Dry Needling for Tendinopathy?

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Disclosure

- No relevant financial relationships exist

Session Learning Objectives

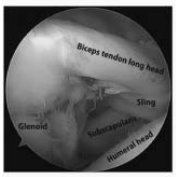
- Summarize the best available evidence supporting tendon needling as a potentially effective treatment for tendinopathy.
- Describe the histologic response of the tissue contributing to the theoretical remodeling of chronic pathologic tissue.
- Describe and demonstrate techniques and their proposed integration into the plan of care for the patient with tendinopathy.

Course Outline

- Background on tendinopathy
- Physical therapy examination, evaluation and treatment of tendinopathy
- Background on dry needling and tendon fenestration
- Video and live demonstration of tendon needling including ultrasonography
- Conclusion, discussion and future directions

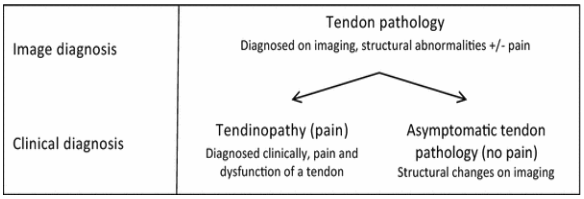
Tendinopathy, tendinosis, tendinitis (what's the difference?)

- **Pre 1990s: the 'tendinitis' model**
  - Inflammation was thought to be the driver
  - Treated with anti-inflammatory measures
- **The move away from 'tendinitis': decade of the 1990s**
  - Histological findings showed little inflammatory mediators in chronic tendons (neutrophils and macrophages)
  - In the late 1990s, Maffulli et al advocated a shift in clinical terminology from tendinitis to "tendinopathy""
- **Degeneration w/o inflammation: Paradigm of 2000s**
  - Continuum of tendon degeneration
  - "Degeneration" common in asymptomatic
  - **Newer evidence indicates inflammation accompanies chronic tendon degeneration**



Rees et al. Tendons--time to revisit inflammation. *Br J Sports Med*. 2014;48:1553-1557.

- The term 'tendinopathy' includes only those cases that are clinically diagnosed with tendon pain with or without pathology on imaging.

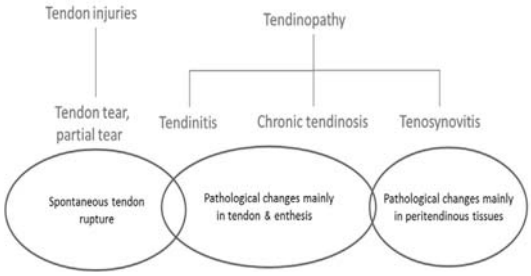


Simpson et al. *Sports Med*. 2016;46:545-557.

Tendinopathy

- Affects professional and recreational athletes well as people involved in repetitive work
- 30-50% of all sports injuries
- Significant morbidity and health care costs
- 28 million people in the United States develop tendon disorders per year
- Cost in the US estimated to be $30 billion/year

Types of Tendon Disorders



Tendinopathy

- Common sites:
  - Supraspinatus
  - Long head bicep
  - Common extensor tendon of the elbow
  - Proximal hamstring
  - Quadricep tendon
  - Patellar tendon
  - Posterior tibial tendon
  - Achilles tendon

Painful Tendinopathy Incidence

- Achilles: 2.35/1,000
- Patellar: 1.6/1,000
- Adductor: 1.22/1,000
- Gluteal: 4.22/1,000
- Plantar Fascia: 2.44/1,000
- Elbow: 3/1,000
- Shoulder: 3/1,000

Prevalence Tendon Abnormalities on Imaging in Asymptomatic Individuals

- Achilles: 10~50%**
  - (Ooi 2016)
- Patellar tendon: 40-90% **
  - (Pappas 2016, Simpson 2016)
- Lateral Elbow: 10-40%**
  - (Krogh 2017)
- Proximal Hamstring: ~20%
  - (Thompson 2017)
- Shoulder: 25-39%
  - (Girish 2011)

Risk Factors

Biggest Risk Factor: presence of a tendon abnormality

Intrinsic Factors

- Age – 'mature' tissues are different and less efficiently
- Chronic disease – diabetes, high cholesterol, menopause, connective tissue disease, seronegative disorders
- Tendon load history
  - Tendon load across lifespan
  - Changes in tendon load
    - Injury, offseason, etc

Extrinsic Factors

- Environment
- Repetitive activity in work, sport or leisure
- Often a sudden burst of activities
- Sport – an increase in training load

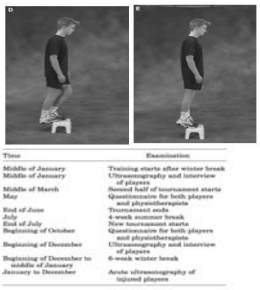
Can you Prevent Tendinopathy?

- Limited evidence for balance training
- Shock absorbing insoles could have a preventive effect on Achilles tendinopathy
- Hormone replacement therapy may reduce risk of tendinopathy in post-menopausal women
- NO evidence was found for stretching

Peters et al. Preventive interventions for tendinopathy: A systematic review. *J Sci Med Sport*. 2016;19:205-211.

Prophylactic Training in Asymptomatic Soccer Players With Ultrasonographic Abnormalities in Achilles and Patellar Tendons The Danish Super League Study

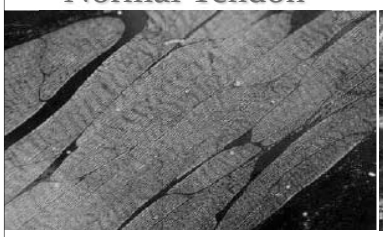
- Prophylactic eccentric training & stretching reduces risk of developing patellar tendon imaging abnormalities
- **No positive effects on risk of injury!**
- In asymptomatic imaging abnormal **patellar tendons, prophylactic eccentric** training and stretching increased **the injury risk**
- No effect on the Achilles tendons



(Fredberg, Bolvig, Andersen; *Am J Sports Med 2008 36:451*)

Histology of Tendinopathies

Normal Tendon



Tendinopathy

Magnusson PS, Langberg H, Kjaer M. Pathogenesis of tendinopathy: balancing the response to loading. *Nature Reviews;* 6. 2010 262--268.

Histology of Tendinopathies

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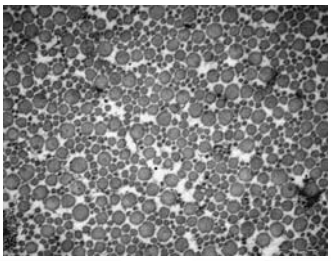
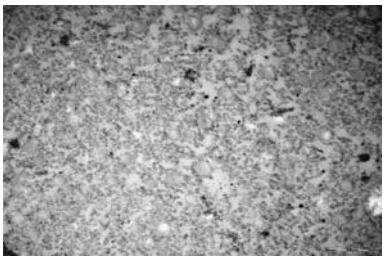


Tendinopathy



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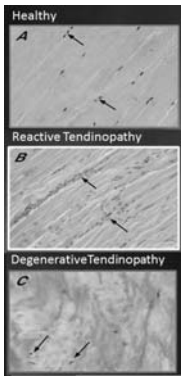
Pathophysiology

- Cell proliferation and activation produces large proteins (proteoglycans)
- Continued cell production in presence of proteoglycans changes cellular matrix
- If overload continues, cellular matrix continues to degrade
- Leads to neovascularization and modification of collagen structure
- Reduction of ability of the tendon to tolerate load



Magnusson PS, Langberg H, Kjaer M. Pathogenesis of tendinopathy: balancing the response to loading. *Nature Reviews;* 6. 2010 262--268.

Normal vs. Excessive Loading

Normal

- Tendon cells spindle shaped
- Minimal ground substance
- Linear, tight bundled collagen
- Minimal innervation
- Minimal vascularity

Tendinopathy

- Rounded nuclei, fewer tenocytes
- Increased ground substance
- Disrupted collagen
- Ingrowth of nerves
- Prominent vessels

Brukman & Kahn.
Clinical Sports Medicine. 2012

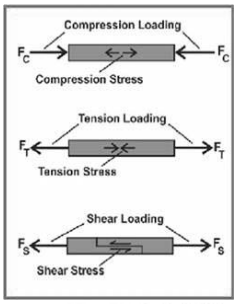
Is the problem pathology or pain or both?

- Pain & pathology are unrelated
- Mainly pain
  - Stops function, stops performance
  - May/may not have pathology on imaging
- Pathology
  - Tendons rupture if not enough intact tendon to take load
  - Quantity of intact tendon is key factor
  - Can be painfree prior to rupture

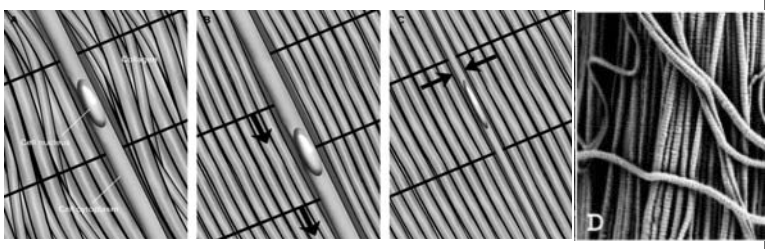
FIGURE 7: Supraspinatus tendinosis in the asymptomatic non-dominant shoulder of a 13-year-old swimmer.

Main Theories of Tendinopathy

- Mechanical Damage Theory
  - Too much load over too much time
- Changes in Nociceptor substance
- Compression theory
  - Impingement/Compression of the tendon between adjacent structures
- Other Considerations
  - Genetics
  - Hypoxia



Tendon cell undergoing (A,B) shear and (C) compression during a tendon-loading cycle.



BJSM

Is tendon pathology a continuum? A pathology model to explain the clinical presentation of load-induced tendinopathy

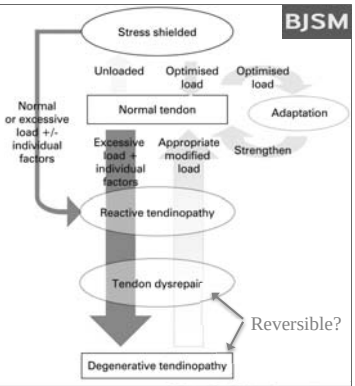
J L Cook,[1] C R Purdam[2]

- Propose tendon pathology continuum with three stages:
  - Reactive tendinopathy
  - Tendon dysrepair (failed healing)
  - Degenerative tendinopathy
- May be painful or pain-free anywhere in continuum

Tendinopathy Continuum

- **Reactive Tendinopathy**
  - Tensile / compressive overload (acute)
  - Repair proteins, proteoglycans prominent
- **Tendon Dysrepair**
  - Myofibroblasts present
  - Disorganization starting: collagen separation
- **Degenerative Tendinopathy**
  - Absent cell nuclei, little collagen
  - Heterogeneous signal on MRI, US

BJSM



Is tendon pathology a continuum? A pathology model to explain the clinical presentation of load-induced tendinopathy

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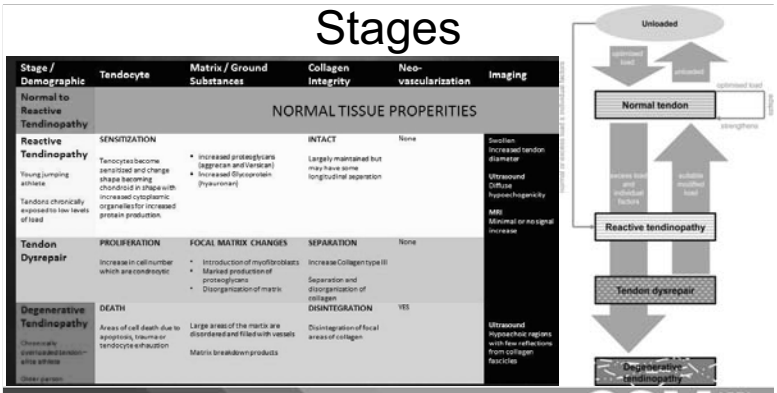
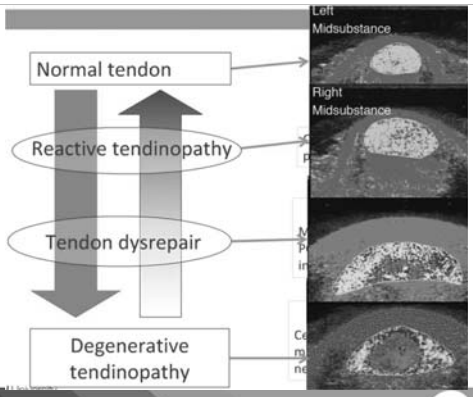
- Adding/removing load is the stimulus that drives the tendon forward or back along the continuum
  - Reducing load may allow the tendon to return to a previous level of structure and capacity within the continuum

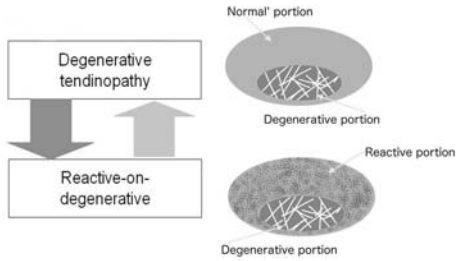
Stages





Stages

- Stages can occur in combination

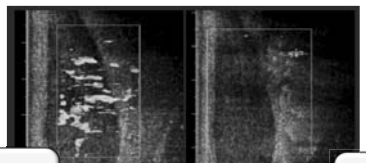


Why is there pain?

- Poorly understood (Pathology common without pain)
- Local nociceptive driver
  - Signaling substances to local nerves and tenocytes (Substance P, glutamate)
  - Biomechanical irritants (chondroitin sulphate)
  - Changes to tendon pH
- Central mechanisms: decreased cortical excitability
- Pain linked to neovascularization and neural growth

Origin of Pain

- Failed healing response?
  - Neovasculature and nerve proliferation

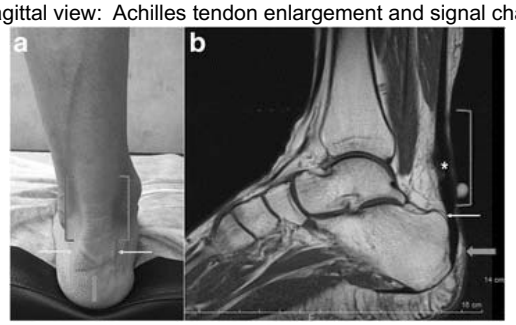


↓ **neovascularization** → ↓ **pain**

Imaging

- Recommended when:
  - Case is complicated/complex and long-standing
  - Appropriate rehabilitation program has failed
  - Thorough clinical examination has identified differential diagnoses in need of exclusion
- Not usually required to make diagnosis
- Ultrasound – preferred option
- Partial tears are common, even in asymptomatic tendons

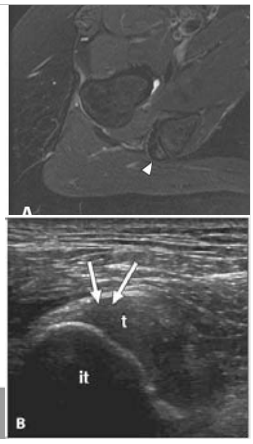
Mid-portion Achilles tendinopathy (red brackets); retrocalcaneal bursitis (yellow arrow); insertional achilles tendinopathy and superficial bursitis (blue arrow). MRI sagittal view: Achilles tendon enlargement and signal changings (*)



Abat et al. *J Exp Orthop.* 2017

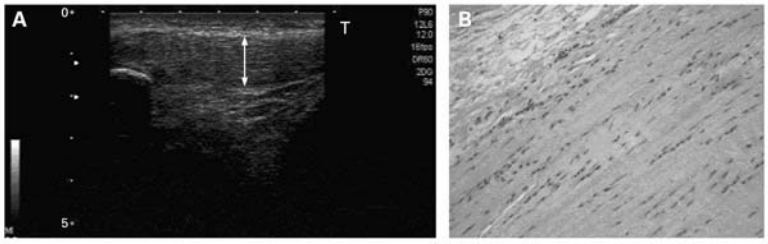
Imaging Features

- With MRI, low signal intensity tendon appears as increased signal intensity approximately equal to muscle with tendon swelling
- On US, the normally hyperechoic and fibrillar tendon appears hypoechoic and thickened with loss of the normal fibrillar pattern



Zissen et al. *AJR* 2010; 195:993–998

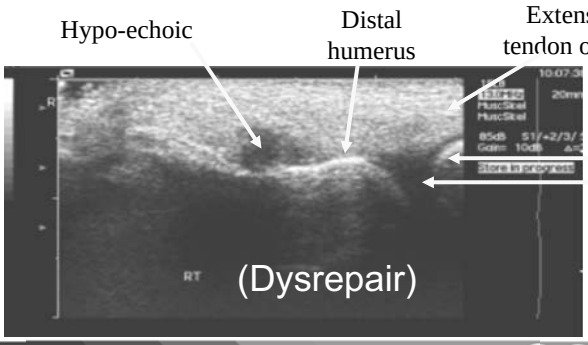
Ultrasound image of a thickened patellar tendon with intact collagen fascicles



(Reactive)

Chiavaras. *Semin Musculoskelet Radiol* 2013;17:85–90
McShane. J Ultrasound Med 2006;25(10): 1281–1289

Tennis Elbow Ultrasound

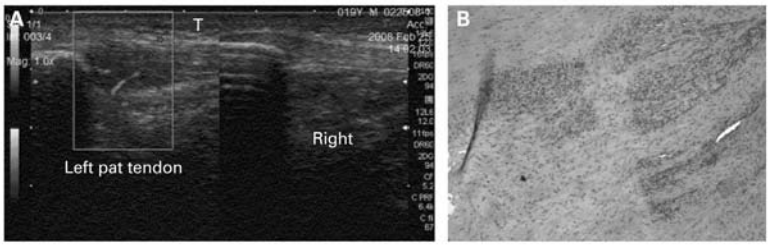


Chiavaras. *Semin Musculoskelet Radiol* 2013;17:85–90
McShane. J Ultrasound Med 2006;25(10): 1281–1289

Tennis Elbow Ultrasound with color doppler

Chiavaras. *Semin Musculoskelet Radiol* 2013;17:85–90
McShane. J Ultrasound Med 2006;25(10): 1281–1289

Ultrasound of a normal right and tendon degeneration left patellar tendon

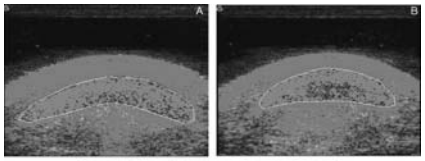


(Degenerative)

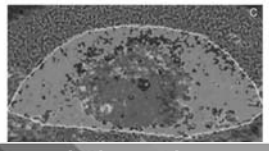
Chiavaras. *Semin Musculoskelet Radiol* 2013;17:85–90
McShane. J Ultrasound Med 2006;25(10): 1281–1289

Ultrasonic tissue characterization

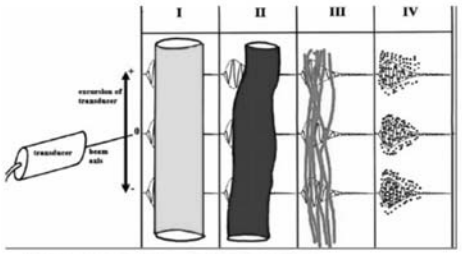
(A) Normal patellar tendon appearance



(B) Mild patellar tendon disorganization



(C) Severe patellar tendon disorganization.



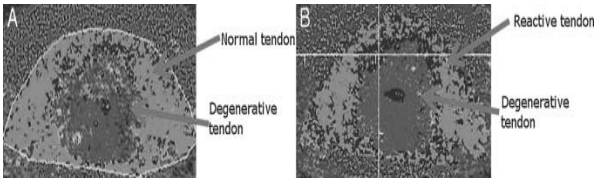
Echotype I- Intact, aligned bundles

Echotype II- Increased waviness/separation of fibrils

Echotype III- Decreased fibrillar integrity

Echotype IV- Absence of fibrillar organisation

US of degenerative patellar tendon structure



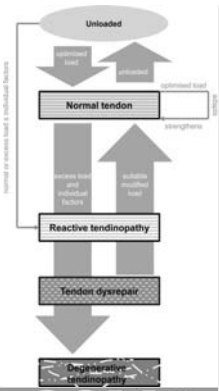
(A) Degenerative progressing to a reactive on degenerative patellar tendon structure (B). Note the increase in blue pixilation in what was previously normal (green) tendon structure.

Tendinopathy Differential Diagnosis

Region	Differential diagnoses to consider	Keys to correct diagnosis
Achilles	Posterior impingement, bursitis, referred pain (less common)	Careful palpation, passive plantarflexion test for posterior impingement
Patellar	Patellofemoral pain	Careful palpation
Lateral elbow	Referred pain from the cervical spine (common), nerve entrapments in the forearm	Careful examination of the cervical spine, awareness of forearm nerve entrapments
Rotator cuff	AC joint pain and osteolysis of the distal clavicle, shoulder instability, and glenoid labral tears	Examination of the AC joint, assessment for instability, and labral tests
Tibialis posterior – medial ankle	Flexor hallucis longus tendinopathy	Careful palpation – FHL tendinopathy is generally at the tunnel; tibialis posterior tendinopathy is generally at the navicular insertion

Patient presentation

- Reactive: Acute overload
  - Usually trauma or a burst of unaccustomed physical activity in a younger person, swelling
- Dysrepair: Chronically overloaded tendon
  - Thickened tendon (can be young or older)
- Degenerative:
  - Primarily older individuals or younger athletes with a chronically overloaded tendon



Clinical Examination

- Leadbetter (1992): "principle of transitions"
  - Injury most likely when CHANGE occurs (intensity, frequency, duration) Movement analysis of physical demands!
- You need to assess function and tolerance to load
  - Energy storage and release loads
  - Look for relationship between increasing the load on the tendon and pain
  - Achilles (heel raise), Patellar (decline squat)
  - Load assessment based on individual (50 yo tennis player vs. 18 yo sprinter
- Palpation: Moderate tenderness in normal!
  - Palpation and results of imaging are generally not useful…
- Strength and endurance base

Reinking. *Physical Therapy in Sport.* 2012; 13:3-10
Michener and Kulig. *J Orthop Sports Phys Ther*. 2015;45:829-832.

Clinical examination

- History: Mainly only see the "reactive" tendons
- Amount of overload (acute vs. history of tendon problems)
- Age (older vs. younger)
- Post menopausal women
- True reactive: very painful, younger, abusive overload, swollen and sore tendon, takes 4-8 weeks to settle
- Reactive on degenerative: usually older, history of load and/or tendon problems, settle 5-10 days
- Pure degenerative tendons don't present because they are not painful, may have lumpy bumpy tendons, remaining tendon is doing pretty well

Cook JL, et al. *Br J Sports Med* 2016

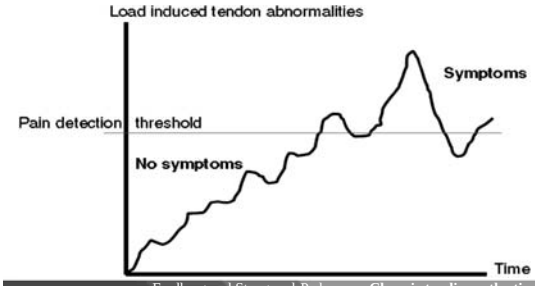
Clinical Classification

- Reactive/early tendon dysrepair
  - Young athlete after acute overload with a fusiform swelling of the tendon
- Late tendon dysrepair/degenerative
  - Older person with a thick nodular tendon
- Management optimized by tailoring interventions to stage of pathology
  - Target the primary driver (cell activation) and inter-related alterations in matrix integrity

Cook JL, et al. *Br J Sports Med* 2016

Inflamed?

Dean et al. Are inflammatory cells increased in painful human tendinopathy? A systematic review. *Br J Sports Med.* 2016;50:216-220.



The Iceberg Model

Fredberg and Stengaard-Pedersen . **Chronic tendinopathy tissue pathology, pain mechanisms, and etiology with a special focus on inflammation** *Scand J of Med & Sci in Sports*, 2008)

Evidence based intervention for the treatment of tendinopathies

Stage	Pharmacological management	Physical management
Reactive tendinopathy/early tendon dysrepair	Tenocyte inhibitors (ibuprofen, celecoxib, corticosteroid), aggrecan inhibitors (ibuprofen, naproxen sodium, indomethacin)	Load management. Reduction in frequency ± intensity of tendon load
Late tendon dysrepair/ degeneration	Prolotherapy (including blood), aprotinin, sclerosing therapy, glyceryl trinitrate	Exercise with eccentric component, ESWT, frictions, ultrasound

ESWT, extracorporeal shock wave therapy.

Isometrics?

Heavy slow resistance?

Cook JL, et al. *Br J Sports Med* 2009, 2016

Transverse Friction Massage

- Insufficient evidence to determine the effects of deep transverse friction on pain, improvement in strength, and functional status for patients with elbow or knee tendinopathy
- No evidence of clinically important benefits was found

Loew LM, et al. Deep transverse friction massage for treating lateral elbow or lateral knee tendinitis. Cochrane Database Syst Rev. 2014

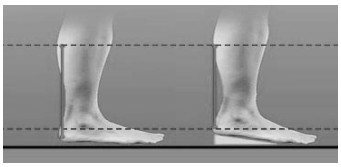
Management
Reactive/Early Tendon Dysrepair

- Management of load, reduce impact of offending activities
  - Assessment/modification of intensity, duration, frequency, type
- Tendons need 1-2 days between high or very high tendon loads
  - Type 1 collagen precursors peaks 3 days after intense exercise
- Tendon load without energy storage/release (cycling, weights)
- Avoid high load elastic or eccentric loading with little recovery time
- High-load isometrics (70-80% MVC) relieve pain and change central activation
- Avoid positions that compress tendon

(Cook & Purdam 2009; Vicenzino 2015, Rio et al. 2015)

Reducing Compression

- Important for insertional tendinopathies
- Change training strategies
- Reduce stretching
- Offload tissue (heel lift, brace)
- Complete rest contraindicated
  - Decreases mechanical strength of the tendon
  - Induce tendinopathic changes secondary to lack of mechanical stimulus



Cook et al. 2012

Reducing Compression

Tendon	Site of compression	Position of compression	Modification	Effectiveness
Achilles insertion	Superior calcaneus	Ankle dorsiflexion	Heel raise	Effective
Tibialis Posterior	Medial malleolus	Anatomically permanent pivot	Orthotics and heel raise	Limited
Long Head of Biceps	Bicipital groove	Shoulder extension		
Supraspinatus	Greater tuberosity	Shoulder adduction		
Proximal Hamstring	Ischial tuberosity	Hip flexion	Limiting sitting/ lunging	Moderate
Gluteus Medius and Minimus	Greater trochanter	Hip adduction	Lumbopelvic control, sleep supine	Effective
Adductor Longus/ rectus abdominus	Pubic ramus	Hip abduction/ extension	Limit loads in abduction/extension	Moderate
Peroneal Tendons	Lateral malleolus	Anatomically permanent pivot	Heel raise	Limited
Quadriceps	Femoral condyle	Deep knee flexion	Limit loads in deep knee flexion	Moderate
Pectorals	Humeral tuberosity	External rotation		

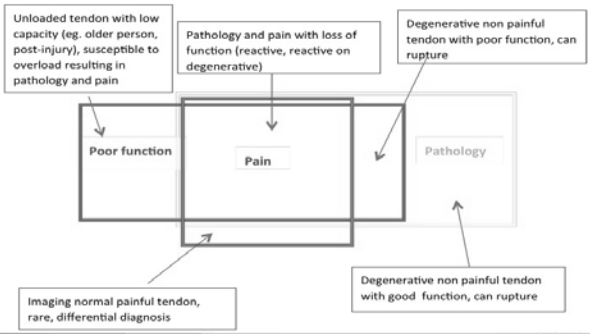
adapted from Cook and Purdam (2012).
https://bjsm.bmj.com/bjsm/2013/07/23/tendinopathy-rehab-progression-part-1/

Management
Late Dysrepair/Degenerative

- Chronically overloaded athletes and older people with stiff and nodular tendons
- Treatments to stimulate cell activity and protein production (collagen/ground substance) and restructure the matrix
- Transverse frictions and extracorporeal shock wave therapy less effective than exercise and not superior to placebo
- Eccentric exercises
  - Improves tendon structure and pain in both the short and long term
  - Decreases tendon neovascularization
  - Improves pain within 4-6 weeks
- Heavy slow resistance exercises also reduce pain and thickness and neovascularization

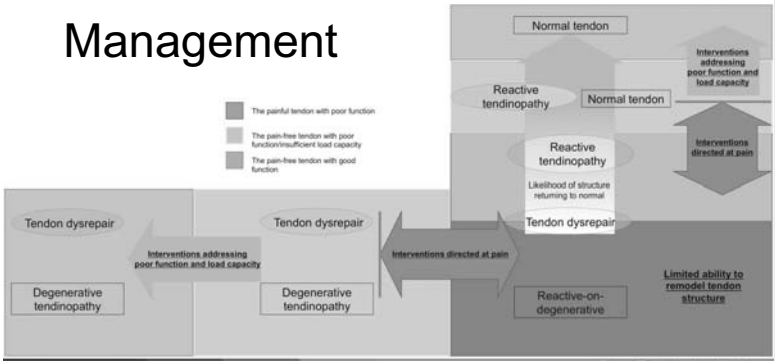
(Shalabi et al. 2004, Ohberg et al. 2004; Roos et al. 2004, Lanberg et al. 2007; Konsgaard et al. 2009, Cook & Purdam 2009; Vicenzino 2015, Rio et al. 2015, Beyer et al. 2015)

Structure, Pain and Function



Cook JL, et al. *Br J Sports Med* 2016

Management



Cook JL, et al. *Br J Sports Med* 2016

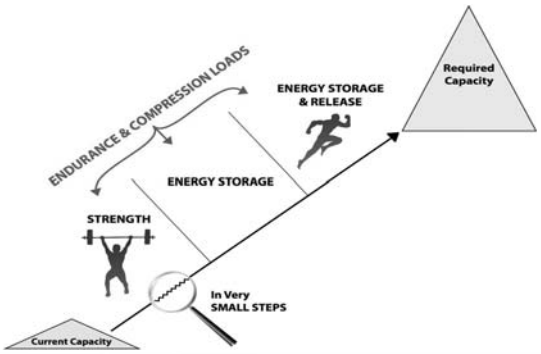
Management

Suggested rehabilitation progression for patellar tendinopathy.

Phase of rehabilitation	Aim of treatment	Intervention	Example exercises
Pain management	Reduce pain	Isometric exercises in mid-range as tolerated. Reduce loading and activity modification	Sustained holds on leg extension; 45 s, 4 repetitions, 2 times/day.
Strength progression	Improve strength	Heavy slow resistance as tolerated (isotonic)	Leg extension/press, 4 sets of 6-8 repetitions, 3-5 times/wk
	Functional strengthening	Progressive resistance exercise program, functional tasks, address movement patterns, kinetic chain and endurance training as required	Walk lunge with body weight or extra weight, stair walking
	Increase power	Increase speed of muscle contraction, lower the number of repetitions	Split squats, faster stairs, skipping exercises
Energy-storage/ stretch-shorten cycle	Develop stretch-shorten cycle	Plyometric exercises, graded gradually	Jumping, deceleration and change of direction tasks
	Training sport-specific	Drills specific to sport including endurance training	Sports specific drills at set intensity and duration
Maintenance	Management of symptoms and prevention of flare ups	Education, continue strength training and manage loading as tolerated	Continue leg extension strength or Spanish squat exercise while training and playing

Rudavsky & Cook. *J Physiother*. 2014;60:122-129.

Schematic of tendon rehabilitation, improving tendon capacity with progressive loads.

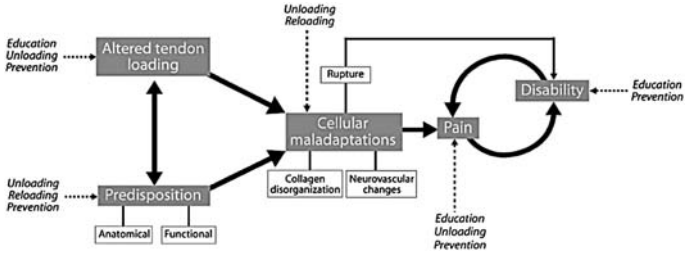


BJSM

JL Cook, and SI Docking Br J Sports Med 2015;49:1484-1485

EdUReP model

Educational intervention (Ed), Unloading of the tendon (U), gradual Reloading of the tendon (Re), and Prevention of tendon pain recurrence (P).



Davenport *PTJ*. 2005

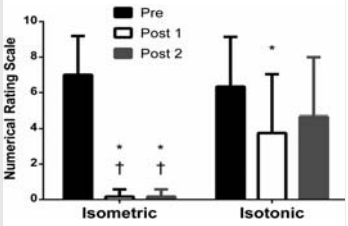
Isometrics for Pain?

- Compared isotonics to isometrics for pain relief

Table 2 Loading protocols in the study

	Apparatus	Prescription	Recovery (min)	Loading bolus
Isometric	Biodex Pro	5×45 s at 60°	2	70% MVC
Isotonic	Leg extension machine	4×8 repetitions *4 s eccentric phase 3 s concentric phase*	2	100% 8RM

MVC, maximal voluntary contraction; RM, repetition maximum.



Rio et al. Isometric exercise induces analgesia and reduces inhibition in patellar tendinopathy. *Br J Sports Med*. 2015;49:1277-1283.

Isometrics for Pain?

- Athletes were advised to complete 5 repetitions of a 30-second double-leg squat using the rigid belt

Rio et al. *Clin J Sport Med*. 2017

Eccentric Exercise

- Conservative approach
- Low-cost
- No equipment
- Self-management
- Effective

Mechanism?

- Mechanical sclerosing
- Collagen remodelling

Prescription of Eccentric Exercise

First Use:

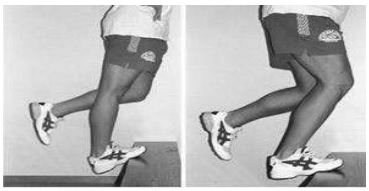
•Alfredson's Heel-Drop Protocol for Achilles Tendinopathy

- 3x15 reps knee straight & bent
- Performed 2x/day for 12 weeks
  - 180 reps per day

•Overload theory

•Pain allowed up to 5/10

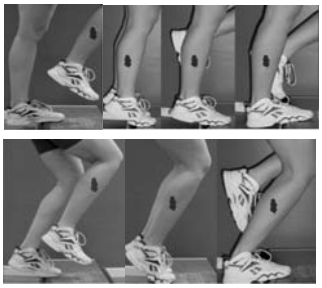
•Add weight (up to 50kg)



Alfredsen et al. Am J Sports Med 1998
Roos et al. Scand J Med Sci Sports 2004.

Achilles Tendinopathy

- Compared Eccentric Protocol to conventional management in 30 middle aged runners with chronic Achilles tendinopathy
- 3x15 reps knee straight & bent
  - Performed 2x/day for 12 weeks
- All 15 in eccentric group returned to running vs. all 15 in conventional group had surgery.



Alfredson et al. Am J Sports Med. 1998; 26; 360
Roos et al. Scan J Med Sci Sports14:286, 2004

Does it have to be PURELY eccentric exercise?

- Eccentric training better results than concentric
  - Achilles (Mafi et al. 2001)
  - Patellar (Jonsson and Alfredson 2005)
  - Tennis elbow (Peterson et al. 2014).
- No strong evidence that eccentric training is superior to isotonic
  - (Couppé et al. 2015; Malliaras et. 2013)
- Heavy Slow Resistance Training (HSRT) has similar or better outcomes compared to eccentric training
  - (Beyer et al. 2015, Kongsgaard et al. 2009, Frohm et al. 2007)

Abat et al. *J Exp Orthop.* 2017

Heavy slow resistance training (HSR)

- Compared eccentrics to HSR
- 3 times per week for 12 weeks
  - 3x15 rep max week 1
  - 3x12 rep max weeks 2-3
  - 4x10 rep max weeks 4-5
  - 4x8 rep max weeks 6-8
  - 4x8 rep max weeks 9-12
- Both groups had similar outcomes out to 1 year
- Exercise does not need to be eccentric only

Beyer et al. Heavy Slow Resistance Versus Eccentric Training as Treatment for Achilles Tendinopathy: A Randomized Controlled Trial. *Am J Sports Med*. 2015;43:1704-1711.

Tendinopathy Loading Programmes

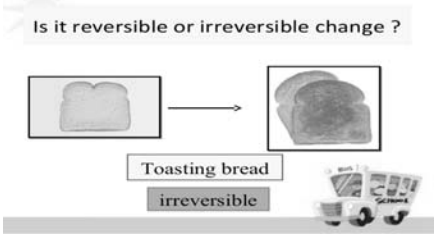
Type of exercise	Research	Sets, reps	Load	Frequency	Details
Eccentric	Alfredson et al. (1998) Achilles	3, 15	Body weight initially. Increased as pain allows	Twice daily for 12 weeks	'Heel drops' 1) with straight knee 2) with slightly knee flexed
Combined	Silbernagel et al. (2007) Achilles	Various	Body weight initially. Increased in phases based on patient status	Daily for 12 weeks to 6 months	Comprehensive programme including eccentric, concentric, balance, plyometric ex's and return to sport
Heavy Slow Resistance	Kongsgaard et al. (2009) & (2010)	4, 15-6	15-6RM Progressed at specific time points over 12 weeks pain allowing	3 times per week for 12 weeks	Bilateral squat, leg press and 'hack squat' with gradual progression in load. Includes eccentric and concentric. 6 seconds per rep. (3 ecc: 3 con.)

Running-Physio.com @tomgoom

http://blogs.bmj.com/bjsm/2013/07/23/tendinopathy-rehab-progression-part-1/

The Big Question: Can a Degenerative Tendon Heal?

- Many authors say changes are irreversible



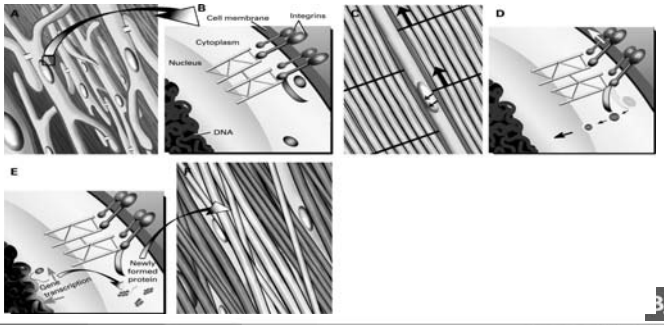
Mechanotransduction

Process by which "mechanical loading" creates a cellular response

- Mechanical trigger (mechanocoupling)
  - Can be in just isolated region
  - Shear or compression
- Cell to cell communication
  - "signaling proteins" (Ca and inositol triphosphate)
- Effector cell response
  - Tissue repair & remodeling

Kahn & Scott. Br J Sports Med. 2008

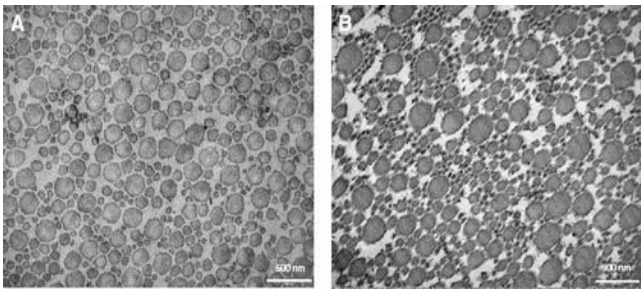
Mechanical loading stimulates protein synthesis at the cellular level.



BJSM

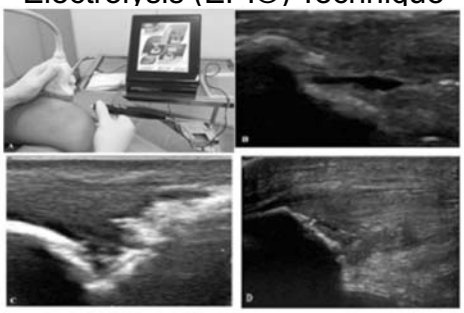
K M Khan, and A Scott Br J Sports Med 2009;43:247-252

Can Exercise Change Tendon Histology?



Kongsgaard et al. Fibril morphology and tendon mechanical properties in patellar tendinopathy: effects of heavy slow resistance training. *Am J Sports Med*. 2010;38:749-756.

US Guided Intratissue Percutaneous Electrolysis (EPI®) Technique



Sànchez-Ibàñez et al. New Treatments for Degenerative Tendinopathy. *Rheumatology (Sunnyvale)* 2016.

Krey D, Borchers J, McCamey K. Tendon needling for treatment of tendinopathy: A systematic review. *Phys Sportsmed*. 2015;43:80-86.

- The evidence suggests that tendon needling improves patient-reported outcome measures in patients with tendinopathy
- There is a trend that shows that the addition of autologous blood products may further improve theses outcomes

Conclusions

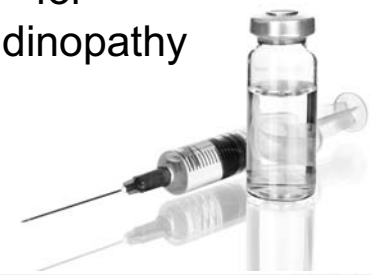
- Pain has little linking with pathology
- Tendon pathology exists in asymptomatic persons
- Recovery can occur without reversal of imaging-identified tendon pathology
- No identifiable pathology in some cases
- Tendon pain has transient on/off nature closely linked to loading and excessive energy storage and release in tendon
- Evidence of cortical changes (activation) and central sensitization
- Tendon pain is often persistent

An Enigma wrapped in a Riddle, shrouded in Mystery

Docking et al. 2015, Ryan et al. 2015, Rio et al. 2014, 2015, 2017

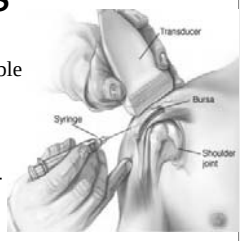
Review of Needle Based Interventions for Tendinopathy

- Cortisone
- Prolotherapy
- Autologous Blood
- PRP
- Dry Needle



Corticosteroids

- US guided corticosteroid injection commonly used
  - Effects are short term, long term outcomes questionable
- Common extensor tendon of the elbow:
  - Short-term symptom relief (<8 weeks)
  - Negative outcomes at 6 months and 1 year
- Rotator cuff: conflicting evidence of any real short-term improvement
- Hamstring tendinosis:
  - 50% of patients improved at 1 month
  - Only 24% of patients >6 months after injection
- Gluteal tendons: Improves symptoms in < 55%



THE LANCET
Volume 376, Issue 9754, 20–26 November 2010, Pages 1751-1767

Coombes et al. Lancet 2010

Corticosteroid Disadvantages

- Underlying tendon abnormality is not directly treated
- Temporary symptom relief not completely understood
  - Altered release of toxins as well as inhibition of collagen, extracellular matrix molecules, and granulation tissue
- Use as an anti-inflammatory is questionable
- Injection of corticosteroids directly into a tendon has been shown to weaken tendon and predispose to rupture
- Other potential complications
  - Fat necrosis
  - Depigmentation
  - Supression of adrenocorticotropic hormone
  - Increased blood glucose levels in patients with diabetes

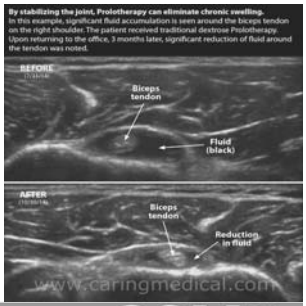
Coombes et al. Lancet 2010

SCANDINAVIAN JOURNAL OF MEDICINE & SCIENCE IN SPORTS

"Injection of corticosteroid inside the tendon has a deleterious effect on the tendon tissue and should be unanimously condemned. No reliable proof exists of the deleterious effects of peritendinous injections. Too many conclusions in the literature are based on poor scientific evidence and it is just the reiteration of a dogma if all steroid injections are abandoned." –U. Fredburg

Prolotherapy

- Involves injection of an irritant, such as hyperosmolar dextrose, into the area of tendinosis
- Thought to improve symptoms by:
  - Causing inflammation, which introduces growth factors that promote healing OR
  - Acts as a vascular sclerosing agent

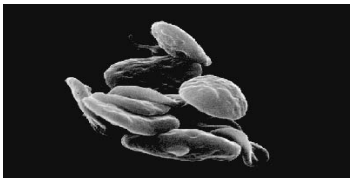


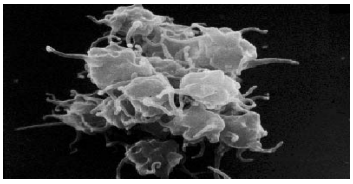
Hauser R. Prolotherapy. The Open Rehabilitation Journal, 2013, 6, 69-76

Prolotherapy

- Effectiveness and safety of prolotherapy injections for management of lower limb tendinopathy and fasciopathy: a systematic review (Sanderson et al. J Foot Ankle Res. 2015; 8: 57)
  - Limited evidence to support prolotherapy being safe and effective for treatment of Achilles tendinopathy, plantar fasciopathy and Osgood-Schlatter disease
- The effect of sclerotherapy and prolotherapy on chronic painful Achilles tendinopathy-a systematic review including meta-analysis (Morath et al. Scand J Med Sci Sports. 2017 Apr 27)
  - Sclerotherapy and prolotherapy may be effective treatments for Achilles tendinopathy and are considered safe

Platelet-rich Plasma (PRP) Autologous Whole Blood





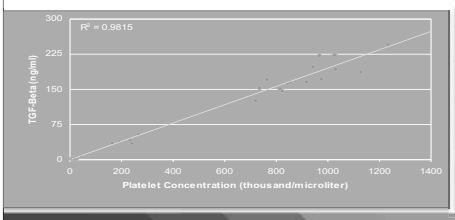
Autologous Blood Injection

- Peripheral blood is drawn from the patient's arm and re-injected into the pathologic tendon using ultrasound guidance
- Thought to increase concentration of growth factors to the region and promote healing
- With centrifuge, the platelet component of the patient's blood (PRP) can be isolated, concentrated, and then re-injected into area of tendinosis
- Rationale for use of PRP over whole blood
- More concentrated platelets lead to a better clinical response.
- Both types of injections are often combined with tendon fenestration

Finoff et al. PM&R 2011;3(10):900–911
James et al. Br J Sports Med 2007;41(8):518–521

Platelet Rich Plasma Biology

Growth Factors increase linearly with platelet concentration



PRP vs DN in Rotator Cuff Disease

- 39 patients with supraspinatus tendinosis or partial tear < 1.0cm)
- 2 DN (control) or 2 PRP injections
- Outcomes: SPADI, PROM shoulder, physician global rating at 6-month
- PRP superior to DN 6 weeks to 6 months post injection
- However!!! There is variability in the use of the term DN in the literature; it does not indicate tendon perforation but could entail a single injection to the subacromial space with a dry needle

Rha et al. Clin Rehab; Oct. 2012

PRP for Tendinopathy

Cochrane Library
Cochrane Database of Systematic Reviews

Platelet-rich therapies for musculoskeletal soft tissue injuries (Review)

Moraes VY, Lenza M, Tamaoki MJ, Faloppa F, Belloti JC 2014

- 19 studies (RTC repair, shoulder impingement, lateral epicondylitis, knee ligament reconstruction, patellar tendinopathy, Achilles tendinopathy, Achilles tendon rupture)
- Very low quality evidence for slight benefit of PRT in short-term pain (<3 months)
- PRP does not make a difference in function in short, medium or long-term
- Insufficient evidence to support PRP for soft tissue injuries

Journal of Athletic Training 2014;49(3):428–430
doi: 10.4085/1062-6050-49.3.06

www.natajournals.org

evidence-based practice

Autologous Growth Factor Injections in Chronic Tendinopathy

Michelle A. Sandrey, PhD, ATC

- Wrist flexor and extensor tendinopathy, plantar fasciopathy, patellar tendinopathy
- PRP or autologous white blood cells
- Very low quality evidence for slight benefit of PRT in short-term pain (<3 months)
- PRP does not make a difference in function in short, medium or long-term
- Insufficient evidence to support PRP for soft tissue injuries
- Studies methodologically flawed, autologous whole blood and PRP injection treatments are not standardized

Results of Multiple Systematics Reviews

- RCTs of PRP injection and non-randomized studies: overall low quality (Sheth et al)
- RCTs and non-randomized clinical trials: evidence for autologous injections for plantar fasciopathy were of low quality (Taylor et al)
- More low quality versus high quality studies evaluating autologous injection and PRP
- Studies do not account for differences in healing in load bearing vs non-load bearing tendons; results of one region are not generalizable to another (Combs et al)
- Great variability exists in how treatments are performed and lack of standardized methods: frequency, preparation, concentration (leukocytes, platelets, growth factors)

Sandry M, Autologous Growth Factor Injections in Chronic Tendinopathy, Journal of Athletic Training, 2014; 49(3):428-430.

Contents lists available at ScienceDirect
Physical Therapy in Sport
journal homepage: www.elsevier.com/ptsp
Literature review

The clinical impact of platelet-rich plasma on tendinopathy compared to placebo or dry needling injections: A meta-analysis

Konstantinos Tsikopoulos [a, *, 1], Ioannis Tsikopoulos [b], Evangelos Simeonidis [b], Efthymia Papathanasiou [a], Anna-Bettina Haidich [c], Nikolaos Anastasopoulos [a], Konstantinos Natsis [a]

- Comparison of PRP to placebo/dry needling
- Primary outcome was pain intensity; 2 or 3, 6 months
- Secondary outcome functional disability; 3 months
- Statistically significant difference in favor of PRP
  - Pain intensity at 2-3 months
  - Functional disability at 3 months

In the beginning...

Dr Janet Travell, left, and Dr David Simons

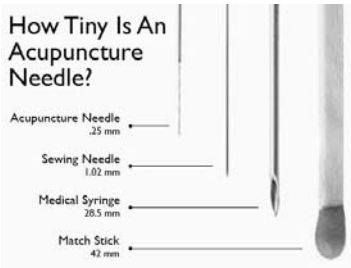
Dr. Karl Lewit

History of Dry Needling

- Travell described using hypodermic needles to inject trigger points for injection therapy (local anesthetic) and also dry (mechanical)
  - 22, 25 and 27 gauge needles
- Chang-Zern Hong described trigger point injection "Lidocaine Injection Versus Dry Needling to Myofascial Trigger Point"

Am J Phys Med Rehabil. 1994 Jul-Aug;73(4):256-63.

- Solid filiform needle is regulated by FDA as Class II medical device
- FDA definition includes how the needles can be used to pierce the skin



What is Dry Needling?

Dry needling (DN) is a skilled intervention used by physical therapists that uses a thin filiform needle to penetrate the skin and stimulate underlying myofascial trigger points, muscular, and connective tissues for the management of neuromusculoskeletal pain and movement impairments.

APTA
American Physical Therapy Association.

What is Dry Needling?

Dry needling is a neurophysiological evidence-based treatment technique that requires effective manual assessment of the neuromuscular system. Physical therapists are well trained to utilize dry needling in conjunction with manual physical therapy interventions. Research supports that dry needling improves pain control, reduces muscle tension, normalizes biochemical and electrical dysfunction of motor end plates, and facilitates an accelerated return to active rehabilitation.

AAOMPT

How do we use dry needling?

Dry needling is a technique used to treat dysfunctions in skeletal muscle, fascia, and connective tissue, and, diminish persistent peripheral nociceptive input, and reduce or restore impairments of body structure and function leading to improved activity and participation.

APTA
American Physical Therapy Association

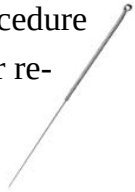
How do we use dry needling?

TrPs are physiological contractures characterized by local ischemia and hypoxia, a significantly lowered pH (active TRPs only), a chemically altered milieu (active TRPs only), local and referred pain, and altered muscle activation patterns.

Dry needling of myofascial trigger points (TrP) has a different physiological basis versus treatment of connective tissue, fascia etc.

Description of Dry Needling in Clinical Practice: An Educational Resource Paper, APTA 2013

- Not intended to be a stand alone procedure
- Therapeutic exercise, neuromuscular re-education and functional training
- Patient education on self-care
- Part of progression to restore movement, return to activity and participation



Description of Dry Needling in Clinical Practice: An Educational Resource Paper, APTA 2013

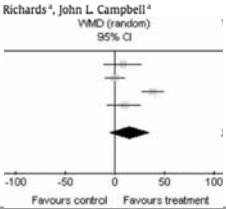
Review

Acupuncture and dry needling in the management of myofascial trigger point pain: A systematic review and meta-analysis of randomised controlled trials

Elizabeth A. Tough [a,*], Adrian R. White [a], T. Michael Cummings [b], Suzanne H. Richards [a], John L. Campbell [a]

- Meta-analysis of TDN vs. sham
  - Ikbuldu 2004 – Upper trap
  - Huguernin 2005 – Hamstring pain
  - Itoh 2006 – Chronic LBP
  - Itoh 2007 – Chronic neck pain

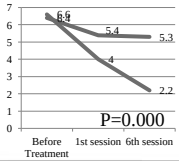
"…limited evidence that deep needling directly into myofascial trigger points has an overall treatment effect when compared with standard of care."



The effect of dry needling in the treatment of myofascial pain syndrome: a randomized double-blinded placebo-controlled trial Clin Rheumatol (2013) 32:309–315

Levent Tekin · Selim Akarsu · Oğuz Durmuş · Engin Çakar · Ümit Dinçer · Mehmet Zeki Kıralp

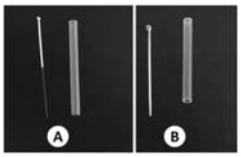
- 39 patients analyzed
- Inclusion: Age 24-65, Symptoms >6 mo. Active TrP in the upper thoracic region
- 22 received TDN, 17 received placebo



VAS Scores

Sham

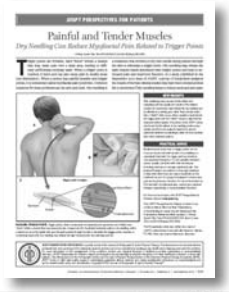
Dry needling



Upper-Quarter Myofascial Pain Systematic review and Meta-analysis

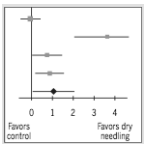
JOSPT

- 12 RCT analyzed
- Heterogeneous upper quarter pain syndromes
- Dry Needling vs. control/sham
- Dry Needling vs. other interventions (injections, laser, acupuncture and standard rehab)

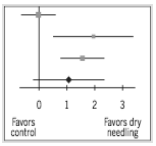


Dry Needling vs. Sham

Immediate (3 RCTs)



4 Weeks (2 RCTs)



- Recommend dry needling compared to sham or placebo for immediate reduction of pain (grade A)
- Cautiously recommend dry needling compared to sham or placebo at 4 weeks (grade A)
- More research needed to establish efficacy of TDN to to other interventions for upper quarter pain

[RESEARCH REPORT]

ERIC GATTIE, PT, DPT[a] • JOSHUA A. CLELAND, PT, PhD[b] • SUZANNE SNODGRASS, PT, PhD[c]

The Effectiveness of Trigger Point Dry Needling for Musculoskeletal Conditions by Physical Therapists: A Systematic Review and Meta-analysis

- Dry needling when compared to control/sham had a statistically significant effect on functional outcomes but not compared to other treatments
- Low to moderate evidence that dry needling is more effective than no treatment
- No difference in functional outcomes when compared to other PT treatment

[RESEARCH REPORT]

SARA PÉREZ-PALOMARES, PT[1,2] • BÁRBARA OLIVÁN-BLÁZQUEZ, PhD[1,3] • ANA PÉREZ-PALOMARES, PhD[4] ELENA GASPAR-CALVO, PT[1,2] • MARINA PÉREZ-BENITO, PT[1,2] • ELENA LÓPEZ-LAPEÑA, PT[1,2] MARIA LUISA DE LA TORRE-BELDARRAÍN, PT[1,2] • ROSA MAGALLÓN-BOTAYA, PhD[1,2,5,6]

Contribution of Dry Needling to Individualized Physical Therapy Treatment of Shoulder Pain: A Randomized Clinical Trial

- 120 individuals with nonspecific shoulder pain were randomized to 1) personalized, evidence based physical therapy 2) trigger point dry needling + personalized, evidence based physical therapy
- Individuals were assessed at baseline, after treatment and 3 months
- Outcomes were pain (VAS), ROM limitations, Constant-Murley score for pain and function and the number of active myofascial trigger points
- Dry needling did not offer benefit in addition to personalized, evidence based physical therapy in individuals with shoulder pain

What About Tendon Needling?

APTA- Resource Paper

Deep DN
- Chemical milieu and pH of skeletal muscle
- Restores local circulation
- ↓ Local and referred pain
- Improve ROM
- Decrease TrP irritability

Superficial DN
- Mechanoreceptors to slow unmyelinated C fiber afferent
- Stimulates A Delta fibers
- ↓ Local and referred pain
- Improve ROM

Fascia/Connective Tissue DN
- Influence fibroblast matrix
- Collagen synthesis and cell proliferation
- Activation of fibroblasts
- Mechanotransduction
- Pain neuromodulation

DN of Fascia and Connective Tissue

- Similar in approach to TrPs
- Palpation of the tissue for adhesion and movement restriction
- Needle directed superficially into adhesion
- Functional reassessment

Tendon Fenestration/ Dry Needling

- Use of a needle to treat tendinosis; has been used for decades
- Interventional radiologists use US to ensure accurate placement of the needle into the tendon, avoid other structures, and reduce complications
- Repetitively passing the needle through area of tendinosis:
  - Disrupts the chronic degenerative process
  - Causes bleeding and inflammation
  - Increases local growth factors and other substances that promote healing

Tendon Fenestration/ Dry Needling

- Common extensor tendon of the elbow
  - 80% of patients had good or excellent outcome
- Patellar tendon
  - 72% of patients had good or excellent outcome
- Also shown to be effective for Achilles, gluteal, proximal hamstring and other tendons about the pelvis and hip

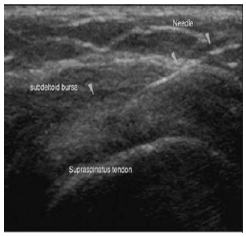
Tendon needling for treatment of tendinopathy: A systematic review

David Krey, James Borchers & Kendra McCamey

- Tendon needling improves patient reported outcomes in patients with tendinopathy
- 2 studies on lateral epicondylosis; increase in visual analog scale 34% (signif change >25%) from baseline to 6 months in one study, 56% increase in another study
- Study on tendon needling and eccentrics for Achilles tendinosis, 19.9% increase in Victorian Institute of Sports Assessment-Achilles (signif change >10%)
- Study on rotator cuff tendinosis, subjective shoulder pain and disability index showed statistically significant improvements from baseline to 6 months ($p<0.05$)
- Conclusion: tendon needling improves patient-reported outcome measures in patients with tendinopathy; autologous blood products may improve outcomes further

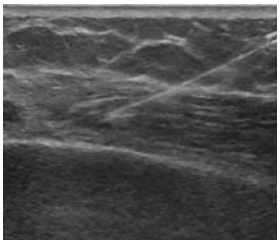
Tendon Fenestration Procedure

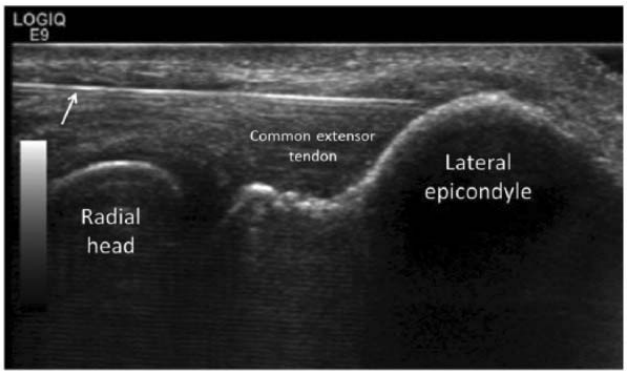
- US confirms presence of tendinosis
- Skin is scrubbed with cleansing agent and US probe placed in a sterile probe cover with gel
- Local anesthetic with 25-gauge needle
- Needle is inserted along the long axis of the tendon, parallel to the transducer
- 20-gauge needle for
  - Shoulder
  - Hip
  - Knee
- 22-gauge needle for smaller tendons



Technical Aspects

- Needle is passed into the area of tendinosis
- Needle is withdrawn out of the tendon and redirected to cover the area of tendinosis
- If the abnormality is adjacent to bone, needle is advanced to make contact with the bone
- 15 to 30 passes are typically used
- As the needle passes through the abnormal tendon, the tendon tends to soften
- Procedure terminated when area of tendinosis is treated and feels soft during needle advancement.





Pre-procedural Instructions

- Prior to the fenestration procedure, patient is instructed to avoid NSAIDs for 2 weeks before and after the procedure
- NSAIDs alter inflammation, growth factors, and the healing cascade

Post-procedure Considerations

- Avoid NSAIDs for 2 weeks
- Ice is avoided as it may dampen the induced inflammation
- For weight bearing tendons, precautions should be considered to enhance healing and tendon tears
  - Achilles tendon: Walking boot is often used
  - Patellar tendon: Knee brace is used
  - Bracing is not used in the upper extremity or hip region
- Timing of stretching and PT after tendon fenestration is variable in the literature
  - Many authors advocate waiting 2 weeks

Can Outcome Be Predicted?

- According to Jacobson et al. there were no clinical variables (age, sex, tendon, chronicity of symptoms, prior physical therapy, prior corticosteroid injection) that were significantly different between those with a positive vs negative outcome
- Kanaan et al. found that well defined tendon abnormality, based on US was predictive of positive outcome following tendon fenestration

Contraindications

- Bleeding disorders
- Anticoagulated patients
- Presence of local infection
- Presence of underlying tendon tear is a precaution
  - Rupture as a complication of fenestration is thought to increase with the degree of a preexisting tendon tear
  - Must weigh potential risk versus benefit
  - Many authors consider fenestration with tendinosis, interstitial tearing, or partial-thickness tearing up to 50% of tendon thickness

Can We Provide a Similar Intervention with a Smaller Needle??

How do we know if we're on the target tendon?

- Knowledge of anatomy and ability to palpate target tissue
- Palpation of thickened areas of tendon
- Reproduction of patient's familiar symptoms

Journal of Chiropractic Medicine (2013) 12, 26–29
ELSEVIER
JCM Journal of Chiropractic Medicine
www.journalchiromed.com

Topics in diagnostic imaging

Treatment of supraspinatus tendinopathy with ultrasound guided dry needling

Roy Settergren DC, MS, MS, RMSK*

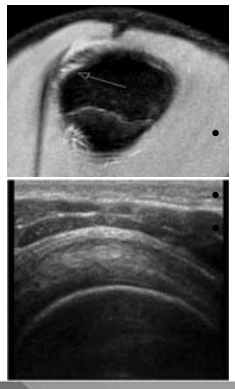
- Case study on 30 year-old female with 4 month history of supraspinatus tendinopathy (confirmed with diagnostic US)
- Sonography was used to guide an acupuncture needle into the tissue
- Tendon fenestration 15 times
- Followed up with therapeutic exercise (ROM followed by gentle theraband resistance into flexion, abduction, ER and IR)
- Day 6 patient reported 50% improvement, Day 10 patient reported full resolution of symptoms

Treatment of 2 Patients with Chronic Infraspinatus Tendinopathy with Dry Needling and Eccentric Exercise

Paul Mintken PT, DPT, OCS, FAAOMPT

University of Colorado
Anschutz Medical Campus

- 30 yo male swimmer 18 month history of posterior shoulder pain
- MRI + for Infraspinatus tendinopathy
- NPRS 6/10 with ER
- QuickDASH 38.6%
- PSFS: 7
  - Swimming
  - Washing hair
  - Shoulder ER



- 34 yo male tennis player with 5 year history of posterior shoulder pain
- US + for Infraspinatus tendinopathy
- NPRS 6/10 with ER
- QuickDASH 27.3%
- PSFS: 6
  - Tennis backhand
  - Reaching behind car seat
  - Reaching across body

Examination

- Painful AROM ER
- Limited and painful shoulder IR and adduction
- Pain with resisted shoulder ER
- Pain to palpation infraspinatous
- Negative ERLS

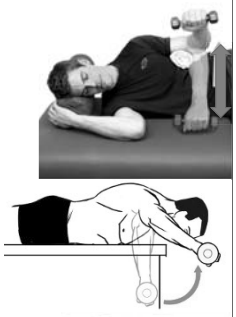
Intervention

- 3 sessions of dry needling to infraspinatus tendon, most tender areas based on palpation and pt report
- Patient positioned in prone, shoulder flexed to 90 degrees and slight ER

http://nursing-skills.blogspot.com/2014/01/infraspinatus-

Eccentric Exercise Program

- Phase 1: Sidelying ER
- Phase 2: Prone ER at 90 deg flexion
- Exercises were performed 3x15 reps, twice a day, 7 days per week, for up to 12 weeks.
- Load was increased until acceptable pain (<5/10) was experienced.



Bernhardsson et al. Clin Rehabil. 2011;25:69–78.

Outcomes

- 3 sessions of DN and Eccentrics over 3 weeks
- Eccentrics continued for 6 weeks

Outcomes at 6 weeks	**Patient 1**	**Patient 2**
NPRS at ret:	0/10	1/10
QuickDASH:	6.8%	11.4%
Global rating of change (GROC):	+6	+5
PSFS:	1.33	2.33

- No pain with resisted ER
- Minimal pain (<2/10) with swimming and tennis

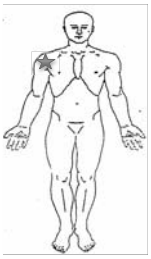
Treatment of Patients with Chronic Bicipital Tendinopathy with Dry Needling and Eccentric Exercise: A Case Series

Paul Mintken PT, DPT, OCS, FAAOMPT
Amy McDevitt PT, DPT, OCS, FAAOMPT

University of Colorado
Anschutz Medical Campus

Patients

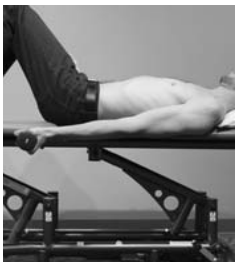
- 3 patients with chronic anterior shoulder pain
- Symptoms > 6 months
- Failed previous course of PT
- Positive examination findings
  - Speed's test
  - Yergason's
  - Pain with palpation LHBT
  - Painful flexion AROM



Intervention/Dry Needling

- Insert needles into most painful and/or thickened areas of the tendon up to 3 areas
- "Pepper" the most painful areas 20-30 times
  - Housner et al 2009

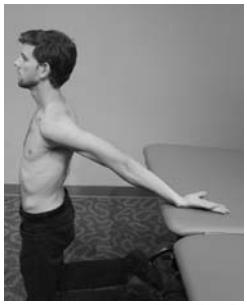
Eccentrics: Shoulder flexion with elbow extended; 3 sets of 15 reps twice daily



Eccentrics: Elbow flexion with shoulder extended; 3 sets of 15 reps twice daily

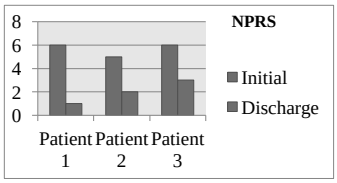
Stretching

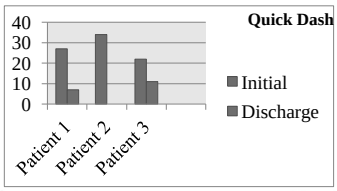
- Palm facing up
  - Place on file cabinet or something higher than waist height
- Extend shoulder until tendon pain
  - Hold 30 seconds, 2 times
    - 2-3x/day



Results

- Total visits
  - 5-8 visits
  - 3-6 weeks
- GROC
  - Patient 1 (+6)
  - Patient 2 (+7)
  - Patient 3 (+5)





Outcomes

- Volleyball player (18 months pain)
  - 8 sessions
  - QuickDASH 11%
  - GROC +5
- Rock climber (7 months pain)
  - 5 sessions
  - QuickDASH 0%
  - GROC +7
- Rock climber (12 months pain)
  - 6 sessions
  - QuickDASH 7%
  - GROC +6

Treatment of Patient with Chronic Hamstring Tendinopathy with Dry Needling and Eccentric Exercise

Amy McDevitt PT, DPT, OCS, FAAOMPT

University of Colorado
Anschutz Medical Campus

Patient

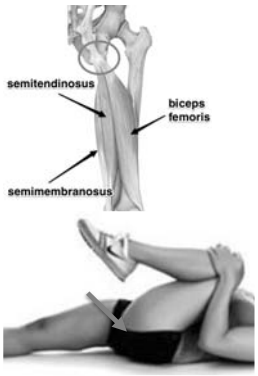
- 40 yo female, 5 month history of R proximal hamstring insertion pain; pt c/o pain with running and sitting
- NPRS 5
- LEFS 68
- Patient Specific Functional Scale (PSFS) 5.3
  - Running, yoga and LE exercise

Examination

- R gluteus medius, gluteus maximus and ERs weakness
- Myotomal weakness noted on R (L5)
- Single leg stance time decreased on R with decreased lumbopelvic stability and control
- Lateral abdominal endurance test-62 sec
- Tenderness to palpation
- + Bent knee stretch test and modified BKST

Intervention

- 4 sessions of dry needling to R proximal hamstring attachment, most tender areas based on palpation and pt report
- Patient positioned in supine with maximal hip flexion (knee to chest) for dry needling



Eccentric Exercise Program (Jayaseelan et al. JOSPT March 2014)

- Phase 1: Leg curl machine, single leg dead lift, single leg stance stability, supine bridge walk outs; lumbopelvic stabilization (plank, side plank, sidelying hip abduction)
- Phase 2: Phase 1 exercises with increased reps and/or weight; single leg windmills, standing hip hikes, lunges; retro treadmill
- All exercises performed 3 sets of 10-15 repetitions based on form fatigue; pain to be present but not disabling

Outcomes

- 4 sessions of DN and Eccentrics over 3 weeks
- NPRS 1
- LEFS 80
- Global rating of change (GROC) +4 after 1st visit and at 4th
- PSFS 8.3 (running, yoga, biking)
- Improved glut med, glut max strength and lateral abdominal endurance
- Minimal pain with running that resolved within 24 hours of activity

Physical Therapy Program
SCHOOL OF MEDICINE
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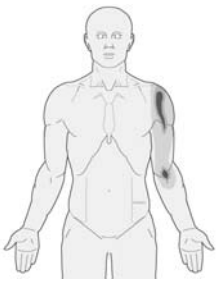
Treatment of Patients with Chronic Bicipital Tendinopathy with Dry Needling and Eccentric Exercise: A Case Series

Amy McDevitt PT, DPT, OCS, FAAOMPT
Becky Leibold PT, MPT, MHS, MTC, OCS
Lindsay Krause PT, DPT, OCS
Maria Borg PT, MPT, CSCS
Paul Mintken PT, DPT, OCS, FAAOMPT

Patients

- Hx chronic anterior shoulder pain (N=10)
- Symptoms > 3 months
- Failed previous course of PT (8/10)
- Positive examination findings
  - Speed's test
  - Hawkins Kennedy
  - Yergason's test
  - Pain with palpation LHBT
  - Painful AROM flexion



Treatment Protocol



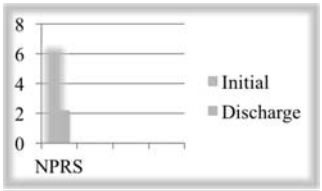
Dry needling
- Painful/thickened areas of tendon
- Pepper thickened and painful areas 20-30 times (Housner et al 2009)

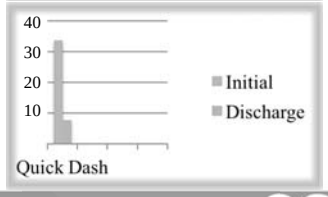
Exercise
- Concentric/Eccentric shoulder flexion with elbow extended 3x15 1X daily
- Concentric/Eccentric elbow flexion with shoulder extended 3x15 1X daily
- Biceps stretch: extend shoulder to tendon pain 2x30 sec 2X day

Results

Total visits
- 3-8 visits
- 2-6 weeks

GROC
- Change of 5.4

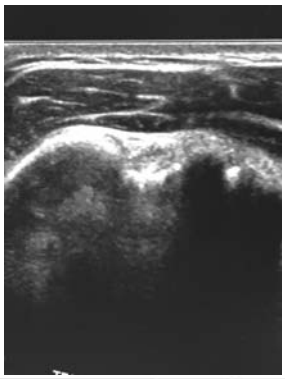




Discussion

- DN and EE may be a compliment treatment to manual therapy and strengthening of the rotator cuff and scapular muscles
- Further implications may include avoidance of more invasive techniques such as injection and surgery

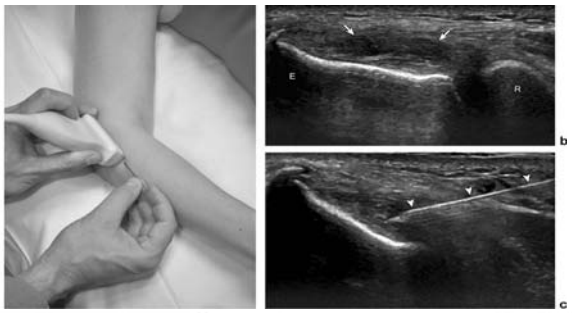




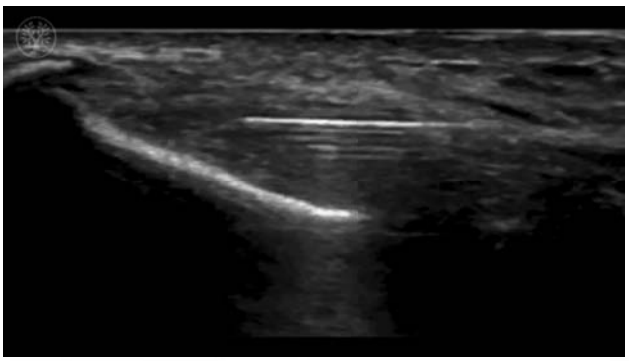
Tendon Needling Demonstration

- Video examples of ultrasonography taken during needling of various regions/tendons Video demonstration of tendon needling in various regions/tendons
- Reassessment strategies after needling

Common Extensor Tendon



Chiavaras. Ultrasound-guided tendon fenestration. *Semin Musculoskelet Radiol*. 2013;17:85-90.



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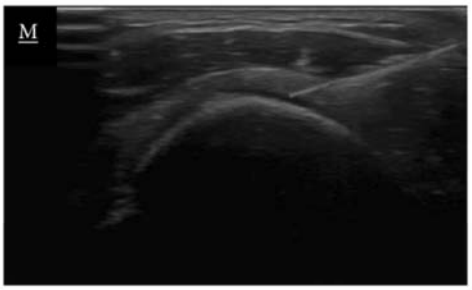
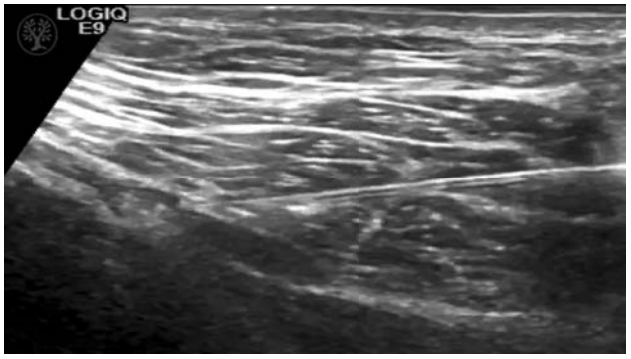
Supraspinatus Tendon



Chiavaras. Ultrasound-guided tendon fenestration. *Semin Musculoskelet Radiol*. 2013;17:85-90.

Proximal Hamstring

Chiavaras. Ultrasound-guided tendon fenestration. *Semin Musculoskelet Radiol*. 2013;17:85-90.



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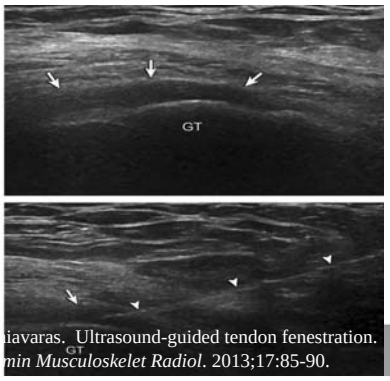
Gluteus Medius Tendon



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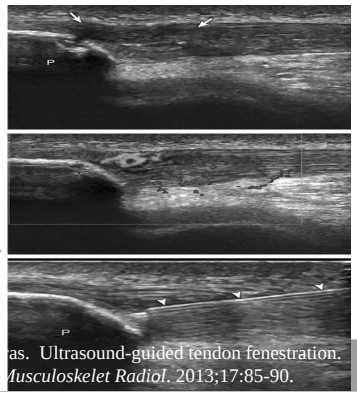
Gluteus Medius Tendon

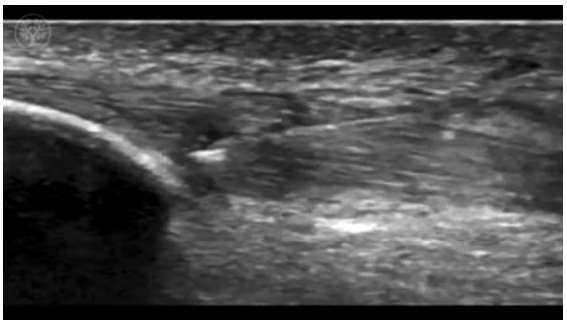
Chiavaras. Ultrasound-guided tendon fenestration. *Semin Musculoskelet Radiol*. 2013;17:85-90.

Patellar Tendon



Chiavaras. Ultrasound-guided tendon fenestration. *Semin Musculoskelet Radiol*. 2013;17:85-90.

Patellar Tendon



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Achilles Tendon

Future Directions

- Potential positive effects of ultrasound-guided tendon fenestration.
- It is unknown which factors influence the outcome of the procedure
- Do some tendons have better outcomes compared to others?
- Does increased vascularity, echogenicity, or size of the tendon abnormality at ultrasound influence results?
- Chronicity: It is unknown whether chronicity of the symptoms, prior treatments, and patient variables such as age or smoking affects outcome.
- Technique: it is unknown whether needle choice or number of needle passes through the tendon has an effect. Lastly, because other percutaneous ultrasound-guided tendon injections such as hyperosmolar dextrose, autologous whole blood, and PRP also involve tendon fenestration during the procedure, does tendon fenestration alone produce similar results compared with these tendon injections?

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