Haglund Deformity and Insertional Achilles Tendon Disease

Thomas O. Clanton, MD
The Steadman Clinic
Vail, Colorado, USA

I. Retrocalcaneal Anatomy
   A. Calcaneus
      1. Superior tuberosity
         a. May be hyper, normal or hypo-convex
         b. Contains the bursal projection
         c. More prominent laterally
      2. Posterior tuberosity
         a. Most posterior projection of calcaneus
         b. Area of most proximal portion of Achilles insertion
   B. Achilles Tendon
      1. Coalescence of gastrocnemius, soleus
      2. Rotates 90° leaving soleus fibers medial & gastroc fibers lateral
      3. Inserts on inferior portion of posterior calcaneal tuberosity ~ 1cm distal to superior tuberosity
      4. Insertion more substantial medially, extends approximately 2 cm distally
      5. Attaches to medial/lateral walls at insertion point
      6. Surrounded by paratenon (one layer) instead of tenosynovium (two layers)
   C. Bursae
      1. Retrocalcaneal
         a. Between Achilles insertion and superior tuberosity
         b. Horseshoe shaped, fluid filled sac (1.0-1.5cc)
         c. Fibrocartilaginous anterior wall = posterior to bursal projection

From Richardson EG: Heel pain. In Coughlin & Mann, Surgery of the Foot and Ankle.
d. Contiguous posteriorly with anterior Achilles epitenon

2. Adventitious
   a. Variably present
   b. Subcutaneous, retrocalcaneal

D. Vascularity
   1. Derived from epitendinous vessels (Anterior)
   2. Watershed area 2-6 cm from insertion, hypovascular
   3. Calcaneo-Achilles network better defined
      a. Derived from posterior tibial (larger), lateral plantar and peroneal arteries

II. Relevant Biomechanics
   A. Achilles tendon accepts 2000-7000 N of stress depending on applied load
      1. Subjected to forces 6-10 times body weight during single cycle of running gait pattern
      2. Talocalcaneal joint orientation may affect the calcaneal insertion of the Achilles predisposing the tendon to stress overload (e.g. overpronation)

III. Causes of Posterior/Retrocalcaneal Heel Pain
   A. Insertional Achilles Tendonitis/Tendinosis (IAT)
   B. Haglund’s Disease
   C. Retrocalcaneal (RC) Bursitis
   D. Historical Perspective
      1. Original description
         a. Patrick Haglund – 1928
         b. Identified retrocalcaneal heel pain, its causes and treatment
         c. Viewed collectively in the reported literature without distinction
      2. New description in 1992 by Clain & Baxter
         a. Insertional Achilles tendonitis described as a separate entity
         b. Classic Achilles tendinosis occurs 2-6 cm proximal to insertion
         c. Difficulty in differentiation between IAT, Haglund’s and bursitis
         d. Pertinent literature suggests overlap exists, but distinctions should be made

IV. Insertional Achilles Tendonitis/Tendinosis
   A. Incidence
      1. Occurs in 6.5 - 18% of runners/athletes
      2. 9-20% of these have insertional variety
      3. Felt to be overuse injury - mostly runners, but also repetitive jumpers (e.g. basketball, volleyball players)
      4. Can occur at any age, but tends to affect older age group than non-insertional group (avg. = 44 yrs vs. 33 yrs)
   B. Pathophysiology
      1. Overuse injury, accumulated impact load
2. Attritional, degenerative - "osis" changes histologically
3. "itis" may be present as a result of concomitant RC bursitis but is not primarily responsible for the condition
4. Chemical irritation and mechanical abrasion may lead to chronic inflammatory response at the heel
5. "Stress enthesopathy" – (Helal) gradual repetitive traction force at insertion point leads to calcification
6. Tight Achilles, overpronation, cavus configuration, obesity have been implicated to predispose to the above changes

C. History & Physical Exam - Pain at the bone/tendon junction
1. History of
   a. Posterior heel pain worse after exercise, may become constant
   b. Worse on hard surfaces, stair-climbing or with heel running
   c. Recent increase in mileage or resumption of training after periods of inactivity ("weekend warrior")
   d. Poor stretching habits
2. Physical exam
   a. Tender at bone tendon interface
   b. Thickening at insertion or even palpable defect
   c. Limited dorsiflexion compared to uninvolved side

D. Diagnostic studies
1. Lateral heel radiographs
   a. Association with prominent superior tuberosity
   b. Variable but common presence of intratendinous spur or "calcific tendinosis"
   c. Assess for presence of Haglund's deformity by pitch angle, parallel pitch lines, and posterior calcaneal angle
2. MRI
   a. More helpful to define extent of involvement of tendon insertion than as diagnostic tool
      - patients with tenderness of the Achilles tendon insertion and no obvious signs of inflammation who have evidence of intrasubstance signal change on MRI generally do NOT respond to nonoperative treatment
      - 70%-91% of patients with intrasubstance signal changes required surgery
3. Ultrasound
   a. May be helpful, but technician dependent.
   b. Good preliminary results
4. Differential diagnosis
   a. Most common Haglund's deformity - coexists in ~ 60% of patients with IAT, but true syndrome is different
   b. Retrocalcaneal bursitis
      - Most likely a continuum

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- Rare as isolated condition
- Pain more medial/lateral, but not directly at insertion of tendon
- More anterior to tendon

c. Others
- Seronegative spondyloarthropathies
- Gout
- Familial hyperlipidemia
- Sarcoidosis
- Systemic corticosteroids
- DISH
- Oral fluoroquinolone antibiotics

E. Treatment

1. Conservative treatment is effective in 95% of cases

2. Conservative - conventional
   a. Rest, NSAID's
   b. Crosstraining - after subsidence of acute episode (e.g. swimming, bicycling, aquajogging, weightlifting, etc.)
   c. PT - emphasis on gastroc-soleus, hamstring stretching modalities, iontophoresis
      - Eccentric training
      - Review of 3 studies demonstrated large group of unsatisfied patients, only 35/83 (42%) were “extremely satisfied” or “satisfied” (Wiegerink et al.: KSSTA, 2012)
      - may be less effective for insertional variety than for midportion Achilles tendinopathy (Roche & Calder: Bone Joint J, 2013; Wiegerink et al.: KSSTA, 2012)
   d. Resume running - reduce mileage, encourage soft surfaces
   e. Heel lift - (1/4 -3/8") - unload Achilles, displaces heel away from shoe counter; may incorporate wedge to control overpronation if present
   f. Orthoses - correct biomechanics - pronation, cavus
   g. Cast - 3-4 weeks followed by gradual resumption of activity
   h. AVOID STEROID INJECTIONS!!

3. Conservative - unconventional
   a. Sclerosing therapy (Ohberg L, Alfredson H: KSSTA, 2003) – injection of polidocanol to reverse neovascularization
   b. Extracorporeal shock wave therapy (ESWT) - 77%-83% of patients satisfied (Wiegerink et al.: KSSTA. 2012)
      - Rompe, Furia, Maffulli: JBJS, 2008
      - RCT comparing efficacy of eccentric calf strengthening and repetitive low-energy shock wave therapy for insertional Achilles tendinopathy in 50 patients (25 per group)
      - at 4 months, VISA-A questionnaire (pain, function and activity) showed greater improvement for shock wave therapy (53 to 80) than eccentric loading (53 to 63)
c. Platelet rich plasma (PRP) - mixed results, majority of studies focused on non-insertional Achilles tendinopathy

d. Cold air and High Energy Laser Therapy (CHELT)
   - comparison of CHELT and ESWT in 60 patients (30 per group) with insertional Achilles tendinopathy
   - CHELT provided quicker and better pain relief, full recovery and greater satisfaction

4. Surgical- usually employed after 6-12 months failed conservative treatment.
   a. Primary goals
      - Excise RC bursa
      - Resect superior prominence
      - Debride calcific or diseased portion of tendon insertion
      - Reattach if necessary- can use suture anchors or suture bridge
   b. Surgical approach - controversial
      - Single medial or lateral
      - Double
      - Inverted Y
      - J or Hockey stick
      - Short transverse
      - Central tendon-splitting approach (Go where the money is!)
         - Allows direct access to tendon, calcaneus, bursa
         - Good visualization
         - Technically simple
         - No skin bridge
         - Potential problem – painful keloid (rare)

F. Results

1. Operative findings
   a. Intratendinous calcification is predominantly central
   b. Expands medial or lateral in smaller percentage
   c. Extent of disease and tendon involvement much greater in patients >50-55 yrs

2. Specific reports
      - 16 feet with RC bursitis: 93% satisfaction with retrocalcaneal decompression
      - 22 feet with IAT/calcific tendinosis: 74% satisfaction
      - Patients with IAT and calcification were older, had longer recovery, more pain and shoe wear restrictions
      - IAT group had 41 % complications
      - Radiographic recurrence did not correlate with outcome or symptoms
   b. McGarvey, Palumbo, Baxter, Leibman: FAI, 2002
      - 22 heels in 21 patients, avg f/u = 33 months
      - Central approach
- 20 of 22 returned to work or routine activity by 3 months
- 18 of 22 (82%) satisfied with surgery
- 17 of 22 (77%) would have surgery again
- 13 of 22 (59%) returned to full activity without problems

- 41 feet in 35 patients, avg f/u 39 months
- Lateral approach, resection of prominent tuberosity, excision of bursa and debridement of thickened paratenon and calcific deposits
- 90% with complete or significant relief, remaining 10% improved

- 29 ankles in 27 patients, mean f/u of 7 years obtained on 25 ankles in 23 patients
- Central tendon splitting approach with excision of degenerative tendon and intratendinous calcifications, Haglund prominence exostectomy and retro calcaneal bursa excision
- 24/25 ankles completely pain free and satisfied with operation

- 36 feet in 34 patients, avg f/u 35 months
- Calcific spur resection at Achilles insertion, 29 (81%) also had concomitant Haglund deformity resection
- 69% good outcome, 25% moderate, 6% poor → reoperation for re-growth of spur

3. Conclusions
   a. Good alternative
   b. Not a panacea
   c. Best used in younger patients
   d. Older patients- treat as chronic Achilles tendon disease/deficiency

4. Insertional Achilles Tendinosis – older patient - consider immediate tendon transfer
   a. Alternatives for tendon transfer: peroneus brevis, FDL, FHL
   b. Author’s preference - FHL
      - Greater strength, durability - 2:1 compared to FDL
      - Anatomically better - "In phase" muscle (plantar flexor as opposed to PB which everts)
      - Axis of contraction most closely approximates Achilles
      - Fires in sync with G-S group
      - Anatomic proximity facilitates less dissection, better approximation
      - Avoids need to disturb NV bundle
      - FDL compensates for FHL function via vincular attachments
   c. Technique - traditional
      - Supine position
      - 2 incisions
      - Detach FHL at master knot
- Optional suturing of distal stump to FDL
- Split anterior Achilles paratenon
- Bring FHL tendon through drill hole dorsal central to medial
- Sew FHL muscle belly to residual Achilles (increase vascular supply)

d. Newer technique
- Posterior approach, prone position
  - FHL harvested at tarsal tunnel
  - Inserted into calcaneal drill hole and fixed with bioabsorbable interference screw
  - Single posterior incision, better fixation, less dissection, earlier rehab

e. Results
- Elias, Raikin, Besser et al.: FAI, 2009
  - 40 ankles in 40 patients, avg f/u 27 months
  - central tendon splitting approach with tendon debridement, Haglund exostectomy and FHL transfer for treatment of chronic IAT
  - 95% (38) rated outcome satisfaction as very good (33) or good (5), two rated as fair and none as poor
  - all patients would recommend to family/friend if needed
- Schon, Shores, Faro et al.: JBJS, 2013
  - 58 limbs in 56 patients, 24 month f/u was obtained on 48 limbs in 46 patients
  - patients underwent Achilles tendon debridement, calcaneal exostosis resection (if present), and FHL transfer for treatment of insertional OR midsubstance Achilles tendinosis
  - significant improvements in: VAS pain intensity (6.7 vs 0.8), SF-36 (34 vs 49), Ankle Osteoarthritis Scale pain (54 vs 1.9) and dysfunction (63 vs 11) subscales, and single-leg heel raise (1.9 vs 2.7)

f. Caveats
- Postero-medial incisions tenuous in older patients (check TcPO2)
- Do not over resect Haglund's (up to 50% Achilles attachment okay per Kolodziej, Glisson, Nunley: FAI, 1999)
- Do not put drill holes too close together (compromise bridge)

g. Rehabilitation (Wapner)
- 4 weeks equinus cast
- 4 weeks neutral walking cast
- Then begin rehab/motion
- Protect with walker boot till 10° DF & 4/5 inversion strength
- May have regular shoe with lift for home ambulation
- I prefer less cast use and earlier mobilization

V. Haglund's Syndrome
A. General
1. Constellation of symptoms associated with Haglund's deformity
2. Bursal projection
3. Objective radiologic finding - not necessarily symptomatic
4. Haglund's Syndrome occurs when bursal projection is compressed with poorly fitting shoe heel counter leading to retrocalcaneal bursal inflammation and pain
5. Adventitious (superficial subcutaneous) bursal inflammation due to direct irritation
6. NO Achilles involvement

B. Diagnosis
1. History and physical exam
   a. Painful heel, especially with certain shoes
   b. Tender medial and especially lateral to Achilles insertion on calcaneus
   c. Pumps actually can reduce symptoms by reducing pitch angle and forcing foot downward and away from heel counter
2. Radiographic
   a. Posterior calcaneal (Fowler-Philip) angle >75°
   b. Parallel pitch lines - bursal projection should lie below superior line
   c. Pitch angle - less is better; avg. ~ 20°
   d. Plantar osseous projection leads to higher pitch angle and can lead to tipping of the bursal projection posteriorly causing a + PPL - these occur in 40% of adults

C. Treatment
1. Conservative
   - Much like that of IAT
   - Remove the offending shoes (hard counters)
   - Wear heel lift or slightly high heel
2. Surgical
   - Resection- Goal is to decompress calcaneal prominence thus relieving impingement on surrounding bursal tissue
   - Must remove entire bursal projection plus additional 0.5 cm
   - Excise bursa if inflamed
   - Lateral paratendinous approach - projection is superolateral
   - Complication rate is low (Stephens; OCNA, 1994 - 0%)
3. Endoscopic approach

From Richardson EG: Heel pain. In Coughlin & Mann, Surgery of the Foot and Ankle. 1999, p. 872

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- Endoscopic calcaneoplasty (ECP) - first described in 2001 (van Dijk et al.: AJSM, 2001) and has since had modifications (Jerosch et al.: KSSTA, 2003; Labib & Pendleton: J Surg Orthop Adv, 2012)
- 81 patients, avg. f/u 35 months
- endoscopic resection of calcaneal exostosis and retrocalcaneal bursa
- 41 patients with excellent results, 34 good, 3 fair and 3 poor → all 3 had ossified area of Achilles tendon insertion and underwent open resection with tendon reattachment
- 30 feet in 28 patients, avg. f/u 58 months
- endoscopic resection of posterosuperior calcaneus and inflamed bursa
- AOFAS scores improved from 53 (pre-op) to 99 at post-op follow-up

4. Other surgical option: Osteotomy - dorsal closing wedge (Keck & Kelly: JBJS, 1965)
- Goal is to reorient bursal projection by closing it anteriorly
- Takes longer to heal
- No guidelines on amount to remove
- Changes biomechanics at heel cord by altering insertion
- Results - small numbers but not great; up to 40% complications
- Helal has advocated these for IAT as well, but results are few in numbers and no long-term follow-up available.

VI. Retrocalcaneal (RC) Bursitis

A. General
1. Rarely exists as isolated entity
2. Usually direct result of compression between heel counter and large Haglund's deformity leading to irritation/inflammation
3. If present as isolated source of pathology must consider more global etiology e.g. calcaneal osteomyelitis or systemic etiology: gout, rheumatological disease, HIV

B. Lateral heel radiographs
1. Obliteration of the retrocalcaneal recess (at the postero-inferior corner of Kager’s triangle)
   - Sensitivity 79%-83%, specificity 98%-100% for RC bursitis (van Sterkenburg et al.: Acta Ortho, 2010)

C. Treatment
1. Isolated RC bursal symptoms may be treated with conservative modalities like NSAID’s or local steroid injections (be careful not to inject Achilles!)
2. Excision works well in recalcitrant cases
   - Can be performed endoscopically
   - Wiegerinck, Kok, van Dijk: Arthroscopy, 2012
   - systematic review of 15 studies
   - endoscopic decompression and debridement superior to open debridement with regards to patient satisfaction and fewer complications
3. RC bursitis in association with other conditions (e.g. IAT or Haglund's) is treated by addressing
the primary problem

References