Submission ID #: 68098
Scriptwriter Name: Sulakshana Karkala
Project Page Link: https://review.jove.com/account/file-uploader?src=20769938

Title: Arthroscopic Management of Massive Irreparable Rotator Cuff Tears: Whole Rotator Cable Reconstruction Using Proximal Biceps Tendon Autograft

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Author Questionnaire

1. We have marked your project as author-provided footage, meaning you film the video yourself and provide JoVE with the footage to edit. JoVE will not send the videographer. Please confirm that this is correct.

√ Correct

2. Microscopy: Does your protocol require the use of a dissecting or stereomicroscope for performing a complex dissection, microinjection technique, or something similar? **No**

3. Software: Does the part of your protocol being filmed include step-by-step descriptions of software usage? **No**

4. Proposed filming date: To help JoVE process and publish your video in a timely manner, please indicate the proposed date that your group will film here: **MM/DD/YYYY**

When you are ready to submit your video files, please contact our China Location Producer, Yuan Yue.

Current Protocol Length

Number of Steps: 15
Number of Shots: 34

Introduction

NOTE TO VO: Please record the Introduction

1.1. The research investigates treatment strategies for massive irreparable rotator tears, aiming to evaluate outcomes and identify optimal, evidence-based approaches in an area lacking standardized clinical consensus.

1.1.1. Suggested B.roll:2.2

What are the current experimental challenges?

1.2. This technique requires proficient arthroscopic shoulder skills and suture management techniques. The video clearly demonstrates the procedural steps of this technique.

1.2.1. *Suggested B.roll:2.4*

What significant findings have been established in this field?

1.3. This technique utilizes the autologous proximal biceps tendon for whole rotator cable reconstruction, making it suitable for middle-aged and elderly patients with low functional demands who desire shoulder preservation.

1.3.1. *Suggested B.roll: 2.11*

What advantage does the protocol offer compared to other techniques?

1.4. The main advantages of this technique include facile tissue harvesting, a straightforward surgical procedure, the absence of immune response, and cost-effectiveness.

1.4.1. *Suggested B.roll: 2.10*

Ethics Title Card
This research has been approved by the Ethics Committee at the 909th Hospital, Xiamen University School of Medicine

Protocol

NOTE: Script drafted from available footage

2. Arthroscopic Shoulder Surgery with Biceps Tendon Reconstruction

Demonstrator: Jiapeng Zheng

2.1. To begin, place the anesthetized patient in the lateral decubitus position, pad all bony prominences with sponge supports, and gently mobilize the shoulder to release joint adhesions **[1]**.

2.1.1. FILE: 1 术前松解.mp4 00:00-00:28

2.2. Immobilize the operative arm using a foam traction sleeve **[1]**. Apply a traction force of 3 to 6 kilograms using a simple traction frame **[2]**. Tilt the torso back by 30 degrees, maintain the operative arm in 60 degrees abduction, and set flexion at 30 degrees **[3]**. After marking the anatomical landmarks and portal positions, disinfect the area with iodine tincture followed by alcohol **[4]**.

2.2.1. FILE: 2 上肢泡沫敷料保护牵引 1.mp4 00:03-00:08

2.2.2. FILE: 3 上肢泡沫敷料保护牵引 2.mp4 00:00-00:05

2.2.3. FILE: 4 体位、体表标记画线.mp4 00:00-00:10

2.2.4. FILE: 5 碘酊消毒 1.mp4 00:00-00:08

2.3. Next, create a standard posterior portal and make a 0.5-centimeter skin incision using an 11-gauge blade **[1]**.

2.3.1. FILE: 9 后方入路 .mp4 00:00-00:18

2.4. Insert a 30-degree arthroscope toward the rotator interval **[1]**. Target the anterior light spot via an incision along the lateral coracoid process **[2]**. Observe the shoulder cavity contents, evaluate the biceps long head tendon, and release the rotator interval if adherent **[3]**.

2.4.1. FILE: 10 建立前方入路 .mp4 00:00-00:12

2.4.2. FILE: 11 前方置入刨刀清理.mp4 00:00-00:08

2.4.3. FILE: 68098-1 .mp4 00:00:11 – 00:00:15, 00:00:32– 00:00:50

2.5. Now enter the subacromial space using a posterior arthroscopic approach **[1]**. Establish anterolateral and lateral approaches at 4 centimeters beyond the lateral acromion border **[2]**.

2.5.1. FILE: 68098-1 .mp4 00:04:03 – 00:04:09

2.5.2. FILE: 68098-1 .mp4 00:04:44 – 00:04:50

2.6. Observe the subacromial space from the posterior portal and insert a shaver through the anterolateral approach to debride thickened bursa and adhesive tissues **[1]**. Use a radiofrequency probe for hemostasis and mark the anterolateral acromion if hyperplasia or impingement is noted **[2]**. Debride soft tissues with hyperplasia using an arthroscopic shaver and remove subacromial spurs with a burr **[3]**.

2.6.1. FILE: 68098-1 .mp4 00:04:52 – 00:05:05

2.6.2. FILE: 68098-1 .mp4 00:08:16 – 00:08:31

2.6.3. FILE: 68098-1 .mp4 00:09:34 – 00:09:50

2.7. Next, reassess rotator cuff tears from the lateral portal, including tear pattern, extension, fatty atrophy, retraction, and location **[1]**. Evaluate the biceps long head tendon **[2]**. Proceed with WRCR *(W-R-C-R)* if massive irreparable rotator cuff tears cannot be restored to the footprint without tension after release **[3-TXT]**.

2.7.1. FILE: 68098-1 .mp4 00:13:50 – 00:14:00, 00:16:20 – 00:16:35

2.7.2. FILE: 68098-1 .mp4 00:18:40 – 00:18:45

2.7.3. FILE: 68098-1 .mp4 00:16:45 – 00:17:05 **TXT: WRCR: Whole Rotator Cable Reconstruction**

2.8. Use a radiofrequency probe to dissect and fully expose the distal end of the long head of the biceps tendon **[1]**. Transect the tendon at its insertion using a basket punch, maintaining a length of 6 to 7 centimeters **[2]**.

2.8.1. FILE: 68098-1 .mp4 00:21:31 – 00:21:38, 00:26:20 – 00:26:35

2.8.2. FILE: 68098-1 .mp4 00:27:49 – 00:28:00

2.9. Braid the long head tendon using four number 2 Orthocord braided composite sutures at both ends and the center **[1]**.

2.9.1. LAB MEDIA: Figure 5B

2.10. Freshen the footprint on the bone surface using a burr **[1]**. Create a U-shaped groove extending from the cartilage margin to the distal end of the greater tubercle at original cable locations **[2]**.

2.10.1. FILE: 68098-1 .mp4 00:34:36 – 00:34:50, 00:35:10 – 00:35:23

2.10.2. FILE: 68098-1 .mp4 00:35:42 – 00:35:50, 00:36:11 – 00:36:20

2.11. Position a 4.5-millimeter anchor at the anterior edge of the U-shaped groove **[1-TXT]** and another at the posterior edge **[2]**. Pull the woven biceps tendon into the subacromial space and secure it at the groove's distal end with two footprint anchors **[3]**. Ensure both ends of the tendon are anchored within the distal groove **[4]**.

2.11.1. FILE: 68098-1 .mp4 00:42:00 – 00:42:06 **TXT: Load both anchors with #2 sutures**

2.11.2. FILE: 68098-1 .mp4 00:42:12 – 00:42:16

2.11.3. FILE: 68098-1 .mp4 00:43:31 – 00:43:45, 00:45:22 – 00:45:38, 00:48:40 – 00:48:45,

2.11.4. FILE: 68098-1 .mp4 00:56:02 – 00:56:10, 00:56:44 – 00:56:49

2.12. Select the white suture from the cartilage margin anchor and pass it through the biceps tendon **[1]**. Tie the suture using an SMC knot to firmly secure the tendon and leave the tail for rotator cuff suturing **[2]**.

2.12.1. FILE: 68098-1 .mp4 00:57:27 – 00:57:32, 00:59:13 – 00:59:23

2.12.2. FILE: 68098-1 .mp4 00:59:36 – 00:59:40, 00:59:57 – 01:00:04

2.13. Using a suture shuttle, sequentially pass sutures from the anchor and tendon center through retracted cuff tissue **[1]**. With a full-loop knot manipulator, secure the repair using an SMC knot and manage sutures with a cannula **[2]**.

2.13.1. FILE: 68098-1 .mp4 01:00:43 – 01:00:49, 01:01:12 – 01:01:24, 01:01:45

– 01:01:52, 01:04:48 – 01:04:56

2.13.2. FILE: 68098-1 .mp4 01:15:19 – 01:15:28

2.14. Assess suturing with an arthroscopic probe hook **[1]**. Add anchors or sutures if needed to close the glenohumeral joint and subacromial space **[2]**.

2.14.1. FILE: 68098-1 .mp4 01:26:55 – 01:27:02, 01:27:36 – 01:27:47

2.14.2. FILE: 68098-1 .mp4 01:38:01 – 01:38:11, 01:41:26 – 01:41:35, 01:44:39 – 01:44:50

2.15. Perform radiofrequency ablation for hemostasis **[1]**. Drain fluid from subacromial space and suture the incision with 3-0 silk braided suture **[2]**.

2.15.1. FILE: 68098-1 .mp4 01:55:20 – 01:55:38,

2.15.2. FILE: 68098-1 .mp4 01:55:54 – 01:56:04

Results

3. Results

3.1. The one-year follow-up of the patients revealed significant improvement in shoulder function and pain relief as compared to those before surgery **[1]**. The patient's VAS score significantly decreased from 4.58 ± *(plus or minus)* 1.17 preoperatively to 0.67 ± 0.78 postoperatively **[2]**, while the ASES *(A-S-E-S)* score increased significantly from 43.30 ± 6.00 to 84.43 ± 4.73. **[3]**.

3.1.1. LAB MEDIA: Table 1. *Video Editor: please emphasize the VAS and ASES score in the post-operative column*

3.1.2. LAB MEDIA: Table 1. *Video Editor: please emphasize the VAS row*

3.1.3. LAB MEDIA: Table 1. *Video Editor: please emphasize the ASES row*

3.2. The postoperative active range of motion significantly increased throughout the follow-up period **[1]**. The patient's forward flexion significantly improved from 101.33 ± 27.77 degrees preoperatively to 154.08 ± 13.58 degrees postoperatively **[2]**. Similarly, lateral external rotation increased from 34.83 ± 10.55 degrees to 41.42 ± 10.29 degrees **[3]**, and internal rotation also showed improvement, rising from 7.00 ± 4.00 degrees to 8.83 ± 3.00 degrees **[4].**

3.2.1. LAB MEDIA: Table 1. *Video Editor: please emphasize the forward flexion, external rotation and internal rotation in the post-operative column*

3.2.2. LAB MEDIA: Table 1. *Video Editor: please emphasize the forward flexion row*

3.2.3. LAB MEDIA: Table 1. *Video Editor: please emphasize the external rotation row*

3.2.4. LAB MEDIA: Table 1. *Video Editor: please emphasize the internal rotation row*

Pronunciation Guide:

- **Arthroscopic**
  - Pronunciation link: https://www.merriam-webster.com/dictionary/arthroscopy Cleveland Clinic
  - IPA: /ɑːrθrəˈskɒpɪk/ (US variant: /ɑrθrəˈskɑpɪk/)
  - Phonetic Spelling: ar-thro-SKOP-ik
- **Massive Irreparable Rotator Cuff Tears**
  - *Massive* /ˈmæsɪv/ — MASS-iv
  - *Irreparable* /ɪˈrɛpərəbl/ — ih-REP-uh-ruh-bl
  - *Rotator Cuff* —
    - Rotator: /roʊˈteɪtər/ — roh-TAY-tur
    - Cuff: /kʌf/ — kuf
- **Whole Rotator Cable Reconstruction (WRCR)**
  - *Whole* /hoʊl/ — hohl
  - *Cable* /ˈkeɪbəl/ — KAY-buhl
  - *Reconstruction* /ˌriːkənˈstrʌkʃən/ — ree-kon-STRUCK-shun
- **Proximal Biceps Tendon Autograft**
  - *Proximal* /ˈprɑksɪməl/ — PROK-si-muhl
  - *Biceps* /ˈbaɪsɛps/ — BYE-seps
  - *Tendon* /ˈtɛndən/ — TEN-dun
  - *Autograft* /ˈɔːtəˌgræft/ — AW-toh-graft
- **Subacromial**
  - Pronunciation link: likely available in medical dictionaries (not seen in snippet)
  - IPA: /ˌsʌbəˈkroʊmiəl/ — sub-uh-KROH-mee-ul
- **Radiofrequency probe**
  - *Radiofrequency* /ˌreɪdioʊˈfriːkwənsi/ — RAY-dee-oh-FREE-kwuhn-see
  - *Probe* /proʊb/ — prohb
- **Anchor** (as in suture anchor)
  - Pronunciation link: regular English word; Merriam-Webster gives /ˈæŋkər/ — AN-ker
- **Supraspinatus**
  - Pronunciation link: https://www.merriam-webster.com/medical/supraspinatus Merriam-Webster
  - IPA: /ˌsuːprəˈspaɪnətəs/ — soo-pruh-SPY-nuh-tuhs

- Phonetic Spelling: soo-pruh-SPY-nay-tiss

Fatty Atrophy

- *Fatty* /ˈfæti/ — FAT-ee
- *Atrophy* /ˈætrəfi/ — AT-ruh-fee

Contracture

- Pronunciation link: medical dictionaries (not in snippet)
- IPA: /kənˈtræktʃər/ — kun-TRAK-chur

SGraft? Actually “Hamstring Allograft” appears in similar literature, but here “autograft” is used. *Allograft* pronounced /ˈælə͵græft/ — AL-uh-graft

Glenohumeral Joint

- *Glenohumeral* /͵glɛnoʊˈhjuːmərəl/ — glen-oh-HYOO-mer-uhl
- *Joint* /dʒɔɪnt/ — joynt

Suprascapular or Subscapular (if used)

- *Suprascapular* /͵suːprəˈskæpjʊlər/ — soo-pruh-SKAP-yoo-lur
- *Subscapular* /səbˈskæpjʊlər/ — sub-SKAP-yoo-lur

SMC knot (technical suture knot name)

- S-M-C → say the letters: “ess-em-see”
- *Knot* /nɑt/ — nawt

Anchor 4.5-millimeter

- *Millimeter* /ˈmɪlimətər/ — MIL-ih-mee-tur