Achilles tendinopathy
Screening for metabolic risk factors

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Who am I?

- Physiotherapist / Researcher
  - Foot & Ankle Rehabilitation Australia
  - Monash University
  - Bundoora Extended Care Centre

- Trained with
  - Professor Jill Cook
  - Professor Håkan Alfredson
  - Professor Sture Forsgren
  - A/Prof Patrik Danielson
Achilles tendon
Collagen is strong yet elastic!

- “collagen has an elastic-energy storage capacity that is approximately 10 times greater than spring steel”
- Maximum Achilles tendon forces when running:
  - force = 9kN (12.5 times body weight)
  - strain = 11kN/cm²

Stored elastic energy

- 2/3 of work in kangaroo hopping at 30km/h\(^1\).
- 1/3 of work in human hopping\(^2\)

Tendinopathy 101

- Tendinopathy: tendon pain during loading
- Non-inflammatory condition
  - Exists on a continuum\(^1\)
- Relative mechanical overload is a key clinical feature \(^2\)
- Load-based rehabilitation (mechanotransduction) is first line treatment \(^3\)

Different presentations

Athletic overload

Metabolic picture
Very High Cholesterol (genetic)

- Familial Hypercholesterolaemia
  - 35-45% have had Achilles pain
  - 6-7% in control group


Dyslipidaemia

- Chronic Achilles tendinopathy (n=60)
- Matched controls (n=60)

- ↑ Triglycerides
- ↑ Triglyceride/HDL-C
- ↑ Apo-B
- ↓ %HDL-C

Esterified cholesterol

- Increased solubility
  - Add long chain fatty acid to polar group of cholesterol

- Tendinopathy (n=6) versus cadaver (n=9)
  - Tendon cholesterol content equal
  - Esterified fraction double in tendinopathy

Load

Walking, sport Biomechanics

Detraining (desk job)

Metabolic factors: Cholesterol T2DM / Insulin resistance Obesity

Tendon capacity
Reduced tendon capacity: Type 2 diabetes

- Clinical\(^1\): 7.5% of patients with Achilles tendinopathy have T2DM

- Biomechanics\(^2\): Tendon strain inversely correlated with T2DM duration

- Mechanism\(^3\): Tendon collagen from T2DM “apparent age” ~2.5x actual age

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New data

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<tr>
<th>Study or Subgroup</th>
<th>Favours [control]</th>
<th>Control</th>
<th>Odds Ratio</th>
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<td><strong>6160</strong></td>
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<tr>
<td>Total events</td>
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Heterogeneity: Tau^2 = 0.27; Chi^2 = 26.70, df = 11 (P = 0.005); I^2 = 59%
Test for overall effect: Z = 6.19 (P < 0.00001)
Reduced tendon capacity: clinical implications

- Address contributing factors
  - Educate patient
  - Tendinopathy may be symptom of underlying insulin resistance

- Optimal management of diabetes

- Slower progression

- Build muscle bulk


Reduced tendon capacity: Diabetes screening?

- Patients with flexor tenosynovitis should be screened for diabetes\(^1\)

- Abnormal OGTT
  - trigger finger: 1 in 4
  - control: 1 in 20

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Early diagnosis: worth the effort?

- Medical costs rise 8-years prior to T2DM diagnosis\(^1\)
- Lifestyle intervention (IGT)\(^2\)
  - Delay: 11-years
  - Reduce: incidence 20%
- Cost-effective\(^2\)
  - Lifestyle: $8,800/QALY
  - Metformin: $29,900/QALY


Early diagnosis: worth the effort?

- YES!

Tendinopathy-diabetes link needs to be translated to primary care clinician
Index of suspicion for **metabolic involvement** in tendinopathy when no history indicating overload

- Consider screening for CVD risk factors
Take home message

- “Things that are bad for your heart are bad for your tendons”
  - Diabetes ✔
  - Cholesterol ✔
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Questions