Achilles Tendon Ruptures: How I Do It

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Tampa, FL January 23, 2016

Achilles Tendon Ruptures

- Most commonly injured tendon
  - Eccentric contraction of g-s complex
- Annual incidence 18/100,000
- Mean age 37-43 yo
- Increased in males

Achilles Tendon Injury: Imaging

- X-ray
  - Lateral ankle X-ray to exclude calc avulsion

- MRI
  - ?To diagnose partial rupture

Ultrasound

Operative vs Nonoperative

- Advantage
  - Improved functional outcome (return to sport)
  - Faster return to work
  - ↓ Rerupture
- Disadvantage
  - Invasive (wound)
  - Greater cost

- Advantage
  - No surgical complications
  - Lack of scar
- Disadvantage
  - Likelihood of patient dissatisfaction
  - Adherence to functional rehab protocol necessary for good outcome

Uquillas et al, JBJS-A 2015

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Non-operative Treatment With Early Functional Bracing

- 2 wks NWB in Cam boot with heel wedges
  - Hematoma consolidation
- Cam boot at 2 wks, progressive weightbearing, with progressive decrease in plantar flexion, dorsiflexion stop
- ROM
  - Passive plantar flexion exercises
  - Active dorsiflexion to neutral

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Non-operative Treatment With Early Functional Bracing

- Neutral in Cam boot at 6 wks
- Start formal PT at 6 wks
- Back in regular shoes at 10-12 wks

- Compliance mandatory!!!

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Operative vs Nonoperative

- *Willits et al, JBJS '10*
  - Accelerated rehab (early WB, early ROM)
  - No diff: rerupture, ankle ROM, function
  - Operative group stronger plantarflexion
- *Sorceanu et al, JBJS '12 (meta)*
  - No difference reruptures, fn w/functional rehab
  - Operative group rtw 19d earlier
- Decision between surgery and nonoperative treatment is a complex one that requires thorough discussion of risks and benefits of the procedure

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Operative vs Non-operative

- Conservative treatment remains an acceptable alternative in older, sick or sedentary patients who have fewer physical demands with limited functional and athletic goals
- The current preferred treatment in young and other wise healthy patients is surgical repair
  - Stronger tendon
  - Quicker return: work, military duty, play

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Surgical Repair

- Slight medial approach
- Curve distally and medially to avoid scar irritation with shoewear
- Proximally avoid sural n.
  - 11 cm proximal to tuberosity
  - 3.5 cm distal to m-t junction
  - 2 cm lateral to lateral achilles

Yepes et al, JBJS '10

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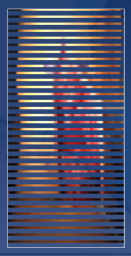
Surgical Repair

- Dissection sharply down to tendon, through paratenon
- Minimize undermining to preserve full-thickness flap for closure
- Expose tendon fully, debride ruptured tendon edges
- Repair in slight plantar flexion



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Surgical Repair

- Locking Krackow stitches
- 4 strands across repair site
  - No 2 or 5 non-absorbable woven suture

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Surgical Repair

- Epitendinous 2-0 vicryl to reinforce repair and ensure anatomic apposition
  - Increase repair strength, stiffness, failure strength
- Release deep posterior compartment
- Tack FHL muscle belly medially
- Water-tight closure of paratenon
  - Highly vascularized
  - Allows for smooth gliding of tendon b/w subQ tissue and deep fascia

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Surgery Post-op
Early Functional Mobilization

- ASA 325mg qd
- 3 weeks of non-WB immobilization
  - Posterior splint x 1wk, SLC x 2 wks
  - Primarily for wound healing
- Early protected ROM and WB in walking boot with 2-cm heel lift, DF stop x 3 wks
  - PT for gentle passive and full active ROM, wound mobilization, scar adhesions

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Surgery Post-op
Early Functional Mobilization

- Progressive WBAT, strengthening at 6 wks
- Bicycle, elliptical, pool exercise at 6 wks
- Standing calf stretch at 7 wks
- Double leg heel raise, wobble board at 8 wks
- Regular shoes full ADLs at 10-12 wks
- Light jogging at 4-6 mos

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Percutaneous, “Mini Open”

- Similar
  - Return to functional activities
  - Ability to perform ADLs
  - Patient satisfaction
  - Rerupture rate
- Lower incidence wound breakdown/complications
- Quicker
  - Return to walking, stairs, sports

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Mini Open Repair - *Achillon*

- Disposable
- Costly
- Nonanatomic repair
- Non locking sutures

Slide courtesy of Robert Anderson, MD

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Next Generation Jig = *PARS*(Arthrex)

- Changes
  - Anatomically improved contour
    - Non-disposable
  - Divergent sutures
  - Locked fixation
  - Colored suture, improved needles

Slide courtesy of Robert Anderson, MD

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Minimal Invasive Repair

- Contraindication
  - Avoid in very proximal or insertional ruptures
  - Distal Avulsions
  - Subacute/Chronic
    - More difficult if delayed > 3 weeks

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Minimal Invasive Repair: Technique

- Incision
  - Transverse or longitudinal
  - If transverse, make approximately 1 cm proximal to palpable rupture
  - Identify sural nerve and protect

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Minimal Invasive Repair: Technique

- Hold tension on tendon stump as jig is advanced
  - Tendon mobilization and jig placement easier with earlier treatment
- Stay superficial within pseudo-sheath
- Pass sutures
  - 2 nonlocked, 1 locked

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Minimal Invasive Repair: Technique

- Secure in maximum plantar flexion
  - Unlocked sutures first, then locked
  - Nearest to farthest

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Postop Management

- Week 0-2 Splint in plantarflexion, NWB
- Week 2-4 Hinged orthosis/splint in plantarflexion, NWB, gentle AROM (avoid early passive DF)
- Week 4-8 Hinged orthosis or boot, progressive FWB with heel lift, increased intensity exercise
- Week 8-12 Continue exercise with increased intensity, heel lift in shoe, run in pool/Alter-G/bike
- Week 12+ Jogging increases, functional exercises No running or jumping until after 16 wks

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Review of 1st 100 *PARS*

- Excellent healing with good tendon contour
- Only one "transient" sural nerve issue
- No re-ruptures

Hsu et al, FAI 2015

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PARS in the Elite Athlete

- 13 cases in elite athletes (2011-13)
  - 2 Olympians (gymnast, long jump)
  - 9 NFL (LB, TE, RB)
  - 2 NBA
- 2 locked sutures used on each end
- Average return to full athletic activity was 6.1 months (range 5.3 – 7.2 months)

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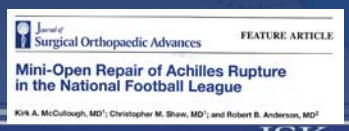
NFL Experience

- Published in JSOA, Dec 2014
- 9 NFL players – single surgeon *(RBA)*
- Avg RTP 8.9 months (one at 5.4 months)
- No re-ruptures, no wound or sural nerve issues


Journal of Surgical Orthopaedic Advances FEATURE ARTICLE
Mini-Open Repair of Achilles Rupture in the National Football League
Kirk A. McCullough, MD[1]; Christopher M. Shaw, MD[1]; and Robert B. Anderson, MD[2]

Slide courtesy of Robert Anderson, MD

NFL Experience

- 2014 season: 10 more with mini-open *PARS*
- No wound or sural nerve issues
- One re-rupture from a significant fall at 3.5 weeks = was unprotected
  - Required open revision

Slide courtesy of Robert Anderson, MD

PARS Results

- Quick learning curve
- Improved wound healing allows for earlier rehab
- Very cosmetic
  - Both skin and tendon
- Great marketing tool
- Charlotte: >200 with no significant complications

Slide courtesy of Robert Anderson, MD

Chronic Achilles Tendon Rupture

- 4 wks – 2.5 mos
- Poor healing potential
- Usually requires surgery
  - Augmentation
    - Soft-tissue
    - Synthetics
    - Allografts
  - Tendon transfer

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Chronic, Delayed Repair

- Debride nonviable tendon segments
  - Defect <3 cm, < 3 mos old
    End to end repair, +/- FHL
  - Defect > 3-6 cm
    - V-Y advancement
  - Larger defects
    - Fascial turndown of central third of proximal Achilles
    - Fresh-frozen Achilles tendon allograft (10 cm)
  - +/- FHL augmentation

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V-Y Lengthening: Defect 3-6 cm

Sliding Advancement of G-S Aponeurosis

-Debride necrotic tissue
-Apex of V at most prox part of myotendinous jn

-Limbs 2x length of rupture gap
-Gently advance myotendinous jn

-+/- FHL transfer
-Repair tendon
-Repair V in Y configuration

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Fascial Turndown

- Extend incision proximally and centrally
- Debride tendon back to healthy tissue
- Measure gap
- Identify central third of tendon and peel fascia off of deeper muscle + 1cm

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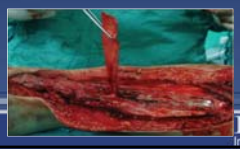
Fascial Turndown

- Place stay stitches at base of turndown just proximal to defect
- Flip fascia and secure to distal Achilles, calc
- Proximal split closed in side-to-side



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Chronic Achilles Rupture: Augmentation

- Autograft
  - FHL, FDL, or slip from gastrocnemius
  - Peroneus longus and plantaris weave
- Allograft
- Freeze-dried human acellular dermal collagen scaffold

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FHL Augmentation

- Augment strength of direct repair
- Supply vascularity to tendon ends
- Harvest
  - Through single posteromedial incision
  - Medial arch incision for harvest and introduce into posteromedial exposure, tenodese distal stump FHL to FDL

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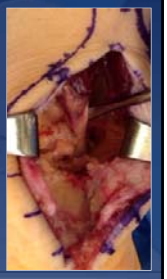
FHL augmentation

- Deep posterior fascia incised longitudinally
  - FHL muscle belly exposed
- Release fibrous sheath b/w lateral and medial tubercles of the posterior process
- Right angle clamp to tension FHL muscle and tendon and see flexion of hallux
  - Avoid tibial n/post tib a. just medial!!



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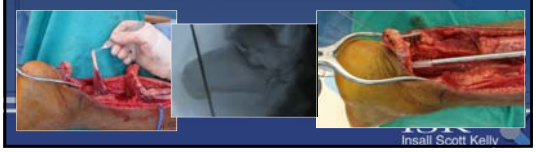
FHL augmentation

- Transect tendon under direct visualization in tunnel by the PM aspect of the subtalar joint
  - Flex ankle and hallux for maximum length
- Stump of FHL tendon anchored to the calcaneus with absorbable interference screw
  - DF ankle when drilling tunnel so co-linear, PF for appropriate tension on transfer



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Conclusions

- Common injury
- Functional non-op treatment similar outcomes to operative but compliance is mandatory
- Recommend operative management for athletes of all levels
  - Stronger tendon
  - Improved endurance
  - Quicker return to play, work

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Conclusions

- Surgical Repair
  - Protect soft tissues, sural nerve
  - Early functional mobilization
- Mini open repair does not have increased complications compared to open
  - Improved wound healing, patient satisfaction
  - Quicker return to sport, work

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Conclusions

- Chronic ruptures are challenging cases but good options for repair
  - Lengthening
  - Augmentation
  - Tendon transfers
  - Synthetics
  - Allograft

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