Ultrasound of Tendinopathy and Joint Disorders

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Outline
• Tendinopathy
  – Background
  – Ultrasound appearance
• Joint disease
  – Inflammatory
  – Degenerative

Tendon: anatomy
• Primarily: Type 1 collagen
  – Viscoelastic
  – Minor collagens
  – Proteoglycans
  – Glycoproteins
• Tendon fibroblasts or tenocytes
  – Respond to mechanical loading
  – Modulate extracellular proteins

Galloway MT et al. JBJS 2013; 95:1620

Tendon: injury
• Acute tensile overload
  – Usually underlying abnormal tendon
• Chronic overuse: repetitive excessive loading
  – Loss of normal tendon architecture
  – Change in tenocyte morphology
  – Altered collagen fibril distribution and neovascularity
  – Microtears
  – Resulting underuse may contribute

Galloway MT et al. JBJS 2013; 95:1620

Tendon: healing
• Inflammatory phase
  – First week after injury
  – Fibrin clot
  – Cell migration, neovascularity
• Proliferation phase
  – 1 to 4 weeks
  – Fibroblasts synthesize collagen and extracellular proteins
• Remodeling phase

Tendinosis or Tendinopathy

- Terms used instead of tendinitis
- No acute inflammatory cells
  - Primarily mucoid degeneration
  - Chondroid metaplasia
- Ultrasound:
  - Hypoechoic tendon
  - Heterogeneous, ill-defined
  - Possible increased thickness


Tendon Tear versus Tendinosis

<table>
<thead>
<tr>
<th>Tear</th>
<th>Degenerative Calcification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anechoic</td>
<td>Formative</td>
</tr>
<tr>
<td>Well-defined</td>
<td>Defined, shadow</td>
</tr>
<tr>
<td>Homogeneous</td>
<td>Resorptive</td>
</tr>
<tr>
<td>Thinned</td>
<td>Amorphous, little shadow</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tendinosis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoechoic</td>
<td></td>
</tr>
<tr>
<td>Ill-defined</td>
<td></td>
</tr>
<tr>
<td>Heterogeneous</td>
<td></td>
</tr>
<tr>
<td>Swollen</td>
<td></td>
</tr>
</tbody>
</table>

*both may appear hypoechoic

*At supraspinatus tendon footprint in patients over 40 years old
Calcific Tendinosis: lavage/aspiration

Common Extensor Tendon: epicondylitis

- Often called “tennis elbow” or “lateral epicondylitis” or “epicondylitis” or …
- All terms are misnomers
- Those inflicted usually do not play tennis (professionally or correctly)
- It is not inflammatory
- It is not a primary problem of the epicondyle

Common Extensor Tendon: elbow

Patellar Tendon: tendinosis

Percutaneous Tendon Treatments

- Corticosteroid
- Fenestration (dry needling, tenotomy)
- Hyperosmolar dextrose, prolotherapy
- Whole blood (autologous)
- Platelet-rich plasma
- Stem cells
- Other: deer antler velvet, amniotic membrane

**Peritendon Steroid Injections**

- Elbow: common extensor tendon
  - Pain returns worse than before injection\(^1\)
- Gluteal:
  - 72% showed improvement at 1 month\(^2\)
- Hamstring:
  - 24% had symptom relief beyond 6 months\(^3\)

\(^1\)Coombes BK et al. JAMA 2013; 309:461
\(^2\)Labrosse JM et al. AJR 2010; 194:202
\(^3\)Zissen MH et al. AJR 2010; 195:993

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  - Proliferative
  - Degenerative

**Arthritis: approach**

- Inflammatory:
  - Synovial proliferation and erosions
- Enthesitis
- Degenerative:
  - Osteophytes
  - Minimal if any synovial proliferation
- Radiographs: appearance, distribution
- Laboratory values and clinical information

**Synovitis: dorsal wrist**

**Synovitis: MCP joint**
**Synovitis: color flow**

- RA Ankle
  - No flow
- RA ankle
  - Positive flow

**Joint Effusion vs Synovial Hypertrophy**

- Anechoic: fluid
- Hypoechoic:
  - Effusion vs. synovial hypertrophy
  - Compressible: fluid
  - Internal hyperemia: synovitis
  - Flow may be absent

AJR 2000; 174: 1353

**Rheumatoid Arthritis**

- 2nd MCP

**Arthritis: bone**

- Ultrasound not very good for erosions:
  - Better than radiographs
  - 40% sensitivity\(^1\), 29% false positives\(^2\): wrist/hand compared with CT
  - Very non-specific, time consuming
- Adjacent synovitis adds specificity
- Correlate with radiographs, labs, distribution

\(^1\)Dohn UF M, Arthritis Res Ther 2006; 8:1
\(^2\)Finzel S. et al. Arth Rheumatism 2011; 63:1231

**Pseudoerosions**

- 3rd MCP: sagittal
- Lunate
- 3rd MCP: transverse
- Ulna

**Gout**

- Double Contour Sign
- Microtophi
- Tophus
First CMC joint: osteoarthritis

Sagittal Plane: dorsal

Note: osteophytes (arrow) and intra-articular body (open arrow)

Take Home Points
• Tendinopathy (or tendinosis)
  – Degenerative process
  – Amenable to percutaneous treatments
• Joint disorders
  – Inflammatory: synovial hypertrophy
  – Degenerative: osteophytes

Syllabus on line and other educational material:
www.jacobsonmskus.com

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