Outline

• Tendons – Strains and Tendinosis
  • Significance
  • Patho-physiology
  • Clinical
  • Treatment principles
  • Recommendations
Significance
1998 - 2002

• 89% of Shoulder claims were ‘strains/sprains or tendonitis’.
• Average # for these 2 groups was 4200 claims per year.
Duration

![Bar chart showing weeks lost by injury: average weeks lost for different injuries.

- Strain, sprain
- Crush, bruise
- Dislocation, fracture
- Tendinitis, related
- Other

The chart indicates the average weeks lost for each injury category, with Tendinitis, related having the highest average weeks lost.]
Claims - Costs

Average cost per claim

- Strain, sprain
- Crush, bruise
- Dislocation, fracture
- Tendinitis, related
- Other

- $0.00
- $5,000.00
- $10,000.00
- $15,000.00
- $20,000.00
- $25,000.00
LTD and STD cost for these 2 groups was $278.3 Million (85%)
Tendon Pain - Causes
Tendon Injuries

- Partial Tears (strains).
- Tendonitis.
- Tenosynovitis.
- Tendinosis/ Tendinopathy.
Partial Tears

- Less Common
- Usually acute
- Macroscopic tears
- Associated initial inflammation
- **Sonography is more sensitive than MRI in differentiating tendinosis from partial thickness tears**
Tendonitis / Tenosynovitis

- Early post injury
- Histology rarely confirmed
- May be in combination with partial tears or tenosynovitis (crepitus)
- ? Precursor to tendinosis
- Recovery: days – weeks (<6)
- Significant pain (unrelenting), swelling, inflammation – responds to anti-inflammatory approach.

-Rare
Tendinosis

• Most Common overuse tendon injury.

• Pain pre and post activity

• Early stages - pain disappears during activity – “can push through it”
Tendinosis

• Etiology
  • Repetitive stresses (load, direction, repetition, friction)
  • Insufficient rest vs. repair cycle
  • Microtrauma is due to the initial load,
  • Loss of homeostatic tension causes loss of remodelling and adaptation.
  • Apoptosis
Patho-physiology

- Breakdown of microscopic collagen bonds
- Variable Blood supply
- Degeneration and Apoptosis
- ? Initial inflammation (5 days on animal models)
Tendinosis

- Microscopic
  - Mucoid collagen degeneration
  - Loss of Collagen continuity
  - Increased
    - Ground substance
    - Neovascularity
    - Cellularity (fibroblasts and myofibroblasts)
- NO Inflammatory cells
- Macroscopic
  - Dull.
  - Soft Brown – yellow.

Photo – S.F Bonar
Clinical

- Local tenderness and thickening (nodularity later).
- Minimal inflammatory signs.
- Pain
  - varies (Eccentric and concentric testing)
  - poorly localised.
- Weaker (muscle and tendon tensile strength) – may progress to rupture.
Clinical Classification

• Mild
  • Pain disappears during activity and re-appears after.

• Moderate
  • Pain with sport / work but not ADL

• Severe
  • Pain during ADLs

Khan. K 2000
Imaging

• X-ray
  • Calcific changes occasionally
  • Generally Negative

• U/S
  • Hypo echoic regions in both symptomatic and non symptomatic tendons.
  • Neo Vascularisation

(Alfredson 2005).

Imaging – U/S

- Acute inflammatory process
  - Note fluid in peritendinous sheath

- Chronic inflammatory changes
  - Echogenic tendon

U/S – John Hill
Imaging – U/S

• Anatomy of Tendons
  • Parallel fascicles of collagen fibers

• Sonography is more sensitive than MRI in differentiating tendinosis from partial thickness tears

U/S – John Hill
Imaging – U/S

Nodular Achilles Tendinopathy
Imaging - MRI

- Aus Basketball team - < 50% correlation (Khan et al)
- Shalaby - 2003 – good correlation for diagnosis
- Poor correlation between MRI / severity and prognosis.
Treatment
Treatment

• Options
  • Rest and splint
  • Cortisone injection
  • Heat / Cold
  • Massage
  • Acupuncture
  • Sclerosants

• Stretch
• ESWT
• NitroGlycerine
• Platelet rich Plasma
• Exercises – Eccentric loading
• Surgery
Treatment

- Traditional
  - Anti-inflammmatory (minor)
    - Cryo-therapy – vasoconstrictive.
    - Electrotherapy – induces collagen synthesis.
    - NSAIDS – minimal evidence for benefit.
    - Cortisone – controversial use.
  - Splinting
    - Promotes further degeneration with chronic use.
  - Surgery
    - Excision of pathological tissue
    - Stimulates blood flow / healing – (75-80% success)
    - Release in Paratendinitis
Treatment

• Biomechanical correction – ergonomics etc.
• Load reduction or alteration (RELATIVE rest).
• Progressive eccentric strengthening
  • Induces collagen realignment and cross-linkage formation.
  • Promotes Collagen synthesis and strength progression.
• Multidisciplinary team approach.
Eccentric loading

- Mechano-transduction is key to Rx.
- Cells convert mechanical signal into chemical repair.
- Uses gene upregulation and protein synthesis
- Cells on stretch (mechanotransduction) communicate via Ca2+, Integrins and PG to get protein synthesis in the nucleus.
  - Khan 2008
Eccentric loading

- Eccentric exercises - ?mechanism
  - stiffen and lengthen of myotendinous unit and decrease in neo-vascularisation.
- Significant improvement, decrease pain and increase in function in 60 – 90%
  - Alfredsson 2001
- 85% neo-vessels resolve (Cook, Alfredson).
- More effective in Mid portion than insertional cases
Eccentric loading

• Silbernagel & Alfredsson 2007
  • Showed that return to exercise did not delay recovery. Have to do the eccentric load rather than just stretch (2x improved rate of recovery)
Treatment

- Nitro glycerine
  - Patch (0.25 of a 0.2mg Transderm nitro patch daily).
    - Pain reduction – Nitrous oxide
    - Collagen stimulation
    - Vascular flow

- ESWT
  - Chronic Insertional Achilles tendinopathy – ESWT more improvement in pain, function and resumed activity than 12 weeks of eccentric exercises
  - RCT showed significant decrease in pain at 1 year but many mixed results in other RCTs
    - Rompe JBJS March 2009
Treatment - Injections

- Cortisone
  - Mixed results – better in acute and tenosynovitis

- PRP (Platelet rich Plasma)
  - ? mechanism of effect – fibrinoblasts induce the anabolic pathways
  - Concentrated intrinsic growth factor
Treatment - Injections

- Sclerosant injection under U/S – 90% resolved for 1 year (Alfredson et al).
- Topol et al. 2005 – Dextrose in adductors in kicking athletes
  - Treatment Rx lasted 21.5 (+/- 13 weeks)
    Between 1 and 9 injection sites.
- Mike Ryan. 2008 (UBC) - pain decreased but not the vascularity.
- Aprotinin (protease inhibitor) Injection – limited evidence
Disability duration
What’s Reality!
Disability duration
What’s Reality!

Weeks lost by injury

- Strain, sprain
- Crush, bruise
- Dislocation, fracture
- Tendinitis, related
- Other

Average weeks lost
Guideline Comparison

0 5 10 15 20 25
Reasons for the discrepancy?

• Diagnosis
  • Speed
  • Consensus
  • Vague presentation
  • “-itis vs. –osis and -opathy”

• Treatment
  • Pre injury conditioning
  • Conservative – Focus - Strength vs Inflammation.
  • Operative
  • Post – Operative – Co-ordinated rehab.

• Return to Work
  • Expectations / Motivation
  • Planning
Outcomes

• Prognosis
  • Early presentation – recovery 6-10 weeks.
  • Chronic presentation 3-6 mo. (80% full recovery to sport).
  • Post surgical Recovery 4-6 Mo (75-80%).
Success Factors

Diagnosis & Treatment

• Speed / consensus – ITIS vs OSIS
• Multidisciplinary team
• Expectations – well laid out and clear
• Monitoring and coordination of Rx.
Success Factors

Prevention
- Underlying cause
  - Biomechanics
  - Weaknesses - Relative
  - Work load
  - Recovery
- Monitoring
- Ongoing training
- Communication
Recommendations

• Diagnostic
  • Consensus
    • Think of the OSIS.
    • Imaging – U/S vs MRI
  • Coordination
    • Multidisciplinary resources (OT, PT, Kin)
    • Education – rationale for activity.
Recommendations

• Treatment
  • Early & Tenosynovitis
    • Ice
    • NSAIDS / Cortisone?
  • Eccentric loading +/- adjuncts
    • Nitroglycerine
    • Sclerosants
    • ESWT ? – depending on site
    • Platelet rich plasma
• Surgery
  • Timing - > 4 months of above Rx
Recommendations

• **Treatment**
  • Coordination with appropriate programs / community therapy.
  • Emphasis on function, strength, endurance, proprioception.
  • Objective measures e.g. VISA scores.
  • Communication and patient Education.
  • RTW planning with OT, CM, Work and Claimant.
# Tendinosis v.s. Tendonitis

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<thead>
<tr>
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<th>Tendinosis</th>
<th>Tendonitis</th>
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<tbody>
<tr>
<td>Prevalence</td>
<td>Common</td>
<td>Rare</td>
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<tr>
<td>Etiology</td>
<td>Repetitive</td>
<td>Combined</td>
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<tr>
<td>Pathology</td>
<td>Degenerative</td>
<td>Inflammatory</td>
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<tr>
<td>Pain</td>
<td>Fluctuating</td>
<td>“Unrelenting”</td>
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<tr>
<td>Treatment Focus (conservative)</td>
<td>Collagen synthesis (eccentric loading)</td>
<td>Anti Inflammatory</td>
</tr>
<tr>
<td>Recovery</td>
<td>• Early – 6-10 wks</td>
<td>• Early – days to wks</td>
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<td></td>
<td>• Late – 3-6 mo.</td>
<td>• Late – 4-6 wks</td>
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<tr>
<td>Post surgical recovery</td>
<td>4-6 mo</td>
<td>3-4 wks</td>
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<tr>
<td>Prognosis</td>
<td>80% to sport</td>
<td>95%</td>
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Recommended Reading


Thank you!

Merci!

Questions?