Soft tissue rheumatism

Part 2: tendinitis, tenosynovitis, ligament sprains and muscle strains

The recurrence of soft tissue injuries can be minimised by finding the precipitating cause, and adequately stretching and strengthening the involved structure before returning to the offending activity.

RODGER LAURENT
MB ChB, MD, FRACP

Dr Laurent is Senior Staff Specialist in Rheumatology and Musculoskeletal Medicine, Department of Rheumatology, Royal North Shore Hospital, Sydney, NSW.

This two-part article is a guide to identifying the involved structure in soft tissue rheumatism, isolating and correcting the precipitating cause, and treating and preventing soft tissue injuries. Last month, Part 1 provided an overview of diagnosis and management, as well as describing features specific to enthesitis and bursitis. This month, the author focuses on tendinitis, tenosynovitis, ligament sprains and muscle strains.

Tendinitis

Site of injury

A tendon consists of collagen fibres with occasional tenocytes. The main blood supply is from the epitenon, which is the vascular connective tissue surrounding the tendon. The ends of the tendon also receive a blood supply from the muscle and bone attachments. However, there may be a relatively avascular area that is often subject to tendinitis. The paratenon surrounds the tendon and epitenon and is a series of thin membranes that allows movement of the tendon over adjacent tissues. When it becomes inflamed, it thickens and reduces the movement of the tendon.

Tendinitis involves the tendon and paratenon. It usually commences in the tendon, with the paratenon then becoming inflamed, thickened and adherent to the tendon. Central degeneration is usually the primary cause in older people, with secondary involvement of the paratenon.

The problem can also begin in the paratenon, with inflammation and thickening of the paratenon and minimal involvement of the tendon. This is the pattern of tendinitis associated with overuse.

Causes

The causes of tendinitis are overuse of the tendon and abnormal biomechanics.

Symptoms and signs

The symptoms and signs of tendinitis include:

- pain over the involved part of the tendon

IN SUMMARY

- **In tendinitis, prolonged rest or immobilisation is detrimental to the tendon, because there is a rapid loss of collagen. It is important to prevent this, even if the initial exercises are minimal.**
- **Stretching and strengthening exercises are important for restoring normal movement in tenosynovitis. If exercise is not commenced early, there may be fibrosis and restriction of movement.**
- **In ligament sprains, exercises must be continued after symptoms have resolved; it takes about nine months for ligaments to return to normal strength.**
- **Recurrence of muscle strains relates to returning to the precipitating activity too soon, before the muscle has healed.**

- swelling and tenderness over the involved region
- pain on stretching the tendon
- pain on isometric contraction of the relevant muscle.

Treatment

Prolonged rest or immobilisation of a tendon after an injury is detrimental to the tendon because there is rapid loss of collagen. It is important to prevent this, even though the exercises in the initial stages are minimal.

Treatment of tendinitis involves:

- reducing or stopping the activity responsible for the pain
- nonsteroidal anti-inflammatory drugs (NSAIDs) – can be used for the first few days, although they usually provide only minimal benefit
- applying cold packs for 10 to 15 minutes over the involved area, two or three times a day – this should be done after exercise, including stretching exercises
- a course of ultrasound – sometimes relieves pain
- commencing gentle static stretches
- beginning concentric muscle exercises as the pain resolves
- starting eccentric muscle exercises after the tendinitis has become asymptomatic with concentric muscle exercises
- sport- or work-specific exercises, to achieve maximum strength of the musculotendinous unit involved
- correcting any precipitating causes, e.g. sports technique or repetitive movements in the workplace.

Common examples of tendinitis

Common examples of tendinitis include:

- Achilles tendinitis
- shoulder rotator cuff tendinitis.

Achilles tendinitis

Site of injury

The Achilles tendon commences at about midcalf and consists of a superficial layer from the gastrocnemius muscle and a deep layer from the soleus muscle. The tendon inserts into the posterior calcaneum. The gastrocnemius muscle crosses two joints. The area from 2 to 6 cm above the insertional site is the area with the poorest blood supply and is the region where tendinitis usually begins (Figure 1).

Tendinitis should not be confused with Achilles tendon enthesitis, which occurs at the insertional site of the tendon.

Cause

The most common cause of Achilles tendinitis is overuse. There are several predisposing factors, including biomechanical abnormalities of the hip, knee and foot (especially overpronation), that produce abnormal movement of the tendon.

A tight Achilles tendon with limited ankle

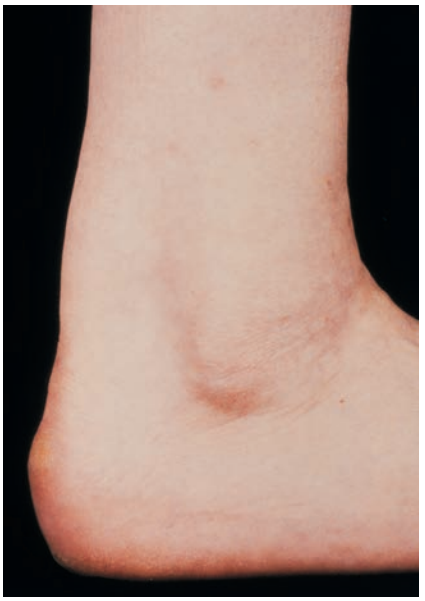


Figure 1. Achilles tendinitis with swelling over the lower part of the Achilles tendon.

dorsiflexion increases the stress on the tendon, as do training errors, inadequate warm-up, a sudden increase in activity and inadequate footwear with poor heel support.

Symptoms and signs

Symptoms and signs of Achilles tendinitis include:

- pain over the lower part of the tendon
- swelling and tenderness over the involved region (Figure 1)
- pain on stretching the Achilles tendon by dorsiflexion at the ankle
- pain on isometric contraction of the gastrocnemius and soleus muscles.

Treatment

The general measures for treating tendinitis outlined earlier apply to the treatment of Achilles tendinitis. In addition, a heel raise, usually a sponge insert, may be helpful by reducing the stretch on the tendon.

Corticosteroids should not be injected around the Achilles tendon because of the risk of tendon rupture.

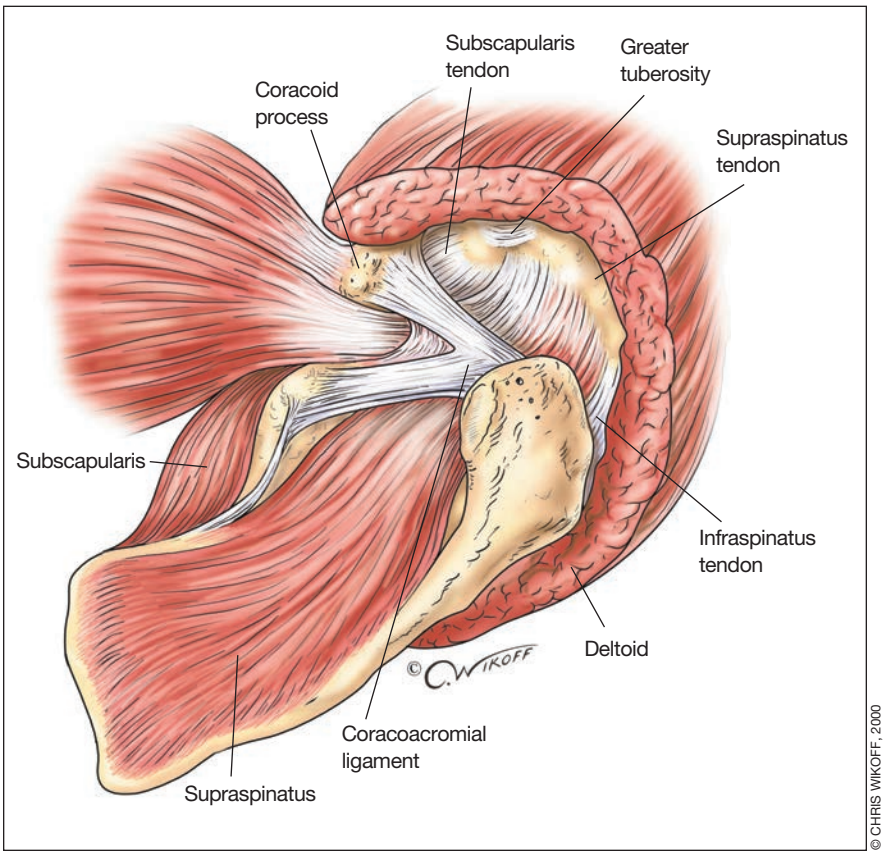


Figure 2. The anatomy of the rotator cuff tendons.

Shoulder rotator cuff tendinitis

Rotator cuff tendinitis is probably the most common cause of shoulder pain, and usually involves the supraspinatus and infraspinatus tendons.

Site of injury

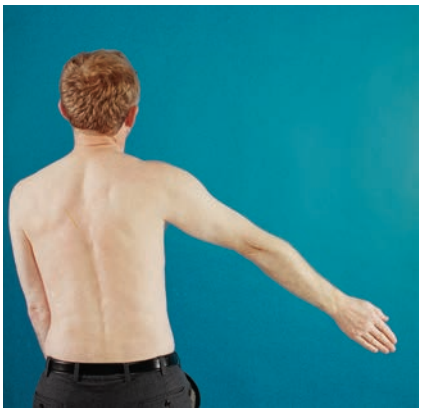
The rotator cuff consists of the tendons of the supraspinatus, infraspinatus, subscapularis and teres minor muscles. These tendons form a broad band and insert into the greater and lesser tuberosity and the ligament that covers the bicipital groove. The supraspinatus tendon passes between the head of the humerus and the coracoacromial arch. The subacromial bursa facilitates movement between the subacromial arch and the rotator cuff tendons of the supra- and infraspinatus muscles (Figure 2). The rotator cuff functions to stabilise the shoulder joint and add power to glenohumeral rotation and elevation.

The primary problem in the rotator cuff is probably central degeneration with swelling of the tendons. This causes impingement of the tendon between the humeral head and coracoacromial arch, which is the main cause of the pain. Weakness of the rotator cuff can lead to further impingement because of a reduction in the ability to depress the humeral head during abduction. Subacromial bursitis is usually secondary to the tendinitis.

Causes

Causes of rotator cuff tendinitis include:

- overuse or trauma – rotator cuff tendinitis is more common in people who use their shoulder in an abducted position of greater than 90° (e.g. swimmers).



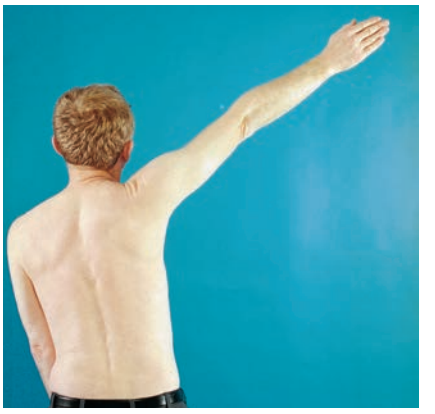


Figure 3. Rotator cuff tendinitis: the painful arc is from about 60° to 120° of abduction.

Figure 4. Flexor tenosynovitis in the index finger – the result of overuse.

- advancing age – in the middle aged and elderly there is often no obvious precipitating cause (the tendons degenerate with age, especially in the middle, and the tendinitis can become chronic)
- structural abnormalities – these can cause increased impingement on the tendon (examples include abnormal scapula position associated with thoracic kyphosis, chronic tendon swelling due to previous tears of the tendon, and loss of the normal humeral head depression mechanism.

Symptoms and signs

Symptoms and signs of rotator cuff tendinitis include:

- pain over the lateral aspect of the shoulder and upper arm that can radiate down the arm, occasionally to the hand
- tenderness over the end of the tendon near its site of insertion into the greater tuberosity
- pain on movement, particularly when the arm is elevated and there is an alteration of scapulothoracic movement
- pain on active or passive abduction – there may be a painful arc between approximately 60° and 120° (see Figure 3 above); however, if the tendinitis is severe, the arm cannot be abducted more than 70° or 80°
- pain on isometric contraction of the supraspinatus or infraspinatus muscles.

Treatment

Treatment of rotator cuff tendinitis is the same as that outlined in the section on general treatment for tendinitis.

Specifically, injection of corticosteroid and local anaesthetic into the subacromial bursa is helpful if the pain is severe or movement is restricted.

Tenosynovitis

Site of injury

In areas where there is considerable movement of the tendon, especially over ligaments and bone, the tendon runs through a fibrous tunnel that allows easy movement and reduces friction on the tendon. The fibrous tunnel and tendon sheath are covered with synovium, which also forms synovial fluid.

Tenosynovitis is inflammation of the tendon sheath and is distinct from tendinitis, which is inflammation of the tendon and the paratenon.

Tenosynovitis can result in fibrin deposition on the tendon and the sheath, producing thickness and nodule formation. These may result in the tendon catching as it passes through a fibrous pulley. This is the cause of 'trigger finger', when the finger flexor tendons are involved (Figure 4).

The most common tendons involved are the abductor pollicis longus and the extensor pollicis brevis tendons at the

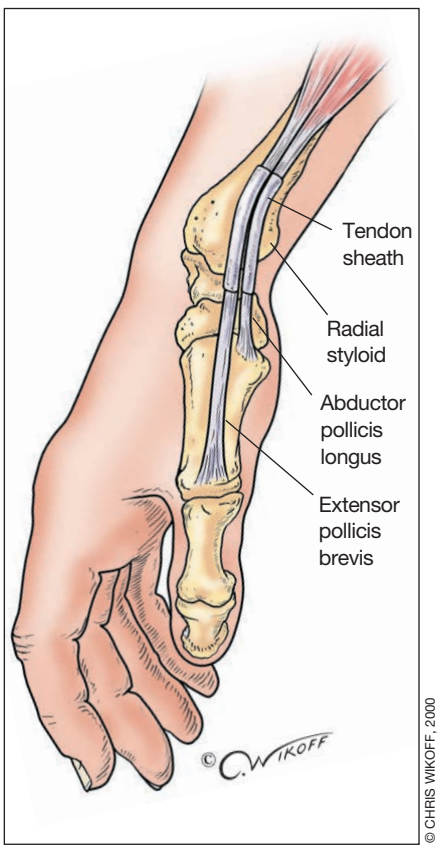


Figure 5. Tendons involved in de Quervain's tenosynovitis.

wrist, the finger flexor tendons, and the tibialis posterior and common peroneal tendons at the ankle.

Causes

The most common cause of tenosynovitis is repeated use or excessive stress on the tendon.

It may also be associated with any inflammatory arthritis (e.g. rheumatoid arthritis or psoriatic arthritis).

Symptoms and signs

The symptoms and signs of tenosynovitis include:

- pain on active movement; if the problem is severe, there will also be pain at rest
- tenderness over the involved area of the tendon
- swelling – this is usually mild if the injury is related to overuse (Figure 4); however, if the tenosynovitis is due to infection or sodium urate crystals, swelling may be marked, with surrounding oedema and erythema
- pain on stretching the tendon or on isometric contraction of the musculotendinous unit
- in chronic tenosynovitis, crepitus can be felt over the tendon; this is the result of fibrin deposition within the tendon sheaths
- restricted movement – this may occur in both acute and chronic tenosynovitis.

Treatment

Treatment of tenosynovitis due to repeated use or excessive stress involves:

- identification of the precipitating activity, particularly if the tenosynovitis is due to overuse – these movements should be reduced or stopped until the tenosynovitis has resolved
- injection of a mixture of local anaesthetic and corticosteroid into the tendon sheath, but not the tendon, when there is significant pain or restriction of movement
- ultrasound and NSAIDs, although they provide only minimal benefit in this situation
- a regimen of stretching and gentle exercises – this is important for maintaining a full range of movement of the musculotendinous unit.

The same treatment is used for tenosynovitis associated with inflammatory arthritis. Treatment of the inflammatory arthritis will also control the tenosynovitis.

An example of tenosynovitis: de Quervain's tenosynovitis

De Quervain's tenosynovitis involves the abductor pollicis longus and the extensor pollicis brevis tendons at the wrist. It occurs at the radial styloid where the tendons, invested in a common synovial sheath, run along a groove in the bone (Figure 5). With repeated use of the wrist and thumb, there can be increased friction on the tendon.

Signs and symptoms

The symptoms and signs of de Quervain's tenosynovitis include:

- pain felt over the radial border of the wrist and possibly radiating down to the thumb
- pain produced by thumb movements, particularly the pinch grip

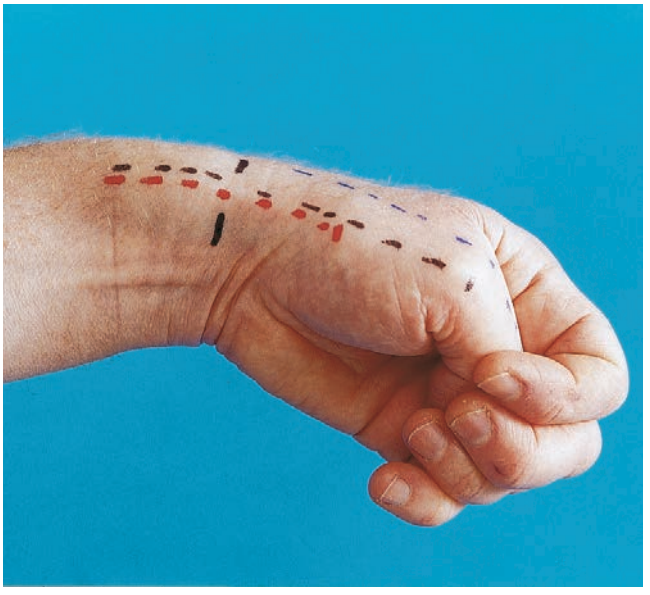


Figure 6. Pain in de Quervain's tenosynovitis is reproduced by flexion and adduction of the thumb and ulnar deviation of the wrist.

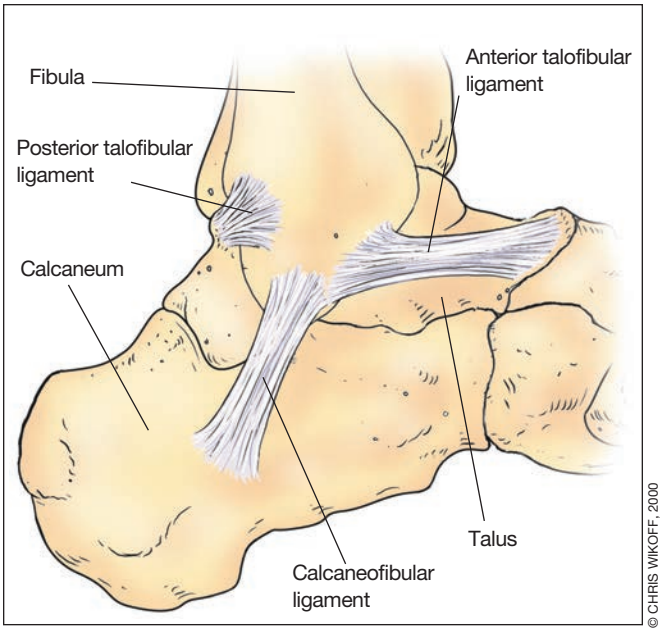


Figure 7. Diagram of lateral ankle ligaments.

- swelling and tenderness over the radial styloid
- pain reproduced on ulnar deviation of the wrist, with the thumb held flexed and adducted so that it is across the palm of the hand (Figure 6).

Treatment

Treatment of de Quervain's tenosynovitis involves:

- a resting splint or an appropriately applied crêpe bandage to reduce movement of the thumb in the acute stage
- corticosteroid injections, particularly in the early inflammatory phase
- stretching and strengthening exercises to restore normal movement; if exercise is not commenced early, there can be fibrosis and restriction of thumb movement
- surgical decompression – may occasionally be required; however, it can usually be prevented by early commencement of an exercise programme.

Ligament sprains

Site of injury

Ligaments are structurally similar to tendons, being predominantly made up of type 1 collagen and fibrocytes. Ligaments provide stability to the joint and determine the limits of its range of movement. Ligaments slowly elongate under pressure and support the joint until muscle support takes over.

Ligaments are usually damaged when there is a sudden stress that does not allow sufficient time for muscle support. The level of injury can range from a simple stretch of the ligament, through varying degrees of tearing, to a complete rupture.

Ligaments are important in proprioception and contain nociceptors that can be damaged when the ligament is injured.

The most common ligament injury is a sprain of the lateral ligament complex of the ankle, particularly the talofibular component of the ligament (Figure 7).

Sprain of the lateral ligament of the ankle

Symptoms and signs

The symptoms and signs indicating a sprain of the lateral ligament of the ankle include:

- pain over the region of the ligament, made worse on inversion and supination of the foot
- swelling over the ligament
- tenderness over the ligament and its attachments
- restriction of movement of the ankle and the subtalar joint, usually due to muscle spasm.

continued

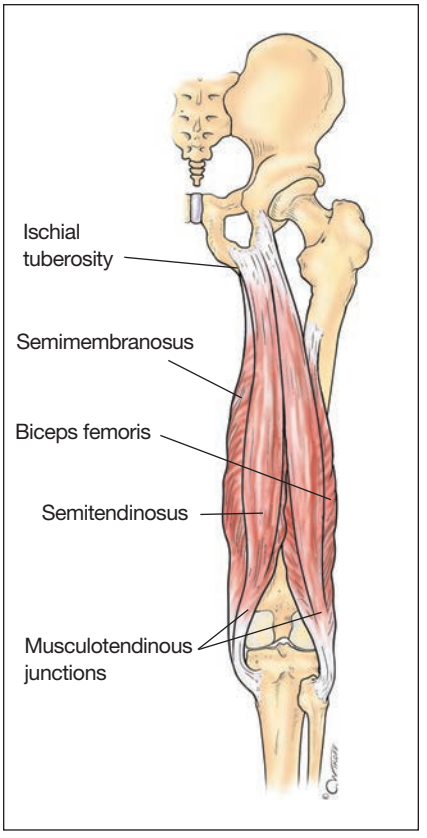


Figure 8. Anatomy of the hamstring muscles.

Treatment

Treatment of a lateral ligament strain of the ankle involves:

- for the acute injury, the standard regimen of rest, ice, compression and elevation
- NSAIDs – may be helpful
- commencing excercise as soon as possible – prolonged rest results in significant loss of collagen (exercise and stretches should be within the limits of pain)
- gentle mobilising exercises for the ankle and the subtalar joint
- strengthening exercises for the peroneus longus and brevis muscles
- strapping of the ankle with adhesive tape, which restricts inversion and eversion of the hindfoot, supporting the ligament and helping proprioception
- proprioceptive exercises, including balance boards and different stepping activities, to correct functional instability
- exercises must be continued after symptoms have resolved, as it probably takes nine months for ligaments to return to normal strength.

Musculotendinous junction injuries

Muscle strains occur most frequently at the musculotendinous junction. The most common muscle strain is that of the hamstring muscles. This muscle lies across two joints, which may be why it is more susceptible to strain.

Hamstring strain

Site of injury

The hamstrings consist of three muscles: semitendinosus, semimembranosus and biceps femoris (Figure 8). At the musculotendinous junction, the muscle cells connect directly to the tendon. The muscle cell membrane at this site is folded so that the muscle cell and extracellular collagen interdigitate. This folding increases the surface area, reducing the stress per unit area at the musculotendinous junction.

Causes

Causes of hamstring strain include:

- eccentric contraction – injuries are more likely to occur during eccentric contraction because the force generated then is greater than that generated during concentric contraction
- muscle crosses two joints – injuries are more common in muscles that cross joints (e.g. hamstring or gastrocnemius muscles)
- muscle weakness, which predisposes to injury
- weakness of a muscle relative to its antagonist, which results in strength imbalance – imbalance between the strengths of the quadriceps and hamstring muscles is important, and can be secondary to exercise programs that emphasise quadriceps exercises but do not include adequate hamstring exercises
- fatigue, which results in physiological shortening of the muscle
- poor warm-up technique, which reduces flexibility and makes the muscle more susceptible to strain.

Treatment

Treatment of hamstring strain involves:

- initial treatment of rest and ice
- NSAIDs – can be used but are probably only required for a few days
- a program of isometric exercises and stretching exercises
- concentric and eccentric exercises and isokinetic strengthening, following the program of isometric and stretching exercises
- sports-specific and endurance training as muscle strength improves
- identifying the cause of the muscle strain in an effort to reduce the recurrence rate.

Returning to the precipitating activity before the muscle has healed leads to recurrence of injury. Once the pain has resolved, muscle strength is still not normal.

Summary

Recurrence of soft tissue injuries can be minimised by identifying the structure involved, finding the precipitating cause (activity), and embarking on a regimen of stretching and strengthening exercises designed to combat the particular weakness. Returning to the precipitating activity before the structure has regained normal strength and flexibility can lead to recurrence. Muscles may take two to three months to return to normal; tendons and ligaments take even longer. MT

Part 1 of this article provided an overview of soft tissue rheumatism and described the specific features of enthesitis and bursitis.