Outcomes of Limited Open Achilles Repair Using Modified Ring Forceps

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Introduction

• **Surgical treatment of acute Achilles tendon ruptures:**
  – 2.4-4.7% rate of infection and wound healing complications

• **Meta-analyses, minimally invasive approaches have:**
  – Equivalent rerupture rates
  – Significantly lower risk of superficial infection
  – Higher patient satisfaction rates

• **Purpose**
  – Review the clinical outcomes of acute limited open Achilles tendon repair using modified ring forceps
  – Analyze functional results using validated outcomes measures
Methods

- 33 consecutive patients with acute Achilles tendon ruptures
  - Minimum 6 month follow-up
- Excluded proximal or insertionl ruptures, periosteal sleeve avulsions, chronic tears (> 6wk old), reruptures
- All patients underwent limited open repair with modified ring forceps
  - Straight ring forceps bent 30deg with a tabletop bender
**Modified Ring Forceps Surgical Technique.** (A) A small 2-3cm incision is made just medial to the palpable gap of the Achilles rupture. (B) Adhesions are cleared with a malleable retractor, and (C) the tendon stump is grasped with an Allis clamp (❖). (D) The modified ring forceps are passed deep to paratenon and gently grasp the Achilles tendon, the forceps are easily to palpate and triangulate through the skin and subcutaneous tissue (†). (E) A straight Keith needle with No. 2 braided non-absorbable suture is passed through the skin, lateral ring, paratenon and tendon, medial ring and far skin (■). (F-G) The suture is delivered out of the wound (*). (H) The distal stump is prepared. (I) The tendon stumps are reapproximated and the proximal and distal sutures are tied firmly. (J) The suture knots are passed deep (anterior) to the Achilles tendon (♣) and tied together to prevent symptomatic knots. (K) Post-operative photo demonstrating the small limited-open incision. (L) Final repair demonstrating restored equinus resting position of the foot.
Methods

**Post-operative protocol:**

- 0-2 weeks: NWB in short leg splint
- 2-8 weeks: WBAT in tall boot.
  - 2 heel lifts initially, removed sequentially at 4- and 6-wks post-op
- 12 weeks: low-impact activity
- 16 weeks: high-impact activity

**Validated patient-reported outcomes measured**

- 10cm Visual Analog Scale (VAS)
- Foot and Ankle Ability Measure (FAAM)
- Victorian Institute of Sports Assessment – Achilles (VISA-A)
• 33 acute Achilles tendon ruptures in 32 patients (27 males [84.4%], 5 females [15.6%])
  • Mean age 44 years (range, 21-76 years)
  • Average final follow-up 42.1 months (range, 6-90 mo)
• VAS: average Achilles VAS was 0.72 out of 100 (SD±4.2)
  • 32 of 33 answered “no” to “Are you having Achilles pain?”
• Complications
  • 1 case (3.0%) of superficial wound infection, resolved uneventfully with oral antibiotics and local wound care
  • No cases of deep infection, significant hematoma, sural neuritis, DVT, adhesions, symptomatic suture knots, or rerupture
Results

- Mean post-op score 82.3 out of 100 points (SD ±19.5)
- 79% pain-free while “stretching the Achilles tendon fully over a step”
- 67% were pain-free during single-leg heel rise
- 82% had no pain during Achilles-loading sports
- 79% had no pain with 10 or more single-leg hops
Results

- Mean post-op FAAM ADL subscale 96.5% (SD±5.2)
  - Functional level was 94% of pre-injury level during ADLs
- Mean post-op FAAM Sports subscale 85.1% (SD±21.2)
  - Functional level was 81% of pre-injury level during sport
- 73% reported no difficulty with recreational activity
- 81% could participate in their sport with normal technique
The treatment of acute Achilles ruptures remains controversial

Surgical goals: restore tendon length & tension, early rehab

Minimally invasive techniques maximize strength and function while minimizing complications

**Modified ring forceps technique**

- Compares favorably with repairs using analogous instruments and commercially available jigs

**Economical repair - Technique cost: $204.00 per surgery**

- 5.3 – 12.1x less costly per case than commercially available jigs
- Cost savings are $868-$2,261/Achilles repair
Technique Advantages

- 2-3cm incision, wound healing/infection risk minimized
- Rings joined at waist, easy positioning at same level & depth
- Surgeon holds instrument in 1 hand, passes suture with other hand
- Limited open approach facilitates direct inspection of tendon ends, aids in restoring native Achilles resting tension
- Work within paratenon, knots buried. Sural nerve irritation and blunt trauma avoided
- Locking sutures not needed (no reruptures)
- Short learning curve, quick efficient surgery (~40min)
Conclusions

• One of the first studies to report validated Achilles specific outcomes (VISA-A) for acute Achilles tendon rupture repair
• Demonstrated that limited open Achilles rupture repair with modified ring forceps has:
  • Favorable functional outcomes at mid-term follow-up
  • Excellent pain relief
  • Easy to learn, efficient surgery
  • Economical repair, commercial single-use kits not needed
• Extremely low complication rate