



# How to approach the patient with a painful swollen joint

In this series, we present authoritative advice on the investigation of a common clinical problem, specially commissioned for family doctors by the Board of Continuing Medical Education of the Royal Australasian College of Physicians.

**SEAN O'NEILL**

MB BS, FRACP

**PETER P. YOUSSEF**

MB BS(Hons), FRACP, PhD

Dr O'Neill is Rheumatology Registrar, Department of Rheumatology, Royal Prince Alfred Hospital, Sydney.

Dr Youssef is a Senior Staff Specialist, Department of Rheumatology, Royal Prince Alfred Hospital, and a Rheumatologist in private practice in Sydney, NSW.

Series Editor

**CHRISTOPHER S.****POKORNY** MB BS, FRACP

Dr Pokorny is a member of the Board of Continuing Education, Royal Australasian College of Physicians, and a Gastroenterologist in private practice, Sydney, NSW.

The differential diagnoses of a single painful joint range from simple injuries through to systemic inflammatory disorders (Table). Initial evaluation should be focused on conditions that require emergency treatment so that permanent disability can be prevented. The history and examination can eliminate many potential causes, and early joint aspiration is usually essential in making a diagnosis.

This article discusses the evaluation of patients aged between about 14 and 40 years of age who present with pain in a single joint. A stepwise approach is shown in the flowchart on page 51.

## History

The joint that is involved may give a clue to the diagnosis. For example, gout occurs in the base of the great toe or knee in the majority of first attacks, whereas reactive arthritis commonly involves the ankle or knee. It is unusual for gout or reactive

arthritis to involve the shoulder – trauma, infection and other crystalline arthropathies may be more likely causes.

The character of the pain, its onset, and aggravating and relieving factors are all important. A history of trauma should lead to suspicion of fracture, ligament damage, meniscal damage (in the knee), or haemarthrosis. The duration of pain is important – acute and severe pain is more likely to be a symptom of infection, trauma or gout than is pain present for several weeks. Morning stiffness (lasting one hour or more) and improvement with use are highly suggestive of an inflammatory cause, such as a pauciarticular onset of rheumatoid arthritis or a seronegative spondylarthropathy. Pain with use and improvement at rest is more suggestive of a traumatic or mechanical cause. Previous episodes of pain in the joint that is currently affected or in other joints suggest a systemic disorder.

## IN SUMMARY

- The most common causes of a painful swollen joint are trauma, infection and crystalline arthritis. The approach to evaluation should focus on excluding conditions that can rapidly lead to joint destruction (particularly bacterial infection).
- A careful history and physical examination can usually exclude most causes of joint pain and swelling.
- Plain x-ray is mandatory in patients with a history of significant trauma. It is also required in the presence of focal bone tenderness in order to exclude a tumour.
- Aspiration of synovial fluid is the most useful investigation in patients with an acutely painful swollen joint, and is mandatory if septic arthritis is suspected. The results of the white cell count, crystal identification, Gram stain and culture are often diagnostic.

continued

Extra-articular symptoms and the patient's medical and social history may give clues to the diagnosis. Questions must be asked about the following:

- fever, sweats and chills, which suggest bacterial or viral infection (although

these can also occur in acute gout)

- features of systemic rheumatic conditions, such as weight loss, fatigue, rash, Raynaud's phenomenon, alopecia, mouth ulcers, dry eyes and dry mouth
- sexual activity, genitourinary infection and diarrhoeal illness, which may point to an infectious cause or a seronegative spondyloarthropathy such as reactive arthritis or inflammatory bowel disease
- intravenous drug use or immunosuppression, which are important risk factors for septic arthritis (and unusual causative organisms)
- travel, particularly recent travel, which may raise the possibility of infectious causes not commonly seen locally such as tuberculosis or Lyme disease as well as numerous viral and reactive causes
- anticoagulant use, which may lead to haemarthrosis with minimal trauma
- family history of arthritis or psoriasis.

Gout is exceedingly rare in premenopausal females. Calcium pyrophosphate (pseudogout) and calcium hydroxyapatite crystal deposition diseases are more common in this group and may present in a very similar fashion.

## Physical examination

It is essential to establish whether or not inflammation (synovitis) is present, as this will narrow the range of causes to be considered. The presence of a joint effusion and soft tissue swelling and warmth are the hallmarks of synovitis, and the active and passive range of motion of a joint may be limited. In contrast, the passive range of motion may be preserved in some tendon injuries (e.g. rotator cuff injuries).

It is essential to establish whether the patient's disease is truly monoarticular by examining all joints, including the spine. Specific features to look for will depend on the specific joint involved.

## Articular features

In lower limb joint pain, an inability to weight bear is suggestive of fracture, infec-

tion or gout. Specific tests for ligament injuries may be appropriate in the painful knee, particularly if there is a history of trauma. Major ligament injuries in the knee may be associated with a significant effusion (Figure 1) or haemarthrosis.

In the knee, it is important to differentiate synovitis from bursitis. This is particularly important for prepatellar bursitis (swelling in front of the knee) and infrapatellar bursitis (swelling below the knee). The range of movement in the knee is usually normal and relatively pain free with bursitis. In the elbow, it is important to differentiate olecranon bursitis – as well as medial and lateral epicondylitis – from an intra-articular joint disorder. The most common cause of prepatellar bursitis and olecranon bursitis in a young patient is infection. When possible, the bursa should be aspirated and the fluid sent for culture and crystal analysis.

## Extra-articular features

Extra-articular features such as fever, skin rash and nodules should be sought. Fever may be present in patients who have joint infection, reactive arthritis, crystalline arthritis and most of the systemic rheumatic diseases. Skin abnormalities that may be present include psoriasis or the photosensitive rash of systemic lupus erythematosus. Skin nodules may be a sign of rheumatoid arthritis, whereas tophi may be present (commonly on the extremities and ears) in patients with longstanding gout.

Many systemic rheumatic conditions are associated with eye abnormalities. Uveitis, conjunctivitis, keratoconjunctivitis sicca and iritis are features of various rheumatic disorders, and may be helpful in establishing a diagnosis. Patients may need urgent treatment to prevent visual loss.

## Investigations Imaging

Plain x-ray is mandatory in patients with a history of significant trauma. Apart from excluding fractures, radiographs are

**Table. Monoarticular joint pain: important causes**

### Infection

Bacterial, such as *Staphylococcus aureus*, *Chlamydia*, gonococcus  
 Mycobacterial (in patients with a history of exposure)  
 Fungal (in immunocompromised patients)  
 Spirochete (in returned travellers)  
 Viral, such as Ross River virus disease

### Haemarthrosis

Fracture  
 Ligament rupture  
 Bleeding disorders  
 Anticoagulant use  
 Pigmented villonodular synovitis  
 Synovial haemangioma

### Intra-articular derangement

Fracture  
 Ligament or meniscal tear  
 Osteonecrosis, with corticosteroid use (past or present) or heavy alcohol intake

### Crystals

Gout (especially in men)  
 Calcium pyrophosphate deposition  
 Hydroxyapatite crystal deposition

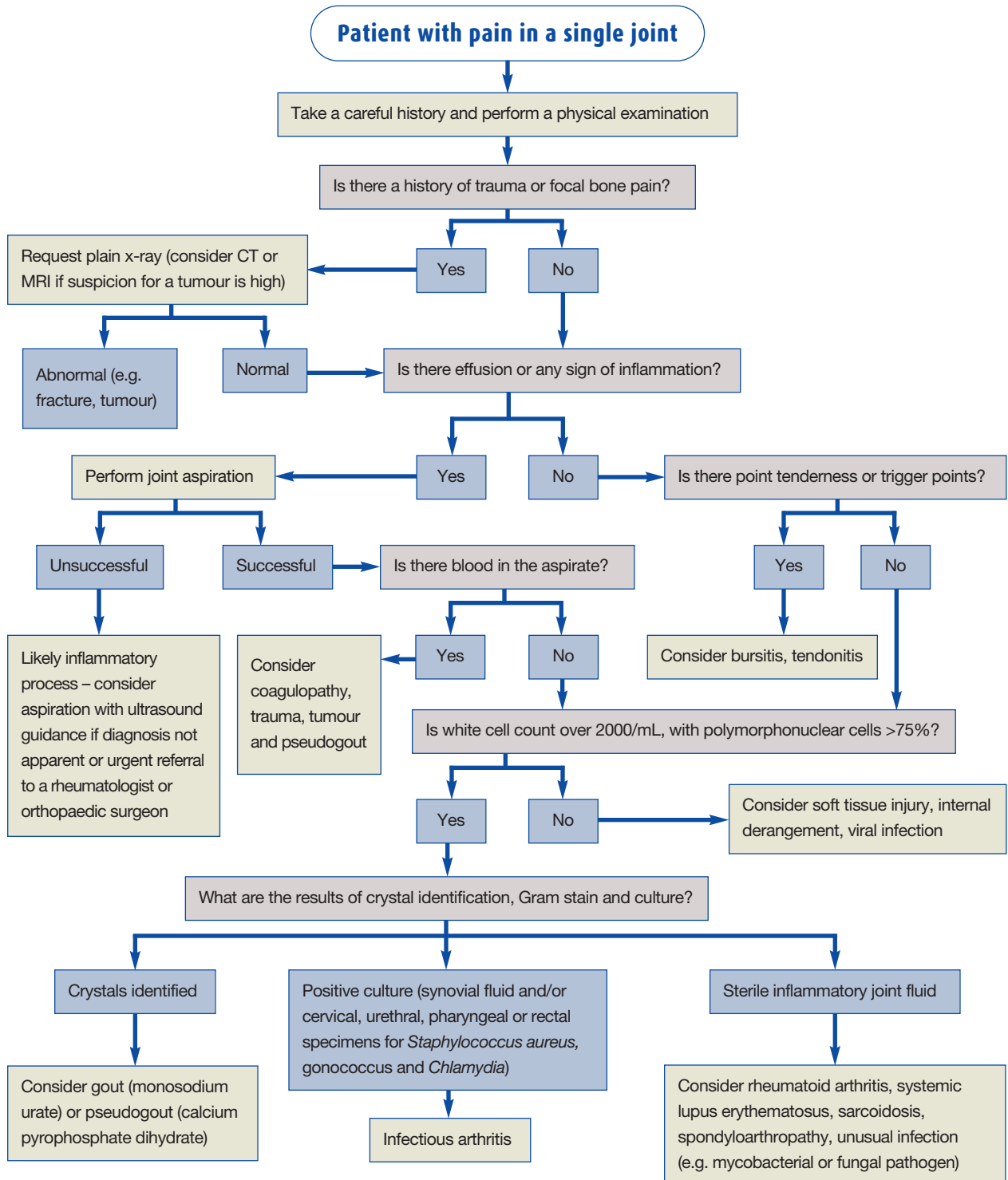
### Systemic rheumatic disease

Rheumatoid arthritis  
 Seronegative spondyloarthropathies, such as reactive arthritis  
 Systemic lupus erythematosus  
 Sarcoidosis

### Tumour

Pigmented villonodular synovitis  
 Chondrosarcoma  
 Metastases  
 Synovial haemangioma

## An approach to evaluating the patient with a painful joint\*\*†



\* Adapted from: Arthritis Rheum 1996; 39: 1-8. † For patients aged between about 14 and 40 years.

continued

helpful in diagnosing effusions in joints that can be difficult to examine, such as the hip and elbow. In the presence of focal bone tenderness, plain x-ray is required to exclude a tumour; if clinical suspicion for a tumour is high, more sensitive imaging (e.g. CT or MRI scan) is needed.

### Aspiration of synovial fluid

Aspiration of synovial fluid is the most useful investigation in patients who have an acutely painful swollen joint, and is mandatory if septic arthritis is suspected. It is of value in diagnosing infection, crystalline arthritis and haemarthrosis, as well as categorising fluid as inflammatory or noninflammatory.

Synovial fluid should be collected with aseptic technique. Some of the fluid should be put into an EDTA tube for an accurate white cell count; a differential count should also be requested. The remaining fluid should be put into a sterile specimen container for Gram stain, culture and crystal identification. Some authorities recommend putting some of the fluid into blood culture bottles to increase the yield in cases of possible septic arthritis, but the utility of this method is not proven.

Joints other than the knee are sometimes difficult to aspirate, and ultrasound

guidance may be helpful. If septic arthritis is considered likely then urgent referral for rheumatological or orthopaedic opinion is needed.

### Macroscopic analysis

Synovial fluid should first be inspected at the bedside. Normal synovial fluid is clear, yellow and viscous, whereas inflammatory fluid may appear cloudy (because of an increased white cell count) and have reduced viscosity. Blood in the joint in the absence of risk factors for bleeding is usually due to a fracture or other significant structural trauma, tumour, coagulopathy or pseudogout.

### White cell count

A total white cell count above 2000/mL is inflammatory; more than 75% polymorphonuclear cells is suggestive of bacterial infection – the higher the count, the more likely the cause is infection. However, neutrophil counts of this level may be seen in acute gout.

### Gram stain and culture

Gram stain and culture are essential in diagnosing bacterial septic arthritis. *Staphylococcus aureus* is the most common pathogen, usually via haematogenous

spread. Other infectious causes need consideration in appropriate circumstances, such as patients who are intravenous drug users or have endocarditis. Tuberculosis should be suspected in a patient with a history of possible exposure – those who have immigrated from endemic areas (e.g. South-East Asia) or are immunosuppressed are particularly at risk. Tuberculosis arthritis usually occurs as a result of reactivation of latent disease. Mycobacteria are notoriously difficult to isolate from synovial fluid, and multiple aspirates may be required for specific Ziehl–Neelsen staining and culture for mycobacteria.

The most common cause of a sexually transmitted reactive arthritis is chlamydia infection. Gonococcal arthritis is also an important cause of oligoarthritis in young adults that may be identified on synovial fluid culture. Disseminated gonococcal infection classically presents with tenosynovitis, polyarthralgias and vesicopustular skin lesions, but it may present as a purulent monoarthritis without associated features. A history of possible exposure and cultures are the keys to diagnosis. Cultures may be grown from synovial fluid, as well as blood, pharynx, urethra, cervix and rectum specimens and from any skin lesions.

This image is unavailable due to copyright restrictions

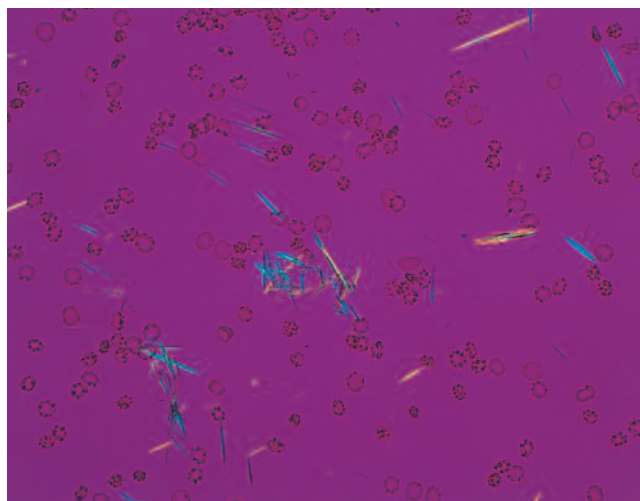


Figure 1. Large effusion affecting the right knee. Note the swelling in the suprapatellar region compared with the normal knee.

Figure 2. Polarised light microscopy showing needle-shaped monosodium urate crystals in acute gout.

continued

### Crystal identification

Crystal arthritis is uncommon in this age group but should always be considered. Some crystals, such as monosodium urate, are usually easy to identify with a polarised microscope whereas calcium pyrophosphate crystals are more difficult (Figure 2). It is important to note that this is an observer dependent test that should be performed by experienced laboratories to minimise the possibility of false negative results.

Although uncommon, gout may occur in young patients, usually males with a family history or heavy alcohol consumption. Initial attacks usually occur in the base of the great toe or in the knee and may be indistinguishable from infection without joint aspiration. Gout in this age group may occur due to genetic differences in uric acid metabolism, as seen in people with certain ancestry (e.g. Polynesian).

### Management

A thorough discussion of the management of the many possible causes of a painful swollen joint is beyond the scope of this article. The following paragraphs cover two important principles of early management.

### Treatment of septic arthritis

A patient with suspected septic arthritis requires immediate referral for joint aspiration and treatment with intravenous antibiotics and possible washout. This is important not only for treating systemic sepsis, but also for preventing joint damage, which may occur in as little as a few days.

### Use of intra-articular corticosteroids

Intra-articular corticosteroid injections may be appropriate in inflammatory monoarthritis, but should not be used if infection is considered possible. They are of particular use in crystalline arthropathies and inflammatory arthropathies (e.g. seronegative spondyloarthropathies). It is generally safest to wait 24 hours for the results of synovial fluid culture before injecting corticosteroid, but this can be performed at the time of aspiration if infection is clinically very unlikely.

### Summary

The causes of a single swollen joint in this age group are many. The evaluation should focus on excluding conditions that can rapidly lead to joint destruction (particularly bacterial infection). History and examination can usually exclude most causes of joint pain and swelling; an x-ray should be performed in patients with a history of trauma. Synovial fluid aspiration is often the critical diagnostic test to exclude infection and should be part of the initial assessment of the patient with a painful joint. **MT**

---

DECLARATION OF INTEREST: None.