

American Academy of Orthopaedic Surgeons  
The Shoulder II: Open and Arthroscopic Techniques #3620  
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Mini-Open Rotator Cuff Repair  
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Introduction

- Deltoid-splitting, not deltoid-detaching
- Indications
  - Best for small and medium tears (extending into anterior infraspinatus)
  - As originally described, not ideal for large or massive tears
    - Limited exposure due to lateral acromion and incision size
- Arthroscopic-assisted technique
  - Glenohumeral arthroscopy - address additional pathology
  - Subacromial decompression - bursectomy and acromioplasty
  - Arthroscopic releases possible
    - Tendon mobilization extend indications to larger, somewhat more retracted tears
  - Can serve as a transition step toward the performance of arthroscopic repairs
    - Side-to-side sutures can be placed arthroscopically, initially

Surgical Principles of Rotator Cuff Repair

- Neer's four objectives for rotator cuff repairs
  - Closure of cuff defect - tension-free, water-tight repair
  - Eliminate impingement lesions of coracoacromial arch
  - Preserve deltoid origin - meticulous repair
  - Rehabilitation to prevent stiffness without disrupting repair
- Additional steps for traditional open repair
  - Excise inflamed bursa - enough for exposure
  - Debride tendon edge - minimally to freshen edge
  - Mobilize tendon - glenoid rim releases, incise coracohumeral ligament, interval slides
  - Prepare bone of sulcus - expose bone bed, but no trough necessary

Notes

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- Gerber suggests that the “ideal repair should have high initial fixation strength, allow minimal gap formation and maintain mechanical stability until solid healing.”
  - Mason-Allen locking suture technique
    - Especially useful during repairs under some tension
- Quality of repair is dependent upon
  - Careful management of soft-tissues
  - Strong fixation of tendon to bone during the healing process
- Overall outcome affected by, among other factors,
  - Extent of pre-operative motion
  - Quality of tendon and bone
  - Amount of muscle atrophy
  - Diligent rehabilitation program
  - Motivated patient - post-operative pain management

#### Equipment

- Capable assistance - arm position and rotation facilitates exposure
- Retractors - further improves exposure
  - Kolbel or similar self-retaining
    - Narrow blades designed for smaller incisions
  - Baby Richardson, or similar sized
- Rasp - can be used to insure flat acromioplasty, and roughen tuberosity
- Chisel or bur - to remove tuberosity bony excrescences
- Rongeur, curettes, bur - to expose bone of sulcus
- Traction sutures
  - Assist with controlling tendon during mobilization and repair
  - Not tenaculums, towel clamps or Kocher clamps, which damage tendon
- Repair with non-absorbable braided suture, such as #2 size - #2 Panacryl can be considered
- Transosseous approach
  - Instruments to create tunnels
    - Link awls and crochet hooks
    - Linvatec repair system
    - Different sizes allow alternating tunnel position
  - Lateral bone augmentation for osteopenic bone
    - i.e., Cuff Link (Mitek) or plastic button
  - Two sutures per tunnel

#### Notes

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- Anchor approach
  - Larger size for fixation in bone
    - Screw-in possibly better than push-in anchor in this setting
  - Two sutures per anchor
  - Consider double row of anchors
- Taper needles - pass through tendon without slicing
  - Cutting needles not necessary

#### Limitations and Complications

- Limitations from constraints of deltoid-split
  - Not for subscapularis tears
  - Challenging for biceps tenodesis, ER and forward flex
  - Larger tears that are not well-mobilized will have tension and be compromised
- Not advised to repair to a point medial to sulcus, i.e., into articular surface
- Complications
  - General, “including but not limited to”
    - Failure of tendon healing
    - Symptomatic re-tear (not all re-tears are symptomatic)
    - Infection
    - Persistent pain
    - Persistent weakness - pre-operative assessment of muscle
    - Axillary nerve lesion - keep split less than 4 cm
  - Specific
    - Post-operative stiffness

#### Surgical Technique

- Pre-operative
  - Consent to include possible bicipital surgery or formal open approach
  - Insure AC joint is, or is not, a part of the pathology
- Pre-incision
  - Prophylactic antibiotics administered within one hour of incision
  - Interscalene anesthesia with sedation vs. general anesthesia
    - Interscalene blocks also provide post-op analgesia
  - Examination under anesthesia
    - No motion deficits pre-op are preferred
      - A stiff shoulder before surgery is more likely to be stiff afterwards
    - Mild motion limitations can be manipulated

Notes

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- Beach chair vs. lateral decubitus
  - Arm positioners help when in beach chair
- Mark landmarks and planned portals/incisions
  - Horizontal (in Langers lines, cosmesis) vs. vertical (more exposure) incision
  - Inject lidocaine w/epi into subacromial space and planned incisions
- Glenohumeral arthroscopy
  - Standard diagnostic steps
  - Address pathology as indicated
  - Establish additional portals, preferably with 18G spinal needle for localization
    - Anterior portal, thru rotator interval, for instruments and to view posterior
      - If distal clavicle resection planned, place this slightly more medial
    - Lateral portal can be established thru cuff defect
      - Insure placement works well for SAD and repair
    - 5.5 mm cannulas are usually all that is needed, unless tissue repair is planned
  - Partial cuff tears can be marked for identification in subacromial space
    - Pass 18G spinal needle from more lateral (to avoid portal location and to pass through tear obliquely from more lateral) thru suspected area of tear
    - Insert No. 0 prolene or No. 1 PDS suture thru hollow needle into joint
    - Retrieve suture from anterior portal and clamp the ends together
  - Damaged biceps can be tagged (i.e., same technique as marking) and/or released
  - Consider steps to mobilize tendon, such as releases around glenoid rim or rotator interval
- Subacromial arthroscopy
  - Scope sheath with blunt trocar swept medial/lateral to lyse scar and/or clear bursa
  - Arthroscopic evaluation of cuff, bursa, undersurface of acromion
  - Lateral portal established with spinal needle localization
    - Bursa shaved or ablated for exposure and to identify marking suture, if placed
  - Probe to define undersurface of anterior 1/3 of acromion
    - Then resect/ablate soft-tissue to expose bone/spur
    - Control bleeding with electrocautery as soon as it is encountered
    - Perform acromioplasty from lateral and complete from posterior (cutting-block)
    - Maintain margin of AC joint if not involved
  - Fully assess rotator cuff tear pattern - use switching sticks to view laterally
    - Determine if limited, mini-open incision is all that is required
  - If more arthroscopic steps are desired
    - Prepare the sulcus (can be started during glenohumeral portion)
    - Mobilize tendon, release adhesions above tendon more medially
    - Lightly debride tendon edge to promote healing

Notes

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- Pass a traction suture to assess mobility of tendon tear
- Pass side-to-side sutures, if tear pattern dictates
- Mini-Open Repair
  - Extend lateral portal
    - Extend deltoid split =3-4 cm from lateral edge of acromion (near anterior edge)
      - Limits risk to axillary nerve
      - Place a stay suture at the end of the split to prevent propagation
    - Develop flaps and place retractors for exposure
      - Specifically-designed self-retaining retractors facilitate exposure
  - Assess exposure and identify tear edge
    - Retrieve traction suture, if placed
    - Resect additional bursa for exposure, as needed
    - Irrigate now and, as needed, throughout remainder of case
    - Take this opportunity to palpate acromioplasty - rasp/recess as needed
  - Prepare tendon for repair
    - Reevaluate tear pattern and adjust plans, as needed
    - Debride tendon edge, if not done, and place traction sutures along tear edge
      - No. 0 braided, non-absorbable sutures are helpful, using taper needle
    - Mobilize tendon, as needed
      - Perform releases, including coracohumeral ligament, rotator interval
    - Prepare sulcus to exposed bone, if not already done
  - Address biceps, if not already done
  - Place side-to-side sutures - No. 2 or No. 0 braided, non-absorbable
    - Sutures are tied or clamped for later tying
  - Transosseous tunnels are placed, allowing for two free No. 2 sutures per tunnel
    - Different colors are helpful, or alternatively a No. 2 and a No. 0 in each tunnel
    - Number and position of tunnels is determined by the tear pattern and size
    - Start tunnel laterally, more distal bone is stronger
    - Exit in sulcus medially to allow for greater surface area of tendon to be apposed to exposed bone after suture is tied
    - Avoid “postage stamping” laterally by varying tunnel position proximal/distal
    - Augmentation of the bone laterally is placed, if required
  - Suture placement in the tendon is based on the tear pattern
    - Grasp >5mm of tendon, more if tendon quality is deficient
      - Spaced along tendon edge based on the number of sutures planned
    - From each tunnel, one suture is modified Mason-Allen technique, other simple
      - Therefore, one suture is locking and other suture is sliding

Notes

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- Suture fixation is performed in 10-15° of forward flexion, with arm at side
  - Tie sutures from side of least tension to most tension, often posterior to anterior
  - Each suture is tied to its other end, laterally over the tendon edge and tuberosity
  - Repair integrity is assessed through ROM, and noted for initial rehab limits
- Closure
  - Catheter for anesthetic infusion is placed thru separate posterolateral entry, if desired
  - Deltoid-split is closed with #2 braided suture, absorbable or non
  - Subcuticular closure is preferred under sterile dressing
  - Cryotherapy has a number of advantages now, as well as later during the rehab
  - Sling for immobilization, with instructions to avoid arm extension
- Postoperative Protocol
  - Healing proceeds through inflammatory phase, reparative phase and remodeling phase, similar for all soft tissue healing, though the repair creates a more controlled environment
  - The rehab process begins pre-op, when surgeon fully discloses expectations to patient
  - Phase I - acute or protective stage
    - 0-4 weeks, more, i.e., 6 weeks, for large/massive tears
    - Maintain sling for protection and to decrease pain
    - Cryotherapy to diminish inflammation
    - Analgesics to diminish pain
    - Passive ROM, progressing to active-assisted ROM
      - Earlier for small repairs, possibly not for some tenuous, massive repairs
      - Inflammation, a setback, can occur if pulleys are started too soon
    - Active motion to uninvolved joints
  - Phase II - subacute or recovery stage
    - Begins 4-6 weeks out, possibly later if size of tear, quality of tissue/repair dictate
    - Advancing to active ROM exercises
    - Progressing over time to advanced stretching
      - Premedicating with analgesics is often helpful
      - Heat promotes soft-tissue flexibility
    - Light, then more advanced, strengthening of shoulder girdle and affected muscles
    - Anti-inflammatory medication may be helpful
  - Phase III - functional stage
    - At 8-10 weeks, though could be later based on progress/repair characteristics
    - Maximize stretching and strengthening over time
      - Don't forget to stretch posterior capsule
    - Add sports- or activity-related exercises when strength improving
  - Activities are resumed in stages, based on demands

Notes

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## Results

- 80-100% good/excellent results for small/medium tears
- Results diminish accordingly for large/massive tears (~67%)
- Less costly, with shorter hospitalization, and earlier return to activities compared to open repair
- Beware of post-op stiffness and unrecognized AC pathology

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