Soft tissue rheumatism

Part 1: overview, enthesitis and bursitis

Difficulties in treating soft tissue rheumatism can arise if the involved structure has not been adequately identified. Recurrence is often the result of a return to the precipitating activity before normal strength and flexibility have been regained.

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This two-part article is a guide to identifying the involved structure, isolating and correcting the precipitating cause, and treating and preventing soft tissue injuries. Part 1 provides an overview, as well as specific features of enthesitis and bursitis. Next month, Part 2 focuses on tendinitis, tenosynovitis, ligament sprains and muscle strains.

What is soft tissue rheumatism?

Soft tissue rheumatism consists of disorders of the musculoskeletal system other than disorders of the bones or joints. It includes disorders of specific tissues such as the tendons or bursae, as well as more generalised problems such as fibromyalgia, in which there is pain in numerous muscles.

The soft tissues involved are:

- the musculotendinous unit (the muscle, tendon, tendon sheath and enthesis – see Figure 1)
- ligaments
- bursae.

The tendon sheath, enthesis or bursae may also be involved in an inflammatory arthritis – for example, rheumatoid arthritis or ankylosing spondylitis – where it may be the presenting feature.

Causes and treatment

The most common causes of soft tissue rheumatism are acute injury or chronic overuse of the musculotendinous unit. This statement needs to be qualified, in that repeated use is more likely to cause injury if it is done in the absence of training or if the musculotendinous unit is being used at a mechanical disadvantage. Therefore, treatment of soft tissue injuries requires treatment of the injury, but must also always include identification and correction of the precipitating cause. This is necessary to prevent recurrence of the problem.

Prevention

Soft tissue injuries tend to recur and this is usually because there is a return to the activity before the structure has regained normal strength. It is often assumed that once the pain has gone, everything is back to normal. However, it probably takes two to

IN SUMMARY

- **Acute soft tissue injuries should be treated with rest, ice, compression and elevation.**
- **While rest is helpful in the acute stage, an exercise program should be continued to minimise the loss of strength and collagen from ligaments, tendons and muscles.**
- **Rehabilitation should include stretches, concentric exercises, eccentric exercises, and work- or sport-specific exercises.**
- **It is important to exercise both the involved (agonist) muscle and its antagonist muscle, in order to maintain joint stability and to ensure normal pressure distribution across the articular surface. This will decrease the risk of further muscle, tendon or ligament damage.**
- **Patients must understand the importance of warm up stretches and exercises. A warm up program including static stretches and a 10-minute run is optimal.**

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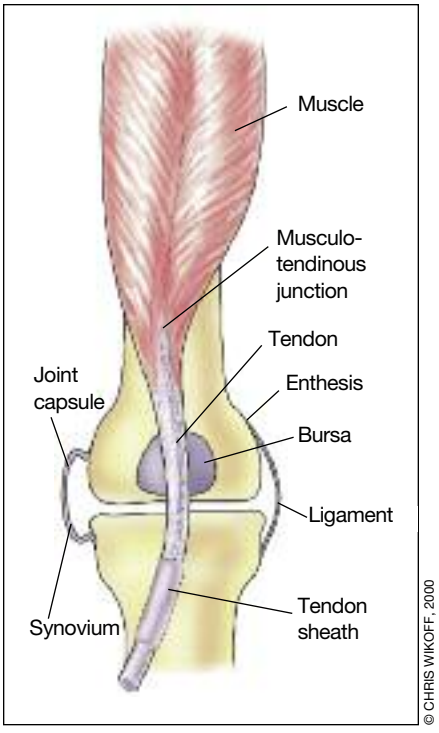

Figure 1. Structures in the musculotendinous unit.

Tips for corticosteroid injections in soft tissue rheumatism

Enthesitis

Injection over the enthesis (e.g. for tennis elbow or plantar fasciitis) is less painful than injecting the enthesis directly. Injecting over the enthesis is just as effective as injecting into the enthesis.

Bursitis

Bursae are relatively simple to inject, although it is important to make certain that it is not a septic bursitis before injecting corticosteroids. Local anaesthetic may be required in the skin if the bursa is to be aspirated.

Tendinitis

It is important that corticosteroid injections go around the tendon and not directly into the tendon. The latter is difficult to do and very painful. Injecting corticosteroids into the tendon reduces the tendon strength for about three to four weeks. Injection into the tendon can also give rise to tendon necrosis, which may be very slow to resolve.

Injection around the tendon, particularly around the paratenon, does not result in any reduction in tendon strength. Corticosteroids reduce the formation of tendon–paratenon adhesions, and are more likely to be of benefit if given shortly after the injury.

Injection around the Achilles tendon is to be avoided because of concerns about tendon rupture.

Tenosynovitis

The injection should be into the tendon sheath and not into the tendon. This is effective in settling any synovitis and reduces the chance of adhesions between the tendon and tendon sheath, with subsequent reduced function. This treatment is more likely to be effective if given soon after the onset of symptoms.

three months before muscle strength returns to normal. It takes even longer for tendons and ligaments, and animal studies suggest that it could take up to a year before they return to normal strength. This is probably because the metabolic half-life of collagen in tendons and ligaments is about 250 to 500 days.

Injuries are more likely to occur in musculotendinous units that work across two joints – for example, the gastrocnemius, forearm extensor or hamstring muscles. This is probably because any factor that affects muscle co-ordination is more likely to produce abnormal stress in muscles that have complex biomechanics. Muscle fatigue and weakness are important factors that influence co-ordination.

Examination of the musculotendinous unit

Many of the problems associated with treating soft tissue pain occur because care has not been taken to identify the involved structure. To identify the structure involved, a good physical examination is essential.

Identification of the involved soft tissue structure in the limbs is relatively easy. However, identification is difficult or impossible in back pain because of the complexity of the structures.

The principles of the examination are outlined below.

Inspection

Inspect the involved region for swelling, deformities, muscle wasting and, in the lower limb, gait abnormalities.

Palpation

Tenderness over the painful area is helpful in determining the structure involved. For example, tenderness over the lateral epicondyle of the elbow is suggestive of enthesitis at the origin of the finger and wrist extensors.

The next stage would be to examine the relevant musculotendinous unit.

Testing movement

Movement is perhaps the most useful component of the examination and, after palpation, the next most likely to help with the diagnosis by reproducing the patient's pain and identifying the involved musculotendinous unit. Both active and passive movements should be tested.

Active movements

Active movements are performed first. They determine:

- the range of movement
- the movement that produces the pain
- the position where the pain occurs

- the rhythm of the movement
- the effect of rapid movement.

Passive movements

Passive movements are performed by the examiner and can be done in the presence of a rupture in part of the musculotendinous unit. They eliminate the effect of joint compression by the muscles.

Passive movements determine:

- the range of movement
- the position where the pain occurs
- the effects of stretching a musculotendinous unit
- the strength and stability of ligaments.

Isometric contractions

Isometric contractions are when the muscle is contracted strongly against resistance, but the joint does not move. An injured musculotendinous unit will be painful on isometric contraction, with reduced muscle strength because of the pain. This helps to isolate the involved musculotendinous unit. Isometric contractions:

- stress the musculotendinous unit
- measure the strength of the muscle
- indicate the site where pain occurs.

General principles of treatment

Treatment for the different types of soft tissue rheumatism will be discussed in the relevant sections. However, there are some general principles that need emphasis.

Initial treatment

When there has been an acute injury, the standard methods for treating acute soft tissue injury apply. These include:

- rest
- ice
- compression
- elevation.

Nonsteroidal anti-inflammatory drugs (NSAIDs) are also used, but overall their benefits in soft tissue rheumatism are minimal. Many soft tissue problems have a subacute onset; therefore, compression and elevation would not be relevant.

Rest is helpful in the acute stage but exercise should be continued, even though it will be minimal in the first few days. Ligaments, tendons and muscles lose collagen and strength very quickly when rested, and it is easier to prevent the loss of collagen than to try to regain it.

Rest is helpful in the acute stage of an injury, but exercise should be continued, even though it will be minimal in the first few days.

Exercise program

There is a standard protocol for rehabilitation of the musculotendinous unit, irrespective of the site of injury. The sequence consists of:

- stretches
- concentric exercises
- eccentric exercises
- work- or sport-specific exercises.

Concentric and eccentric muscle contractions

A concentric muscle contraction is where the muscle shortens while contracting. This is shown in Figure 2, where the biceps muscle is shortening while lifting a book.

An eccentric muscle contraction is where the muscle is lengthening while contracting. This is shown in Figure 3, where the book is being lowered with the biceps working but increasing in length.

Eccentric muscle contractions generate more force in the musculotendinous unit than concentric contractions and are more likely to result in injury. If there is difficulty in identifying the musculotendinous unit involved, it may be detected by an eccentric contraction with resistance, rather than by a concentric contraction.

The importance of knowing the difference between concentric and eccentric contractions is particularly relevant to treatment. This is because the eccentric muscle contraction generates more force within the musculotendinous unit and the muscle must be capable of this before returning to the appropriate work or sport. If these exercises have not been included in the treatment program, reinjury is more likely.

Treatment of the antagonist muscle

Exercises usually concentrate only on the involved (agonist) muscle, but it is also important to exercise the antagonist muscle. The antagonist exerts a constant opposing torque throughout the joint's range of motion.

In an exercise program, an emphasis on the involved muscle may produce

Figure 2. Concentric contraction of the biceps muscle: the muscle is shortening while contracting.

Figure 3. Eccentric contraction of the biceps muscle: the muscle is lengthening while contracting.

continued

a disproportionate balance of muscle strength. Excessive activation of the agonist muscle may actually inhibit co-activation of the antagonist. Normal balance between the two is necessary to maintain joint stability and to ensure that pressure distribution across the articular surface is normal.

A reduced co-activation pattern of the antagonist muscle can result in increased risk of further muscle, tendon or ligament damage. Therefore, any exercise program for injured muscles or tendons, or for those muscles that support an injured ligament, should include both agonist and antagonist muscle exercises.

For example, in an exercise program for knee disorders, in addition to quadriceps exercises, there should also be hamstring exercises. In treating tennis elbow, the emphasis is on the extensor muscle exercises, but the program should also include forearm flexor muscle exercise.

Proprioception

Proprioception is important to help provide functional stability in a joint. Nociceptors are present in the ligaments, joint capsule and tendons, and injury to any of these structures will affect their function.

Injuries to ligaments result in:

- mechanical instability, due to stretching of the ligament
- functional instability, due to proprioceptive defects arising from nociceptor damage.

It is important to regain normal neuromuscular control after an injury. If there is a persistent proprioceptive defect, the chances of reinjury are high because the resultant functional instability means that the structures are more likely to be injured. Returning to the previous activity, particularly if it is a sporting activity, without normal proprioception increases the chances of reinjury. Any treatment program should include appropriate exercises to restore normal proprioception.

Proprioceptive exercises for the lower limb, particularly the knees and ankles, include balance boards (especially the wobble board) and different stepping activities. For the upper limb, proprioceptive exercises include weight-bearing through the arm when kneeling or moving a ball along a wall.

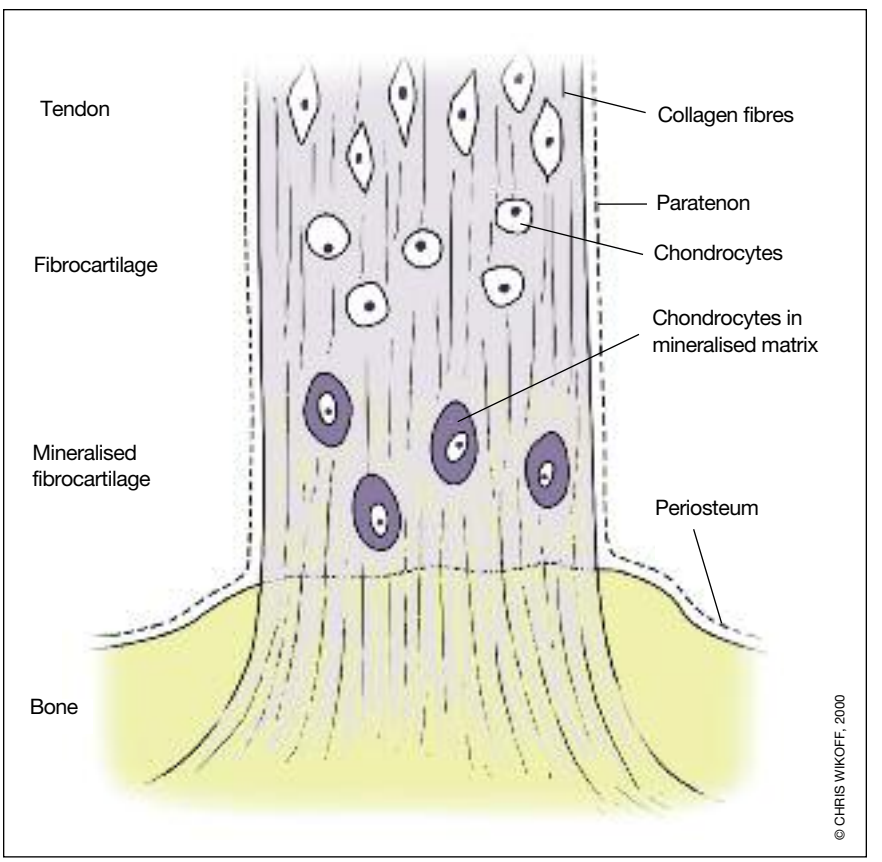

Figure 4. Structure of the enthesis.

Warm-up exercise program

Following treatment of any injury to the musculotendinous unit, it is important that the patient understand the importance of warm-up stretches and exercises. This applies particularly to people over the age of 40 years.

A warm-up program that combines static stretches with a 10-minute run has been shown to be the best regimen to prevent Achilles tendon injuries. This combination is better than either practice alone. After a warm-up, the musculotendinous unit is more pliable and therefore less likely to be overstretched.

Corticosteroid injections

Corticosteroid injections are helpful in soft tissue injuries, particularly if there is any associated inflammation. The aim of the injections is to reduce the pain so that an exercise program can be commenced. Usually for soft tissue injections, corticosteroid and local anaesthetic are mixed together in a ratio of one to one.

The box on page 46 contains specific features relevant to the injection of various soft tissue injuries.

Enthesitis

Site of injury

Enthesitis is inflammation at the enthesis. The enthesis is the site where tendons and ligaments join on to the bone. The

tendon merges into a zone of cartilage with chondrocytes forming chains parallel to the line of the tendon. The deepest layer of cartilage is calcified and is contiguous with bone (see Figure 4).

Mechanical stress can cause destruction of the cartilaginous zone, with invasion by cellular and vascular connective tissue. The resultant granulation tissue undergoes calcification and ossification.

New bone formation at the enthesis – for example, plantar spurs – is not the cause of the pain, but is an indication of previous or chronic enthesitis.

Common examples of enthesitis are:

- lateral epicondylitis (tennis elbow), which occurs at the common extensor origin at the elbow
- plantar fasciitis, which is an enthesitis at the site of insertion of the plantar aponeurosis onto the inferior border of the calcaneal tubercle.

Enthesitis can become chronic and is often difficult to treat. Exercise is the most important component of treatment, and it can take up to one year for the enthesis to return to normal strength.

Causes

The most common cause of enthesitis is repetitive use or overloading, usually associated with sport or work. It is often due to poor technique such that excessive stress is being placed on the enthesis.

Enthesitis is an important component of the seronegative spondyloarthritides, especially ankylosing spondylitis, where it can be the presenting feature. A seronegative spondyloarthritis should be considered in a young male with an enthesitis, for which there is no obvious cause, that is unresponsive to treatment.

Symptoms and signs

Symptoms and signs of enthesitis include:

- pain at the site of the enthesis, which can radiate down the involved muscle or ligament
- tenderness at the site of insertion of the tendon or ligament
- reproduction of the pain by stretching the appropriate musculotendinous unit or ligament
- pain at the enthesis on isometric contraction of the musculotendinous unit.

Treatment

There are two main components to management of this condition:

- treatment of the enthesitis
- identification and correction of the precipitating cause.

Treatment of acute enthesitis

Treatment of acute enthesitis involves the following:

- Injection around the enthesis with a local anaesthetic and low dose corticosteroid reduces the pain and discomfort, and permits commencement of an exercise program.
- A course of ultrasound over the enthesis can be effective in providing pain relief.
- NSAIDs may be helpful in the acute stages.
- Stretching and strengthening exercises for the involved musculotendinous unit should include both concentric and eccentric exercises.
- If the enthesitis is at the site of insertion of a ligament, the muscles supporting the ligament's function must also be strengthened.
- Before a return to work or sport, specific exercises relating to the movements commonly used should be included in the exercise program.

Treatment of the precipitating cause

Determine what movements are being done at work or sport so that any errors can be recognised and corrected.

Lateral epicondylitis at the elbow

Site of injury

The common extensor tendon arises from the lateral epicondyle. This includes the wrist and finger extensor muscles, with the exception of extensor carpi radialis longus (Figure 5).

These muscles cross two joints and, therefore, are more susceptible to injury.

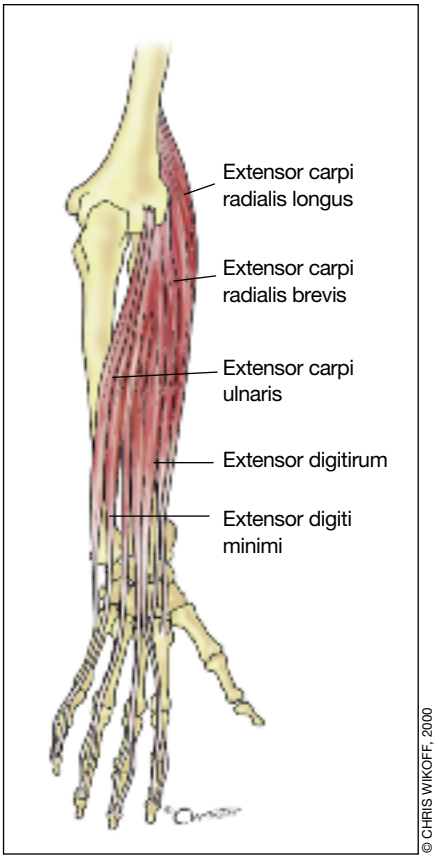

Figure 5. Anatomy of the extensor muscle origins at the elbow.

Figure 6. The site of the common extensor origin at the elbow. The area is marked in red and is just above the radiohumeral joint.

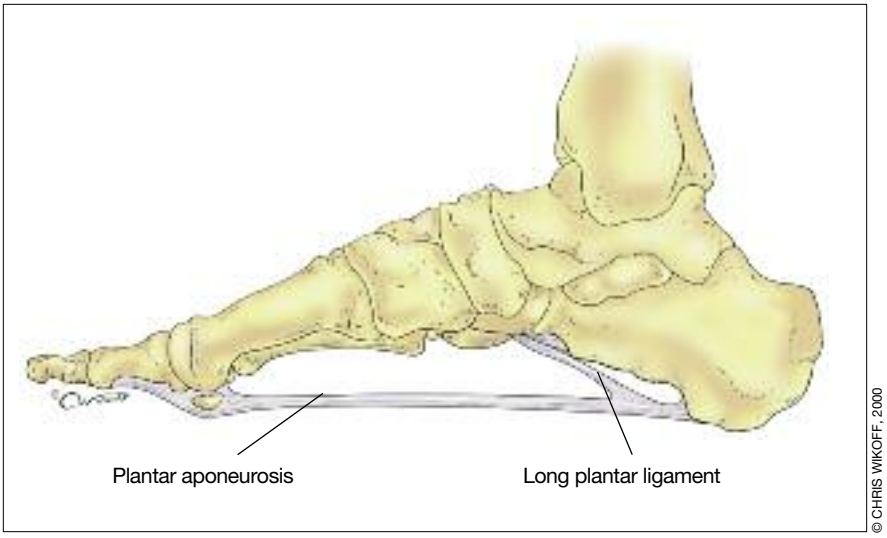

Figure 7. Lateral view of foot showing plantar aponeurosis and long plantar ligament.

The flexor muscles are usually stronger than the extensor muscles, and muscle imbalance may contribute to enthesitis at the common extensor origin (Figure 6).

Causes

The most common cause of lateral epicondylitis at the elbow is excessive wrist movement, or forearm pronation and supination.

Symptoms and signs

Symptoms and signs of lateral epicondylitis at the elbow include:

- pain over the lateral epicondyle that may radiate down the forearm into the dorsum of the hand and into the ring and middle fingers – pain rarely radiates up the arm; the origin of the extensor carpi radialis brevis is the most commonly affected site
- tenderness over the lateral epicondyle and occasionally over the upper part of the extensor muscles
- pain on stretching the extensors with the elbow extended, hand pronated and flexion at the wrist and fingers
- pain on isometric contraction of the wrist or finger extensors with the elbow extended.

Treatment

Treatment involves:

- injection around the lateral epicondyle with local anaesthetic and corticosteroid
- concentric and then eccentric exercises of the wrist extensor muscles
- treatment of specific features (e.g. poor grip technique when holding a racquet) – holding a tennis racquet with the wrist ulna-deviated instead of radius-deviated applies abnormal stress to the common wrist extensor muscles
- a gradual return to work or sport.

Eccentric exercise for treating lateral epicondylitis at the elbow involves placing the arm on a table with the hand over the edge and, with progressive increase in weights, increasing the eccentric component of the forearm extensors. This is slowly flexing the hand at the wrist.

Plantar fasciitis

Site of injury

The plantar aponeurosis is a strong fibrous structure on the ventral aspect of the foot (Figures 7 and 8). The main part is the central part, which arises from the calcaneal tuberosity – predominantly

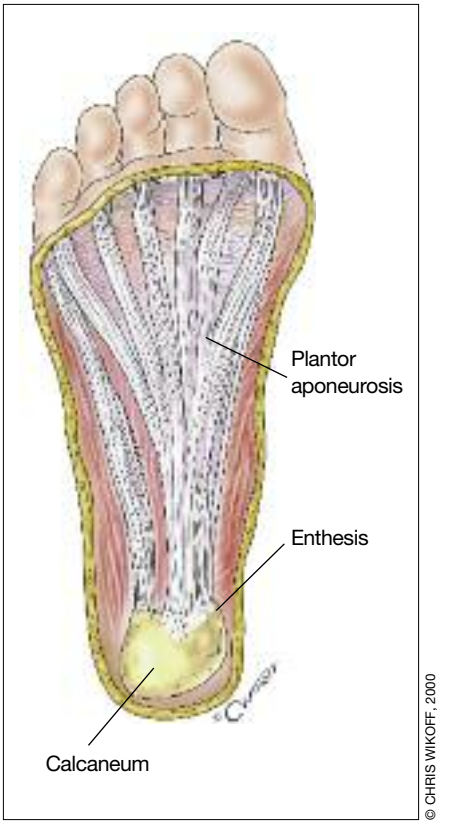

Figure 8. Inferior surface of foot showing plantar aponeurosis.

from the medial tubercle. It becomes a broad thin band that divides into five sections, one for each toe. The sections attach to the sheaths of the flexor tendons and base of the proximal phalanx of each toe.

The function of the plantar aponeurosis is to maintain the longitudinal arch of the foot, particularly when the toes are dorsiflexed. It also helps stiffen the fibrous skeleton of the foot during push-off.

Causes

Numerous causes for plantar fasciitis have been proposed, the most important being a tight Achilles tendon, which limits ankle dorsiflexion.

Increased walking or running, especially in the overweight, and biomechanical abnormalities of the foot (e.g. pes planus or hind foot valgus) are also relevant.

Figure 9. The medial aspect of the weight-bearing area of the heel is the main site of pain in plantar fasciitis.

Figure 10. Area to inject plantar aponeurosis enthesis with local anaesthetic and corticosteroids.

Symptoms and signs

Symptoms and signs of plantar fasciitis include:

- pain under the heel, particularly the medial aspect (Figure 9), on weight-bearing
- tenderness over the calcaneal tubercles, especially the medial tubercle
- discomfort on stretching the aponeurosis by passive hyperextension of the foot and toes.

Treatment

Treatment involves:

- insertion of a heel pad into the shoe, with the central area removed to reduce weight-bearing over the enthesis
- injection of local anaesthetic and corticosteroid around the involved area; the easiest way to do this is from the medial aspect of the heel (Figure 10)
- a course of ultrasound over the plantar aponeurosis enthesis
- correction of any biochemical abnormalities in the foot (e.g. excessive pronation) with orthoses
- an exercise program for the leg and intrinsic foot muscles, including Achilles tendon stretches.

Bursitis

Site of injury

Bursae are fluid-filled sacs that facilitate movement between structures, particularly tendons, ligaments, skin and bone.

There are two main types of bursae: superficial and deep. The superficial bursae are formed after birth and probably arise in response to mechanical stimuli. The deep bursae are usually present at birth.

Bursae are lined with synovium and contain synovial fluid. Therefore, in addition to the mechanical causes for bursitis, bursae can be involved in any inflammatory arthritis. An example of an olecranon bursitis is shown in Figure 11.

Causes

The main causes of bursitis are:

- trauma, usually repetitive movements over the bursa – for example, rubbing of the elbow on a desk in the case of an olecranon bursitis, or frequent kneeling in the case of an infrapatellar bursitis
- crystals, usually sodium urate crystals associated with gout (Figure 11)
- infection, usually bacterial, rarely fungal (Figure 12)
- an inflammatory arthritis (e.g. rheumatoid or psoriatic arthritis), which may be associated with bursitis.

Symptoms

Symptoms of bursitis include:

- pain around bursa; pain from deep bursae may be referred – for example, subacromial bursa pain may be felt down the lateral aspect of the arm and forearm
- fever, with a septic bursitis
- swelling, in superficial bursae (e.g. olecranon bursae); deep bursa (e.g. subacromial or trochanteric bursae) rarely produce obvious swelling.

Signs

Signs of bursitis include:

- tenderness over the bursa
- increased temperature and surrounding oedema if the bursitis is due to infection or sodium urate crystals; however, this does not occur with bursitis due to repeated trauma or associated with rheumatoid arthritis
- the range of passive movement in any adjacent joint is usually normal
- active movements, but not usually passive movements, of any closely apposed musculotendinous unit may produce pain – this is because movement may compress the inflamed bursa, producing pain that restricts movement of the joint

Figure 11. Olecranon bursitis due to gout.

- stretching a musculotendinous unit over a bursa may also be painful. For example, iliopectineal bursitis is painful on hip extension because the iliopsoas tendon compresses the bursa.

Diagnosis

The most important diagnostic test is aspiration of the bursa, culturing the fluid and examining for crystals using polarised light microscopy.

Figure 12. Septic prepatellar bursitis.

A traumatic bursitis is usually noninflammatory, with a low white cell count – that is, less than 2000/mL. If the bursitis is due to gout, there will be a high white cell count and the presence of intracellular and extracellular sodium urate crystals.

Treatment

Treatment of bursitis involves:

- identification of the precipitating cause
- intrabursal injection of corticosteroids for nonseptic bursitis
- treatment of septic bursitis by drainage and appropriate antibiotics
- NSAIDs (may be helpful)
- a course of ultrasound (may be beneficial for deep bursae affected by repeated trauma from tendons or muscles)
- modification of the precipitating cause (if the bursitis is due to repeated trauma).

Summary

Soft tissue rheumatism is most commonly due to acute injury or chronic overuse of the musculotendinous unit. Problems in treating soft tissue pain are often associated with inadequate identification of the involved structure. Injuries tend to recur because there is a return to the precipitating activity before the structure has regained normal strength and flexibility. Muscle may take two to three months before returning to normal strength; tendons and ligaments take even longer.

This two-part article is a guide to identifying the involved structure, isolating and correcting the precipitating cause, and treating and preventing injuries. Part 1 provides an overview, as well as specific features of enthesitis and bursitis. MT

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