Case study 1
• Doctor refers you a young athlete who runs with anterior knee pain
  • Hurts when he runs
  • Diagnosis by
    • Abnormal imaging
    • Pain on tendon palpation

• Is this patellar tendinopathy?

Case study 2
• Older lady who plays golf presents with lateral hip pain
  • History of low back pain
  • Overweight
  • Smoker
  • Unfit

• Is this gluteal tendinopathy?
Slide 4

What is differential diagnosis?

- Is the tendon the source of the pain?
  - A diagnosis does not always mean the same as the source of pain.
- Is the tendon pathological?
  - The relationship between pain and pathology on imaging is not absolute.
    - 66% of tendons that rupture because of terrible structure have never had pain.

Slide 5

Fitting people into tendon boxes

- Most tendons have a clear profile.
- Patellar, glut med.
- Some are less able to fit into a box.
- Achilles.
- Some fit the box but are difficult to diagnose.
- Ischial tendons.
- Most athletes fit in a box:
  - Tendinopathy is a condition of power athletes.
  - Ischial tendinopathy is a condition of power athletes.
- Some do not fit in the box.
  - Groin tendons.
- Most athletes fit in a box.
  - Tendinopathy is a condition of power athletes.
  - Ischial tendinopathy is a condition of power athletes.
  - Beware the plodders.
- However, tendinopathy to some extent is a condition of older age.
  - Except the patellar tendon.

Slide 6

What makes a good box?

- Homogeneous risk factors
  - Patellar:
    - Young men, jumping athlete.
    - Occasionally in elite female athletes.
    - Half the pathology rates as men.
  - Gluts:
    - Postmenopausal women.
    - Occasionally men.
    - Compression in women not men.
- Homogeneous pathology
  - Patellar:
    - Central cyclops lesion.
  - Gluts:
    - Struggle to find a normal tendon.
What makes a difficult box?

- Loading across the lifespan
- Achilles has no box because of the high loads throughout life
- Simple everyday tasks as energy storage
- Down stairs, change of direction
- Multiple potential sources of pain
  - Groin
  - Tendons, bone
  - Remember that there is no cortical bone between bone and tendon

Cardinal signs of tendon pain

- Must be related to overload
- Can be obvious or subtle
- May present in form of high load arthralgia
- Must be localised pain
- Fever or Mild if Finger
- Must have load dependent increase in pain
- Pain may be less noticeable with increasing load
- Pain must be worse with energy storage and release loads
- Worse the day after high loads
- Tendon signs
  - Anti stiffness Achilles, sit pain hamstring

What about palpation?

- A really poor diagnostic sign
- Athletic tendons are sore
- Palpation swimmers is not linked to either symptoms or imaging findings
- A terrible outcome measure
- Will remain sore on palpation even when painfree and back at sport
- An awful prognostic sign
- Imaging only changes despite improvement in symptoms and function
- Do not use it to "confirm" a diagnosis
- Do not let the athlete continue to poke it
- Not a good indication of progress
What about palpation?

- The patellar tendon is the sorest point in the knee in both osteoarthritis and in patellofemoral joint pain.
- Palpation soreness did not correlate with:
  - Clinical signs
  - Decline squat pain
  - Pain provocation test
  - Imaging
  - Cook et al 2001

Can we diagnose severity?

- On imaging?
  - No
  - There are no criteria for rating tendon pathology or tears
- On history?
  - Yes
  - Inability to recover from load for >24 hours
- On clinical examination?
  - Yes
  - Inability to store energy in the tendon
  - Muscle wasting
  - Soft landing
  - Poor leg spring
  - Muscle wasting

So what about imaging?

- Little correlation between clinical symptoms and findings on imaging
  - Not only in diagnosis, but also in prognosis
- Incomplete understanding of the features that are critical in tendon pathology:
  - Amount of disorganisation, Doppler flow, intratendinous tears?
  - Reliance on subjective interpretation
  - There are no criteria to diagnose partial tears
  - It's totally subjective and inter-rater reliability is poor
- Changes are load related
  - Related to load through life
  - Age does not cause tendon degeneration, life load does
What is the relationship between pain and imaging abnormality?

- A negative scan is highly predictive of the pain not being from the tendon.
- Caveat: 50% of imaging normal tendons with pain developed pathology over 1 year.
- A positive scan means that the pain might be from the tendon.
- BUT it does not have to be.
- A pathological tendon is a risk factor for pain.
- Vascularity is NOT the source of pain.
- Merely a marker of tendon degeneration.

Imaging for diagnosis

- High proportion of asymptomatic pathology negatively affects accuracy.

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<th>Feature</th>
<th>Case</th>
<th>Control</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
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<td>8</td>
<td>92.7%</td>
<td>64.6%</td>
<td>45.2%</td>
<td>96.6%</td>
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</table>

- Diagnosing source of symptoms based on imaging, you are going to get it wrong 55% of the time!!!

So what about imaging?

- The accuracy of US and MR imaging in detecting gluteal tendon pathology (coming soon!!!)
- Compared imaging findings to surgical/histological findings.
- 12 participants undergoing GTRS and 16 undergoing hip arthroscopy.
- Ultrasound demonstrated good-to-excellent reliability in detecting full-thickness tears.
- Positive likelihood ratio of 9.5 (CI 4.0 – 19.3)
- BOTH imaging modalities are extremely poor in diagnosing tendinosis or partial tears.
- “Worse than a flip of a coin.”
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Diagnosing partial tears

What is the inter-tester reliability of diagnosis of a partial tear? Is it influenced by the clinical notes? Are the criteria used valid?

<table>
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<tr>
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<th>Lift</th>
<th>Front</th>
<th>Right</th>
<th>Mix</th>
<th>Total</th>
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<tbody>
<tr>
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<td>Lift</td>
<td>Front</td>
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<tr>
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<td>90%</td>
<td>95%</td>
<td>80%</td>
<td>90%</td>
<td>86%</td>
</tr>
</tbody>
</table>

Slide 17

Imaging is not a benign test

- In tendinopathy where it likely does not add anything to your clinical diagnosis
- Outcome measure, prognosis
- Terms like tear and degeneration can cause kinesiophobia

Unintended consequences of imaging
- 3264 cases of work-related low back pain
- 21% had MRI within first 2 weeks
- 20% had MRI within first 2 weeks
- No MRI: 22 days
- Early MRI: 133 days
- Total medical cost post-MRI: $2,779
- Surgery post-MRI: 0.8%

Webster & Cifuentes, 2010

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Giving patients context

- A simple epidemiological statement can have profound effect

- Difference in narcotic prescriptions (7% vs 22%)
What else is in our box of tricks?

- Immediate response to isometric exercise can confirm the tendon is the source of pain
  - 4 x 45 second holds
  - 1-2 minute rest between
  - Should at least halve the pain
  - If provocative think other diagnosis

What do isometrics do to pain and the brain?

- Reduces pain
  - More than isotonics
  - Longer than isotonics
- Reduces cortical inhibition
  - Returns inhibition to normal
  - Mean 19% stronger after isometrics

What else is in our box of tricks?

- Taping differentially diagnoses PFJ pain and tendon pain
  - Load pain decreases if source of pain is the PFJ
  - Does not mean tendon
  - No taping is as useful in other tendons
What about being young?

![Graph showing data]

### What are the common mis-diagnoses?

- Bursitis cannot be a diagnosis in isolation.
- Intimate part of the enthesis organ.
- Will exist in conjunction with enthesopathy.
- Treating the bursa alone will be unrewarding.
- Address compressive loads.

### What are the common mis-diagnoses?

- Regional
  - Patellar
  - PFJ — with pain over the tendon
  - Plica (quadriceps tendinopathy)
  - Fat pad irritation (whatever that is and if it exists)
  - Achilles
  - Plantaris compression/involvement
  - Neural irritation
  - Various medial and lateral tendons
  - Posterior joint
  - Gluts
  - Hip joint
  - Back pain
  - Hamstrings
  - Sciatic nerve tethering

![Image of anatomical structures]
Slide 26

Clinical signs of plantaris

- Often chronic non-responsive Achilles pain
  - Can be acute onset
- Higher than normal Achilles pain
  - Can be medial in the acute stages
- Can become “normal” Achilles pain
- Do not like being in dorsiflexion
- Flatter shoes, barefoot
- Especially pushing off from dorsiflexion
- Have a history of soleal strains
- Mild, short duration calf pain

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What are the presentations of systemic disease?

- Achilles
  - Enthesopathy: important for seronegative arthropathies
  - Often bilateral
- Mid-tendon for familial hypercholesterolaemia
  - Insulin resistance/T2DM
- Per amnestic
  - Rarely mechanical
What complicates differential diagnosis?

- Multiple interventions
- Intra-tendinous injections
- Prolonged unloading
- No much else
- Low incidence of psychosocial issues
- No real evidence of “central sensitisation” in the lower limb
- Tendinitis is a reactive pain disorder
- Not a bit of all
- There are changes to motor drive and sensory processing
- Not a response to all types of pain
- There is no receptive drive for tendon pain

Differential diagnosing the pathology stage

- Continuum model
  - Should influence treatment
  - Allow reactive tendons to settle
- Imaging
  - Can differentiate reactive from degenerative
- Only UTC can differentiate degenerative from reactive or degenerative

Peri-tendinous differential

- The clinical tests for peri-tendon diagnoses are limited
  - History and clinical examination should give it to you
    - Type of load
    - Not typical for tendon pain
    - More movement, facilitation & friction loads
    - Activity and pain relief
    - Response to load tests
      - No increase is pain with increasing tendon load
      - Crepitus may or may not be present
      - A stethoscope may help
      - Response to heparinoid cream to best diagnosis
Retinacular conditions

- Classic is de Quervains
- Outside-in condition
- Retinacular changes first
- Increases compression on peritendon
- Long term peritendon changes can induce tendon pathology
- Clinically see it in Achilles with posterior retinaculum

Diagnosing the load that initiated the pain

- What loads are essential to cause tendon pain?
- Different types of load
  - Compression, energy storage and release
- Different places in the tendon
  - Enthesis, mid-tendon
- Different management to reduce key load

What is the role of repeat imaging?

- Nothing (simple slide)
Case study 1
• Doctor refers you a young athlete who runs with anterior knee pain
  • Hurts when he runs
  • Diagnosis by
    • Abnormal imaging
    • Pain on palpation
  • Is this patellar tendinopathy?
  • Neither diagnostic criteria tell us ANYTHING about the source of pain
  • Running rarely causes patellar tendon pain
  • Much more likely to be PFP
  • Diagnosis
    • Diffuse pain especially on loading
    • Little muscle wasting
    • Poor hip control

Case study 2
• Older lady who plays golf presents with lateral hip pain
  • History of low back pain
  • Overweight
  • Smoker
  • Unfit
  • Differential diagnosis nightmare
    • Gluteal tendon pain can refer down leg
    • Behaviour of the bursa
    • Gluteal tendon pain coexists with LBP and hip joint pain
  • Diagnosis
    • Try isometrics
      • Single leg hip hitch
    • If pain substantially decreases then try a gluteal tendon rehab program

Summary
• Tendinopathy diagnosis seems simple but it isn’t
• Diagnosis hijacked by imaging appearance
• Tendinopathy is a clinical diagnosis
• It is often mis-diagnosed
  • Too many things called tendinopathy when they are not
  • Not the other way around