



## Introduction

Tendinopathy – the collective term for tendinitis, tendinosis, and paratenonitis – is a clinical syndrome characterized by tendon thickening and localized pain. The exact etiology has not been fully elucidated, though leading theories include tensile overload, collagen synthesis disruption, load-induced ischemia, neural sprouting, thermal damage, and adaptive compressive responses.

Although it had previously been thought that inflammation was not an important factor in the disease process, this has recently been re-evaluated and it is now believed tendinopathy is a combination of both inflammation and degeneration. Following vascular disruption secondary to microscopic, partial, or complete tendon rupture, a typical inflammatory response with increased COX-2 or IL-6 expression is demonstrated [1]. However, histologic studies of a wide variety of tendons examined during surgical biopsies of individuals with chronic tendon pain who have

failed conservative treatment have shown minimal presence of inflammatory cells [2]. Thus the majority of what has been traditionally labeled “tendinitis” is truly tendinosis despite persistence of the “-itis” suffix [2]. Paratenonitis (umbrella term for tenosynovitis, peritendinitis, and tenovaginitis) typically occurs where a tendon rubs over bony protuberance. It exhibits a more prominent role of inflammation acutely though exhibits minimal inflammation, degeneration, and fibrotic changes in the tendon and its sheath chronically [1–3].

Risk factors for developing tendinopathy are divided into intrinsic and extrinsic factors. Intrinsic factors (related to the properties of an individual’s tendon or healing capacity) include increased age, increased body mass index, biomechanical abnormalities, prior tendon lesion, fluoroquinolone use, and gender for certain tendinopathies. Extrinsic factors (pertaining to the load placed on the tendon) include training errors, environmental conditions, subpar equipment, and poor ergonomics [3].

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## Clinical Findings

Clinically, tendinopathies present with localized pain upon tendon loading and palpation of the affected portion of the tendon. Locating the painful area can help guide treatment protocols, e.g. Achilles tendinopathy located at the watershed region (2–3 cm proximal to the insertion) and

insertional Achilles tendinopathy follow differing treatment algorithms. On visual inspection, superficial tendinopathies demonstrate observable tendon thickening. While not visible, deep tendon's thickening can present clinically, e.g. rotator cuff tendinopathy exacerbating shoulder impingement of a narrow subacromial space. In paratenonitis, crepitus or fluid in the tendon lining may be palpable [3].

Functional assessment scores can help the clinician to grade symptoms, determine patient function, and provide measures of monitoring recovery during rehabilitation. Commonly used metrics include the Victoria Institute of Sport Assessment (VISA) or VISA-A for patellar and Achilles tendinopathy, respectively.

Greater trochanter bursa syndrome (GTBS) is one of the most commonly encountered syndromes in practice. Pain over the greater trochanter is most often diagnosed as greater trochanteric bursitis while the problem is mostly related to muscles surrounding the hip (mainly gluteus medius and minimus).

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## Diagnostics

Diagnosis can be confirmed via characteristic changes in tendon appearance on ultrasound (US) or Magnetic Resonance Imaging (MRI). US has become more prevalent with improvements in technology, although it has limited use for prognosis. Doppler US has proven particularly useful for detecting tendon pathology and may reveal tendon thickening, hypoechoic areas, and increased blood flow in the deep portions of the tendon. MRI shows increased signal in abnormal tendons, corresponding to the increased water content associated with excessive proteoglycans and increased blood flow. MRI is more effective than US in detecting partial tendon tears [4].

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## Treatment

The majority of patients who present with tendon injuries do so in the chronic stage (over 3 months of symptoms). Successful conservative treatment consists of patient education, relative rest, correc-

tion of underlying biomechanical faults, active rehabilitation, and gradual return to activity [5].

- Activity modification: Limit the volume and intensity of loads placed upon injured tendon.
- Biomechanical modification: Should include work-place ergonomic assessment. While this has not been vetted in large randomized trials, it is supported by clinical experience.
- Active rehabilitation:
  - Exercise: The cornerstone of treatment for most cases is slow, controlled, progressive eccentric exercise using heavy loads although similar concentric exercises have recently showed promising results.
  - Stretching: Despite many clinician's and therapist's regular use of stretching as a treatment modality, there exists insufficient evidence to support or refute its use to prevent Achilles tendinopathy and other sports-related injuries.
  - Massage and Joint Mobilization: Neither are beneficial.
- Anti-inflammatory medications:
  - Non-Steroidal Anti-inflammatory Drugs (NSAIDs): Multiple studies show effectiveness of topical NSAID gel or iontophoresis for short-term (5–7 days) pain control. Oral NSAIDs may be helpful for short-term pain relief.
  - Glucocorticoids: Effectiveness and risks vary with duration and mode of delivery. Oral/topical may be useful for acute tendinopathy (<3 months). Should be avoided in chronic tendinopathy, especially via injection due to risk of tendon rupture.
- Investigational treatments which have not been compared to the above in large clinical trials:
  - Topical glyceryl trinitrate
  - Prolotherapy
  - Sclerotherapy
  - Aprotinin
  - Dry needling
  - Autologous blood/platelet rich plasma therapy
  - Acupuncture
  - Shock wave therapy
  - Ultrasound
  - Laser Therapy

Ultimately, those who fail conservative treatment (6 months of therapy with adjunct medical treatment) may opt to undergo surgery of the affected tendon. Most procedures involve incision of the paratenon, removal of adhesions, and debridement of degenerate tissue.

## Differential Diagnosis

- Tendinitis.
- Tendinosis.
- Paratenonitis.
- Partial/Full tendon tear.
- Tendon dislocation.
- Bursal pathology.
- Enthesitis.

### High Yield Points

- Overuse tendinosis, the most common form of tendinopathy, is characterized by tendon thickening and chronic, localized pain, while a cellular inflammatory response is minimally present.
- Among the many intrinsic and extrinsic risk factors, advancing age and increased overall volume/intensity of tendon load pose the greatest risk for development of tendinopathy.
- GTPS is mostly diagnosed as greater trochanteric bursitis while most of the time the cause is tendinosis of gluteus medius and minimus muscles.
- Diagnosis is suspected with pain upon tendon loading and palpation of affected portion of the tendon, and confirmed via US or MRI findings.
- Treatment involves relative rest and slow, heavy eccentric exercise. Adjunct therapies may include stretching, tissue mobilization, ice or heat. A number of alternative therapies are currently being investigated.
- Following 6 months of diligent physical therapy and adjunct medical treatments, it is reasonable to obtain surgical consultation if there have been no improvements in symptoms or function.

## Questions

1. A 52-year-old runner presents with a 4-month history of heel pain made worse after running. Treatments thus far have consisted of heel wedges in running shoes and diligent stretching of the gastrocnemius after running. He has decreased running mileage over the winter months. MRI demonstrates increased signal at the insertion of the Achilles tendon and a partial tear. Next step in the management should include:
  - A. Topical Diclofenac (Voltaren) gel, 4 gm, applied 4× daily
  - B. Initiation of eccentric exercises
  - C. Referral to orthopedic surgery
  - D. Ultrasound guided corticosteroid injection

Answer: B

2. A 44-year-old female presents with radial side wrist pain of 6 months duration exacerbated by thumb movements, especially grip. She had previously noted swelling in the area though this has since resolved. Finklestein test is positive. Radiographs are normal. Corticosteroid injection into the first dorsal compartment relieved her symptoms. This is a process consistent with:
  - A. Tendinitis
  - B. Tendinosis
  - C. Paratenonitis
  - D. Carpometacarpal joint arthritis

Answer: C

3. A 25-year-old carpenter presents with chronic pain over the lateral aspect of the elbow. He notes pain when using a hammer. On exam, he has pain with resisted wrist extension while the elbow is fully extended. All of the following would be the expected findings on histologic examination of the affected tissue except which?
  - A. Fibroblast hypertrophy
  - B. Vascular hyperplasia
  - C. Disorganized collagen
  - D. Inflammatory response

Answer: D

## References

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