직장: 이병일·전제명/연지: 박정호

개방적 복원술 Open Repair of Rotator Cuff Tears

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Contents

- 1. Elements of Open Repair of Rotator Cuff Tears
- 2. Characteristics of Mini-Open Repair
- 3. Dilemma in Treatment of Massive Rotator Cuff Tears

Elements of Open Repair of Rotator Cuff Tears

I. Skin Incision

- 1. Beach chair, lateral, supine position
- 2. Langer's line
- 3. Mini-open repair extension of anterolateral portal, transverse or vertical

II. Deltotrapezial Fascial Incision

- 1. "Deltoid on approach"-incision which parallels the anterior acromial border and proceeds down the raphe between the anterior and lateral deltoid"
- 2. Mini-open repair lateral deltoid splitting
- 3. Minimize the deltoid detachment and detach the deltoid with its osteoperiosteal attachments from anterior acromion (and distal clavicle)
- 4. Deltoid split
 - A. $\langle 4 \text{ cm-axillary nerve} \text{ is closer than 5 cm in 20\% of cadavers, especially true of female with short arm spans}^2$
 - B. Stay suture
 - C. Retract deltoid avoid excessive "pull"

III. Bone Excision

- 1. Acromioplasty-anterior and inferior two-step acromioplasty (Rockwood)
- 2. Minimal to no bone debridement (acromial smoothing)
- 3. Distal clavicle resection or removal of osteophyte of acromioclavicular joint
- 4. Resection of the coracoacromial arch (CA ligament release)³⁾
 - A. Remove CA ligament in subperiosteal fashion and repair back to the acromion in a more medial position
 - B. Endanger the deltoid origin, impair the superior stability, adhesion

between the cuff and acromion - "should not be thoughtlessly divided" (Codman)

5. Mini-open repair - arthroscopic acromioplasty, CA ligament release, distal clavicle resection, removal of osteophyte of AC joint

IV. Bursal Excision

- 1. Remove thickened, inflamed or fibrotic bursa and scar tissue an increase in inflammatory mediators, afferent nerve endings and their products in inflamed subacromial bursa is a source of pain^{4,5)}
- 2. Assessment of rotator cuff tear size, shape, location, depth, retraction, tendon mobility, reparability, tissue quality
- 3. Mini-open repair arthroscopic and/or open bursectomy

V. Tendon Preparation

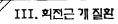
- 1. Humeral rotation to expose tear
- 2. Traction sutures

VI. Cuff Mobilization

- 1. Three stages of sequential release(1)
 - A. Humeroscapular motion interface is freed between the cuff and the deltoid, acromion, CA ligament, coracoid, coracoid muscle
 - B. Coracohumeral ligament/rotator interval capsule is sectioned around the coracoid process (interval slide)
 - i. CH ligament excision or incision of the coracoid base should result in as much as 1 cm of lengthening itself²⁾
 - C. Divides the capsule from the glenoid just outside the glenoid labrum
 - i. Medial dissection from the point of origin into the biceps tendon and the supraspinatus fossa should be limited to 3 cm (suprascapular nerve was on average between 2.5 and 3 cm medial to glenoid rim)
 - ii. Dissection from the posterior rim of the glenoid into the infraspinatus fossa should not exceed 2 cm
 - iii. Supraspinatus and infraspinatus could be advanced laterally for more than 1 cm²⁾

VII. Cuff Repair

- 1. Gently decorticate cuff "footprint"
 - A. Bony trough is not recommend increase the distance of tendon excursion and may create a sharp edge of bone over which the tendon has to pass⁶
 - B. Healing of rotator cuff tendons to cortical bone is comparable to



healing in a cancellous bony trough to

- 2. Transosseous vs. suture anchors "A frictionless surface" (Codman)
- 3. Transosseous suture
 - A. Sutures #2 nonabsorbable, braided
 - B. Cuff stitch simple vs. mattress vs. modified Mason-Allen suture
 - i. mattress suture inferior than simple suture80
 - ii. Mason-Allen suture do not slide or allow slack and may lead to suture breakage⁶⁾, but better grasping power in compromised tendon tissue⁹⁾
 - C. Drill holes at least 2~3 cm below the tip of tuberosity
 - i. Osteopenic bone more distally suture can be passed
 - D. Bury the tendon edge in a trough to prevent iatrogenic impingement
- 4. Any necessary side-to-side repair is carried out using a buried knot technique
- 5. Routine debridement of the tendon edges is not recommended healthy granulation tissue present over the tendon edges indicating a neovascular response⁶
- 6. Anterior and posterior tendon to bone stitches are tied first and then the middle sutures in 10° to 15° of forward flexion, 10° abduction and slight internal rotation position⁶
- 7. Tissue defects
 - A. Biceps hypertrophy²
 - i. Can be used to advance and reattach posterior cuff
 - ii. Can augment rotator interval and anterosuperior deficient coverage
 - B. Tissue deficiency or thin repair
 - i. Partial repair make "functional cuff tear" 10)
 - ii. Augmentation good result with polyester implant (Wallace) or ineffective with small intestinal submucosa¹¹⁾
- 8. Check repair 140 degrees of forward elevation and 40 degrees external rotation

VIII. Deltotrapezial Fascia Repair

- 1. Deltoid repair with nonabsorbable suture
- 2. Carefully reattach deltoid to prevent deltoid dehiscence
- 3. Poor results were associated with lateral acromionectomy or deltoid detachment

IX. Postoperative Care

- 1. Sling and passive motion for 4~6 weeks
 - A. Immediate continuous passive motion

- B. To allow more motion and to allow it sooner (Codman)
- 2. Full motion by 6 weeks
- 3. Active motion start at 4~6 weeks
- 4. Strengthening start at 8~12 weeks
- 5. Return to full activity 4~6 months
- 6. Should be individualized

X. Clinical Results

- 1. Open repair vs. min-open repair no difference in outcomes¹²⁾
- 2. Open repair
 - A. Functional improvement 70~95%, pain relief 85-100%
 - B. 7 of 24 arthroscopic-assisted rotator cuff repair were converted to an open end approach because of the quality of the tendon tissue and configuration of the tear requiring soft tissue releases¹³⁾
- 3. Mini-open repair
 - A. Small and moderate-sized tears had better functional outcome with arthroscopically assisted repair¹⁴⁾
 - B. Shorter hospitalization, earlier return to activity¹⁴⁾, greater active forward flexion¹²⁾
- 4. Determinants tear size¹⁴⁾, minimally retracted tears, good preoperative motion and strength, good tissue quality, no subscapularis involvement¹³⁾
 - A. Good prognostic factors²⁾
 - i. Intact biceps
 - ii. Strong deltoid
 - iii. Traumatic (younger)
 - iv. No prior symptoms
 - v. Acute repair
 - B. Poor prognostic factors
 - i. Involvement of subscapularis, teres minor
 - ii. LH biceps rupture
 - iii. Severe weakness
 - iv. High riding head
 - v. Muscle atrophy
- 5. Postoperative cuff integrity no significant effect on outcomes 150

Characteristics of Mini-Open Repair

1. Advantages of mini-open repair(3)

A. Glenohumeral assessment (and treatment of pathology) - 60.5% had associated intra-articular pathology and 12.5% had major abnormalities¹⁶⁾



- B. Deltoid preservation
- C. Less morbidity
- D. Cosmesis
- E. May allow for better handling of tendon retraction and poor tissue quality than arthroscopic repair

2. Disadvantages of mini-open repair

- A. Difficult to mobilize retracted tear
- B. Suture placement difficult due to limited exposure
- C. Required good arthroscopic skill
- D. Unable to access subscapularis/long head of biceps
- E. Increased deltoid trauma due to excessive pull
- F. Increased incidence of postoperative stiffness

3. Patient selection

- A. Preserved passive/active ROM
- B. Small to medium-sized tear
- C. Minimal to moderate retraction
- D. No superior humeral head migration
- E. No muscle atrophy
- F. Subscapularis not involved

Dilemma in Treatment of Massive Rotator Cuff Tears

1. Repair of massive tears

- technically challenging due to poor quality of remaining tissue, significant tendon retraction, bursal scarring, adhesions to adjacent structures

2. Two groups

- A. Atraumatic elderly, neglected (chronic), weak, muscle atrophy, pain
- B. Traumatic younger, normal prior to injury, marked sudden weakness, minimal muscle atrophy, pain

3. CAN it be repaired

- A. Assess only following cuff mobilization
- B. Inspection alone inadequate
- C. Don't know till you try

4. SHOULD it be repaired

A. Debridement - works(17) (83%) or deteriorates with time¹⁸⁾ (84-68%)

- B. Debridement inferior to repair and repair superior to debridement 199
- C. Preserve CA arch

5. DOES it heal

- A. Structural failure but clinical success^{20,21)}
- B. Cuff healing
 - i. Don't know unless you image
 - ii. Clinical exam unreliable to assess
- C. Better function with intact repair
- D. Debridement vs. failed repairs

6. Open repair of massive tear in patients aged 65 years or over²²⁾

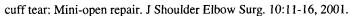
- A. Excellent or good 44%, poor 23%, satisfaction 44%, pain relief 93%
- B. Significant variables female sex, symptom duration than 34 months, American Society of Anesthesiologists grade
- C. Appropriately selected patients can be expected to have good functional outcome

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