

Tendinopathy and Ultrasound-guided Tenotomy

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Disclosures

- Consultant: Bioclinica
- Contractor: POCUS PRO
- Advisory Board: Philips
- Book Royalties: Elsevier
- Not relevant to this lecture

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Fundamentals of Musculoskeletal Ultrasound are
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Tendon: injury

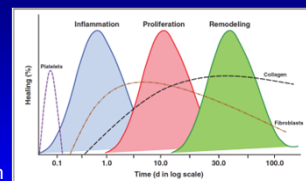
- Acute tensile overload
 - Usually underlying abnormal tendon
- Chronic overuse: repetitive excessive loading
 - Loss of normal tendon architecture
 - Change in tenocyte morphology
 - Altered collagen fibril distribution and neovascularity
 - Microtears
 - Resulting underuse may contribute

Galloway MT et al. JBJS 2013; 95:1620

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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

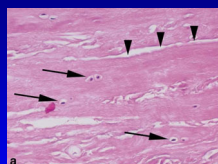


Galloway MT et al. JBJS 2013; 95:1620
Lee KS, et al. Am J Roentgenol 2011; 196:628

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Tendinosis

- Histologic term used instead of tendinitis
- No acute inflammatory cells
 - Primarily mucoid degeneration
- Inflammatory mediators do exist¹
 - Precise role unknown
- Tendinopathy: non-specific term
 - Any tendon pathology



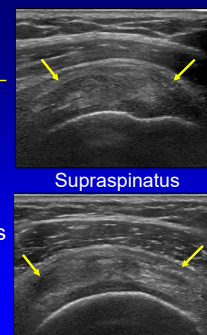
From: Hodler J, et al. JMRI; 2010; 72:811

¹Mosca MJ et al. BMJ Open Sport Exerc Med 2018

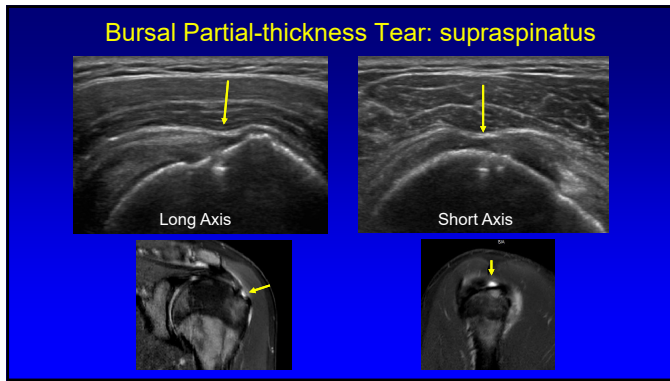
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Tendinosis: ultrasound

- Hypochoic tendon
- Heterogeneous, ill-defined
- Possible increased thickness
- Possible neovascularity
 - Common extensor, patellar, Achilles
- Possible linear calcifications



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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

Lopez-Vidriero et al. Am J Sports Med 2010; 26:269

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Peritendon Steroid Injections

- Shoulder: minimal transient pain relief¹
- Elbow: common extensor tendon
 - Pain returns worse than before injection²
- Gluteal:
 - 72% showed improvement at 1 month³
- Hamstring:
 - 24% had symptom relief beyond 6 months⁴

¹Mohamadi A et al. Clin Orthop Relat Res 2017; 475:232
²Coombes BK et al. JAMA 2013; 309:461
³Labrosse JM et al. AJR 2010; 194:202
⁴Zissen MH et al. AJR 2010; 185:993

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Tendon Fenestration

- Also called “dry-needling” or tenotomy or microtenotomy
- Needle repeatedly passed through areas of tendinosis
- Disrupts area of tendinosis
- Bleeding causes release of growth factors
- Stimulates tendon healing

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Fenestration: technique

- No NSAIDS x 2 weeks prior
- Ultrasound guidance: in plane
 - Long axis to tendon
- 20 or 22 gauge needle
- 20 – 30 passes until area soft
- Minimal Lidocaine: over tendon

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Percutaneous Fenestration

- 20 or 22-gauge needle
- 20 to 30 needle passes
- Continued until area covered and tendon softens

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Fenestration: technique

- Cover entire tendon abnormality
- Contact bone if at tendon abnormality
- Pull needle out of tendon to redirect
- Also redirect medial to lateral
 - Pivoting at needle entrance
 - Cone-shaped area

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Fenestration: technique

- Contraindications:
 - Not delineated in literature
 - Prior steroid injection < 3 months ago
 - Bleeding disorders
 - Infection
 - Tendon tear > 50% thickness?

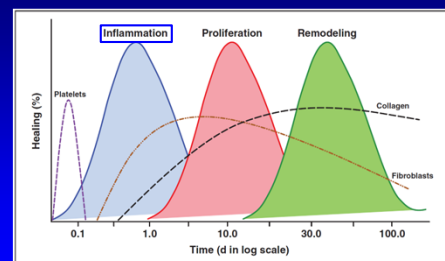
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Post-procedure:

- No ice
- Rest for 2 weeks
 - Daily activities okay
 - Gradual return to activities
- Follow-up:
 - Referring physician, physical therapy
- No NSAIDS: 2 weeks

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Phases of Tissue Healing



From: Lee KS, et al. Am J Roentgenol 2011; 196:628

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Post-procedure:

- Patellar tendon:
 - Knee brace (locked) x 2 weeks
 - First week non-weight bearing with crutches
 - Nothing?
- Achilles tendon:
 - Walking boot x 2 weeks

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Ultrasonic Tenotomy (Tenex)

- Ultrasound phacoemulsification
 - Debride and aspirate necrotic tendon
- Irrigation
- Safe and effective
- No comparison studies
 - Outcomes, cost-effectiveness



Williams RC et al. PM R 2018; 2015; 10:313

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Fenestration: tendons

- Common extensor tendon: elbow
- Patellar tendon
- Gluteal tendons: great trochanter
- Achilles
- Other

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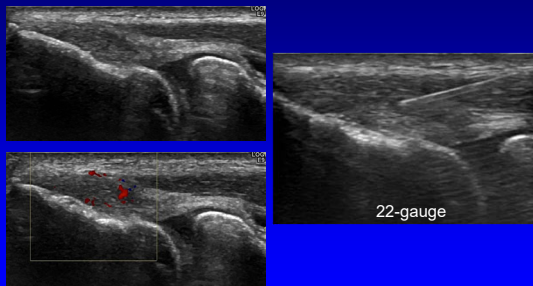
Tendon Fenestration

- 14 tendons
- VAS score improved: 4, 12 weeks
- Patellar (5), Achilles (4)
- 1 each: gluteus medius, iliotibial tract, rectus femoris, hamstring, common extensor tendon

Housner JA et al. J Ultrasound Med 2009; 28:1187

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Common Extensor Tendon (Elbow)



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Common Extensor Tendon: elbow

- 58 patients¹
- Outcome: average 28 months
 - Pain level and difficulties with related activities
 - 64% excellent, 16% good, 7% fair, 13% poor
 - No adverse effects
- Follow-up study: 57 patients²
 - 93% excellent or good results
 - Corticosteroid injection not needed

¹McShane JM et al. J Ultrasound Med 2006; 25:1281
²McShane JM et al. J Ultrasound Med 2008; 27:1137

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Common Extensor Tendon: elbow

- Randomized controlled: 28 patients
- PRP + fenestration versus fenestration alone
- Trend for greater clinical improvement in PRP subjects at 2 months
- No difference in clinical outcome at 6 months

Stenhouse G et al. Skeletal Radiol 2013; 42:1515

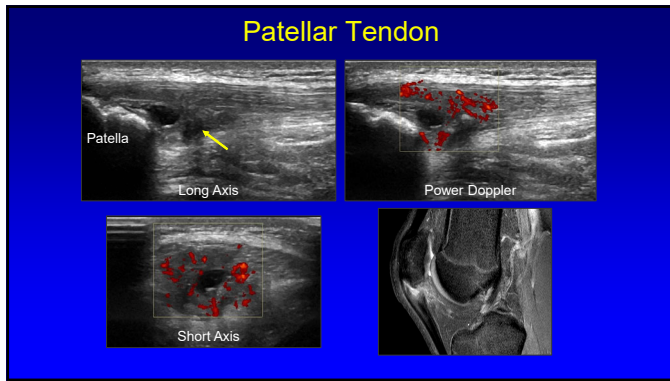
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Common Extensor Tendon: elbow

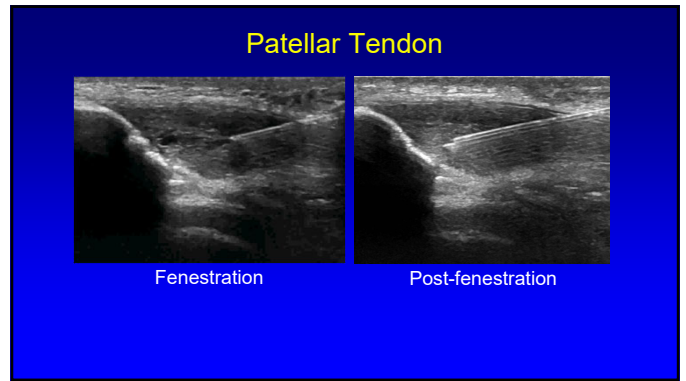
- Randomized controlled: 230 patients
- PRP + fenestration versus fenestration alone
- No difference in outcomes at 12 weeks
- Significant difference in pain scores at 24 weeks: PRP group had less pain

Mishra AK et al. Am J Sports Med 2014; 42:453

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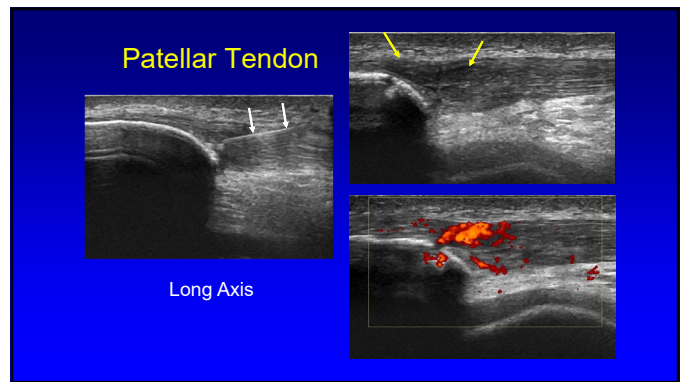
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Patellar Tendon

- Randomized controlled: 23 patients
- PRP + fenestration versus fenestration alone
- PRP outcomes better at 12 weeks
- No significant difference in outcomes when greater than 26 weeks

Dragoo JL et al. Am J Sports Med 2014; 42:610

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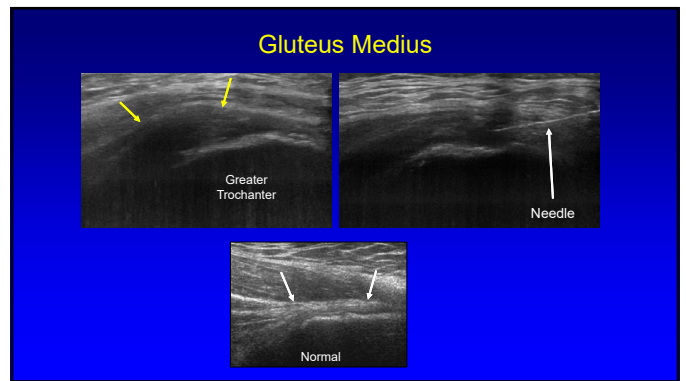
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Patellar Tendon

- 45 tendons
- 76% improved at 4 weeks, 24% no change
- Improved outcome at 4 weeks if:
 - Less pain prior to procedure
 - Well-defined area of tendinosis at US
 - No correlation with other ultrasound findings (color, size, location, etc.)

Kanaan Y et al. J Ultrasound Med 2013; 32:771

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Gluteus Maximus and Minimus

- Randomized controlled: 30 patients
- PRP versus fenestration alone
- Significant improvement at weeks 1 and 2
- Approximately 80% had long term improvement: up to 1 year follow-up
- No difference between treatment groups¹
- Two injections: more sustained response²

¹Jacobson JA et al. J Ultrasound Med 2016; 35:2413
²Fitzpatrick J et al. Am J Sports Med 2019; 47:1130

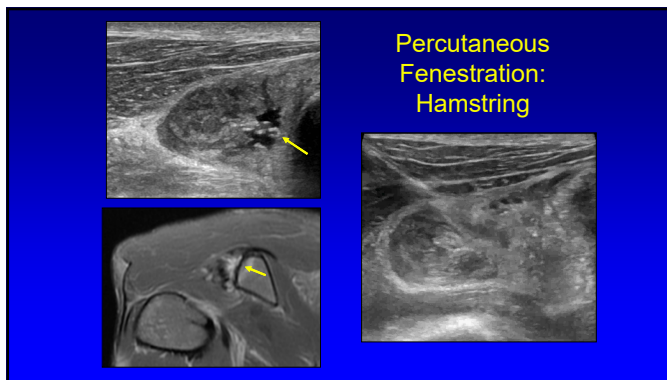
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Fenestration: pelvis

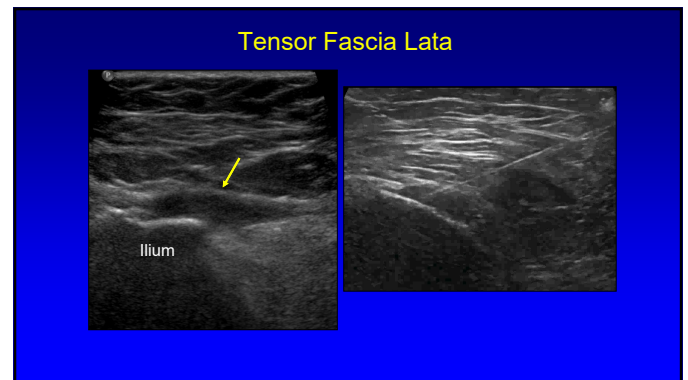
- 22 tendons in 21 patients
- Gluteus medius (11), hamstring (8), gluteus minimus (2), tensor fascia lata (1)
- Marked or some improvement: 82%

Jacobson JA et al. J Ultrasound Med 2015; 34:2029

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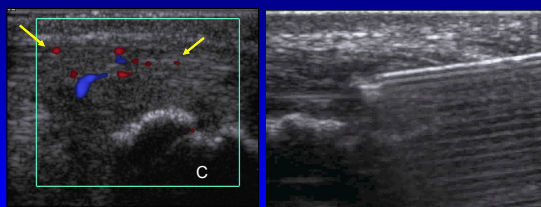


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Achilles tendon



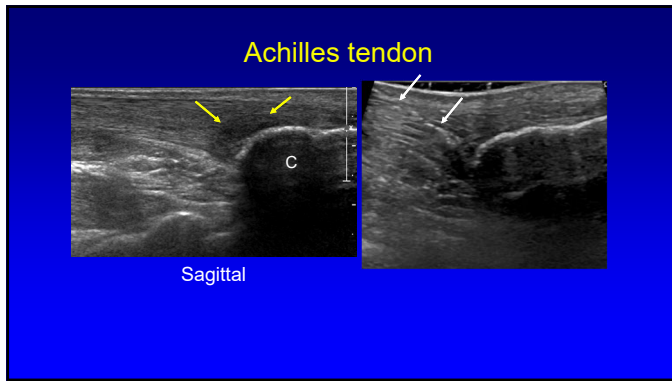
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Achilles Tendon

- Randomized controlled: 54 patients
- PRP versus saline injection
- No significant difference in outcomes
 - At 24 weeks¹
 - At 1 year²
 - *Both groups: eccentric physical therapy

¹de Vos RJ et al. JAMA 2010; 303:145
²de Jonge S. Am J Sports Med 2011; 39:1623

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Take Home Points

- Tendinosis
 - Primarily a degenerative process
 - Amenable to percutaneous treatments
- Tenotomy
 - Safe effective treatment option

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Thank you!

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

Twitter handle: @jjacobsn

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