the clear cannulas are placed in the anterior and lateral portals. The suture in the anchors is left in the lateral portal but outside of the cannula. This decreases the risk of suture entanglement when the lateral portal is used.

The soft spot medial to the acromion and posterior to the clavicle is then palpated. An 18-gauge spinal needle is then inserted angled 30° laterally in the coronal plane. At times, it is necessary to debride some of the tissue located in the subacromial space posterior to the acromioclavicular joint to enhance visualization of the needle. Once the needle is seen in the subacromial space, it is withdrawn and a 3-mm incision is made in the skin where the needle was inserted. The portal is then bluntly enlarged using a hemostat. An angled penetrating suture grasper such as the Arthrex Penetrator (Arthrex, Naples, FL) or the Innovasive 45° Suture Passer (Innovasive, Marlborough, MA) is then inserted (Fig 2). The instrument is visualized in the subacromial space, penetrates the cuff tendon medial to the tear, and is pushed out laterally under the cuff into the tear. From this position, a limb of suture-anchor suture is captured and drawn back medially through the tendon and out the supraclavicular portal. A nonpenetrating suture grabber is then used to retrieve both limbs of suture out the lateral portal. A simple stitch is then tied using a sliding knot backed with half hitches for security. This step is repeated until all the anchored sutures are incorporated in the repair. The final repair is then examined. If acceptable, cannulas are withdrawn and portals are closed with nylon suture or steri-strips. Patients are placed in a shoulder immobilizer postoperatively.

**Postoperative Care**

Following rotator cuff repair, we use a sling with abduction pillow to immobilize the shoulder. Passive pendulum exercises are started on the first postoperative day. Patients initial progress is dependent on the quality of the repair intraoperatively. Generally, most patients progress through a course of therapy with the initial emphasis on passive range of motion for the first 4 weeks, advancing to active assisted range of motion, and finally strengthening programs starting 10 weeks after repair. Noncontact, nonthrowing athletes return to sports around 6 months postoperatively, and contact and throwing athletes return after 9 months to 1 year.

**DISCUSSION**

Advances in shoulder arthroscopy have made it possible to perform rotator cuff repair through a minimally invasive approach. The supraclavicular fossa portal is not a standard portal used in our surgical practice because of the anatomic difficulties associated

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*Figure 2. Posterior view (A, acromion) of an anatomic model showing the use of an angled penetrating suture grasper (G) to approach suture anchors (S) placed in the humeral head. (One limb of suture has already been passed medially through the cuff.)*
with its intra-articular use and its poor functional access to the shoulder joint. Souryal and Baker\(^2\) found a significantly increased incidence of penetration of the supraspinatus tendon when the arm was ab ducted greater than 45°. While this presents problems for use of the portal intra-articularly, we find this access to the supraspinatus tendon to be an advantage for arthroscopic rotator cuff repair in the subacromial space.

The use of suture anchors has improved the lateral fixation of full-thickness rotator cuff tears.\(^3,6\) However, passing the suture through the rotator cuff tendon after the insertion of the anchor can be challenging and time consuming. Techniques to assist in suture passage include suture shuttles or suture passers. The use of a shuttle is effective but is a 2-step process.\(^7\) We prefer to use a penetrating suture passer (e.g., Arthrex Penetrator or Innovative Suture Passer) in this situation. These devices are best used when oriented 90° to the tear so that they can be advanced directly through the tear to retrieve suture and pull it through the tendon. The supraclavicular fossa portal allows direct access to most tears, both anteriorly and posteriorly. Further, the amount of tendon incorporated into the stitch can be visualized so that adequate fixation is ensured.

We believe that the supraclavicular fossa portal allows adequate access to the rotator cuff to be used as an accessory portal in arthroscopic cuff repair. However, proper technique is necessary to ensure the safe use of the portal. The lateral decubitus position helps to improve access to the supraclavicular fossa, but the beach-chair position may also be used if an assistant holds traction on the operative limb in greater than 45° of abduction. Further, we recommend the use of a spinal needle to initially establish the portal with arthroscopic visualization. The needle should be inserted and directed laterally in the coronal plane. Vertical positioning should be avoided because it may lead to damage to the supraspinatus muscle belly and suprascapular nerve. Occasionally, accessory portals are necessary to gain access to the subacromial space during arthroscopic rotator cuff repair. We have described a technique using the supraclavicular fossa portal location with a penetrating suture passer to gain the appropriate angle to pass suture through the cuff tendon with laterally based suture anchors.

**REFERENCES**