Operative Intervention of Achilles Tears

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1. Goals of treatment for both operative and non-operative management
   - Restoration of muscle integrity and tendon length
   - Return to full activity with preinjury strength
   - Avoidance of complications

2. Evaluation
   - The profile of patients who experience acute Achilles tendon ruptures is quite variable and should be taken into consideration when planning treatment.
     i. Weekend Warriors: Most are males with an average age of 38 who participate in running and jumping sports. Surprisingly, 10% are still misdiagnosed.¹
     ii. Higher level athletes: Operative intervention is the standard of care in acute Achilles ruptures for this patient population.
     iii. Older individuals or those with disease or medication as predisposing factors, often sedentary.
   - Physical Examination: The acute Achilles rupture produces a palpable defect usually 2-6 cm above the tuberosity in the hypovascular zone. Weak plantar flexion may still be present but the patient cannot perform a single leg heel rise.
     i. Palpable defect with positive Thompson test and altered carrying angle from unaffected side indicate torn Achilles tendon (99% reliable)
   - X-rays, MRI, and ultrasound are typically unnecessary for diagnosis unless an avulsion is suspected.

3. Treatment: There is no universally accepted treatment protocol for acute Achilles tendon ruptures. The choice is ultimately the preference of the patient and of the surgeon.

4. Potential complications
   - Minor and moderate: Pain, abnormal sensibility, scar adhesion, delayed wound healing, hematoma, suture granuloma, skin necrosis, superficial infection, keloid formation
   - Major: Deep infection, wound fistula, deep vein thrombosis, pulmonary embolus, death, fixed equinus contracture, major tendon lengthening
   - RERUPTURE

5. A Review of the Literature:
• Return to Activity
  i. Fairly well-accepted that operative repair facilitates a faster return to activity. Professional and elite athletes uniformly treated with operative repair.
  ii. In a military population, patients in the operative group returned on average 1.5 months sooner than in the non-operative group.  
  iii. Maffulli et al: Return to sport at an average 4.8 months in 17 national-level or professional athletes
  iv. McCullough et al: 7 of 9 patients able to return to the NFL with a mini-open repair
  v. In a meta-analysis of pooled level I studies, Soroceanu et al JBJS 2012 showed significantly sooner return to work (19 days) in the operative group.

• Rerupture
  i. In a series of 363 patients, Gwynne-Jones et al demonstrated significantly lower rerupture and re-operation rates in the operatively treated group.
  ii. Kocher et al: Rerupture rate 12.1% with non-operative treatment vs 2.2% with operative treatment
  iii. Several Level I studies trend towards higher rerupture rates in non-operative cohorts but do not reach significance.
     1. Nilsson-Helander et al: 6 vs 2 reruptures
     2. Metz et al: 5 vs 3 reruptures
  iv. However, these studies pooled together in a large meta-analysis do show significantly lower rerupture rates in patients treated operatively.

• Anatomic length
  i. Cetti et al. showed the average separation of an Achilles tear to be 2.73 centimeters at time of repair surgery.
  ii. While immobilization in plantar flexion has been shown to be effective, Reilmann et al found that 50% of defects cannot be compensated for by plantar flexion.

• Performance/Strength
  i. Minimizing tendon elongation very important for strength and function.
  ii. In a level I study, Willits et al showed a small but significant difference in plantar flexion strength in favor of the operative group at one year postoperatively.
iii. Cetti et al, in a level I study showed significantly higher (57% vs 29%) return to sports activities in the operative group.\textsuperscript{15} The operative group also had decreased calf atrophy, more ankle range of motion, and a significantly lower rerupture rate.

iv. Nilsson-Helander et al showed better short-term functional outcomes at 6 months with the use of the Achilles Tendon Total Rupture Score.\textsuperscript{10}

- Expected-Value Decision Analysis by Kocher et al\textsuperscript{9}
  i. A system in which patients place assigned values on a specific outcome (e.g. well, minor complication, major complication, rerupture)
  ii. Outcome probabilities determined from a systematic literature review
  iii. Fold-back analysis determined that operative management was the optimal treatment.
  iv. While wound complications are certainly a part of operative management, minor and moderate complications are more desirable than rerupture according to this model.

- Optimal tendon strength
  i. Achieved when both intrinsic and extrinsic healing mechanisms are utilized\textsuperscript{12}
    1. Intrinsic: Healing facilitated by inflammatory cells and fibroblasts within the tendon and epitenon. This is the primary healing mechanism in operative repair.
    2. Extrinsic: Healing via the migration of cells from surrounding tissues including the muscle sheath and synovium. This is the primary healing mechanism in non-operative repair, but is also a component of operative repair healing.

From all of these studies what can we conclude?

- Most importantly, early rehabilitation is very important in both operative and nonoperative treatment strategies in improving functional outcomes, reducing rerupture rates and minimizing postoperative complications.\textsuperscript{10, 14}
- While there are patient populations where non-operative management is certainly preferable (old, sick sedentary, afraid of surgery), surgery is the treatment of choice in younger patients and those with higher functional demands (laborers, athletes, military,
law enforcement, etc.) due to evidence of earlier return to work, reduced risk of rerupture, and superior short-term functional outcomes.  

6. Modern techniques aim to achieve direct apposition of tendon ends with sutures which are robust enough to allow early tensioning of the tendon repair followed by protected range-of-motion and weight bearing.

7. My surgical protocol:
   - Regardless of technique (open or mini-open, 6 core strand + epitenon repair), the surgery is performed with the patient prone and both ankles draped steriley in order to see that proper tension is restored.
   - Rehabilitation: Begins when wound has healed.
     - First 7-14 days: NWB in postoperative splint
     - Week 3: Drop-out cast, active plantar flexion
     - Week 5: Hinged orthosis or boot with wedges x 2, start PWB with crutches, weightbearing progression to full weightbearing over two weeks, start PT for active plantar flexion and allow dorsiflexion up to 5° short of contralateral side
     - Week 7: Wean wedges and adjust hinged orthosis (or boot) over 2 weeks guided by pain
     - Week 9: Wean boot over 2 weeks
     - Week 11-12: Start functional PT with sports progression
     - Week 12-16: Limit activities in athletes to practice or return to noncompetitive activities. Risk of rerupture persists up to 4 months.
     - Week 16: Start controlled practice with pain as guide
     - Month 6-12: Athletes return to full preinjury level of activity
References:


