# Acute hot joint

**_The acute hot joint has a broad differential diagnosis. It presents to a wide spectrum of practitioners in primary and secondary care, many of whom may be unfamiliar with the management of musculoskeletal disease. This review discusses the most serious cause of the hot joint, sepsis, and discusses the other less worrying, but more frequent, diagnoses._**

The clinical presentation of the acutely hot swollen joint is common and has a wide differential diagnosis. The most serious of these is septic arthritis, which accounts for significant morbidity and is fatal in up to 11% of cases (Gupta et al, 2001). Delayed or inadequate treatment can lead to irreversible joint destruction and death as a result of overwhelming systemic sepsis. Prompt diagnosis and treatment are vital to avoid these adverse outcomes.

Other diagnoses, although less worrying, are more common (*Table 1*). These include crystal arthritis (gout or pseudogout), trauma, haemarthrosis, systemic inflammatory arthritis (including rheumatoid arthritis and the seronegative spondyloarthritides) and extra-articular pathology including bursitis and tenosynovitis.

The acute hot joint can present to both primary and secondary care, but the crucial diagnosis of septic arthritis can be difficult even in the hands of experienced clinicians. Such patients frequently present to doctors unfamiliar with the assessment and management of joint disease.

**Table 1. Differential diagnosis of the acute hot joint**

| Differential diagnosis | Clues to this diagnosis |
|---|---|
| Septic arthritis | Usually short history (<2 weeks), marked pain and restriction of movement of affected joint(s) |
| Crystal arthritis (gout, pseudogout) | First metatarsophalangeal joint suggests gout. History of diuretic use, particularly in older women, suggests pseudogout |
| Trauma | History, bloody joint aspirate |
| Haemarthrosis (underlying coagulopathy) | History, bloody joint aspirate |
| Systemic inflammatory arthritis (rheumatoid arthritis, seronegative spondyloarthritis) | Systemic symptoms. Multiple joints involved Involvement of the axial skeleton. Psoriatic rash Inflammatory bowel disease Genitourinary/gastrointestinal infection Conjunctivitis/uveitis |
| Extra-articular pathology (bursitis, tenosynovitis) | Joint has full range of movement. Visible inflammation of extra-articular structures |

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In this review the principal focus will be on the diagnosis and management of septic arthritis. Other causes of the acute hot joint will also be discussed.

## Presentation of septic arthritis

The diagnosis of septic arthritis rests almost entirely on clinical judgment. A septic joint is hot, painful and restricted in all movements (Gupta et al, 2001). The onset of symptoms is usually fairly rapid, over 1 or 2 weeks, and large joints are more commonly affected than small ones with up to 60% of cases affecting the hip or the knee (Kaandorp et al, 1997). In up to 20% of cases more than one joint may be involved so an oligo- or poly-articular presentation should not deflect from the need to exclude infection (Dubost et al, 1993). Systemic features such as fever may or may not be present (Weston et al, 1999).

## Risk factors for sepsis

There are many factors that will render an individual at higher risk of developing joint sepsis. Any underlying joint disease, such as rheumatoid arthritis or osteoarthritis, will increase the vulnerability of a joint to infection. In this context the affected joint will usually have signs of inflammation that are out of proportion to the disease activity found in other joints. Prosthetic joints are also highly susceptible (Kaandorp et al, 1997).

Other risk factors include intravenous drug abuse and skin ulceration, both of which provide potential portals of entry for infection. Patients with diabetes or a history of alcohol abuse are at increased risk (Sharp et al, 1979). Those who have had recent invasive procedures, including joint aspiration and injection, also have a higher incidence of joint sepsis (Meijers et al, 1987). The risk of joint sepsis following joint aspiration, however, is very low and aspiration should always be performed if the diagnosis of infection needs to be excluded.

## Alternative diagnoses

Other causes of the hot joint may be suggested in the history, particularly in the case of trauma or haemoarthrosis. Gout should be suspected if the first metatarsophalangeal joint is affected and in this circumstance aspiration need not be performed. In elderly women on diuretic therapy or with intercurrent illness, pseudogout is likely. In those patients with systemic inflammatory disease, more than one joint will usually be affected. Joints will often be stiff and swollen, particularly in the mornings. If there is involvement of the axial skeleton, then a seronegative spondyloarthritis should be considered. The presence of a psoriatic rash, genitourinary, gastrointestinal or eye symptoms may also point towards a seronegative inflammatory arthritis.

## Investigation of the acute hot joint

### Synovial fluid

Aspiration of the acute hot joint is mandatory. The only absolute contraindication to aspiration, outside of the operating theatre, is the presence of a prosthetic joint. In this circumstance orthopaedic advice should be sought. If the overlying skin looks inflamed or infected then the aim should be to approach through unaffected skin. Warfarin is not a contraindication to aspiration.

The synovial fluid should be examined by Gram stain for the presence of organisms which will guide initial therapy. The fluid should then be cultured for at least 48 hours so that any causative organism may be identified and sensitivities to antibiotic therapy determined. Neither the absence of organisms on Gram stain, nor a negative subsequent synovial fluid culture, excludes the diagnosis of septic arthritis (Weston et al, 1999). Indeed, in patients in whom there is a high clinical suspicion of septic arthritis, there is no difference in morbidity or mortality between those with a positive and those with a negative synovial fluid culture (Gupta et al, 2003). If clinical suspicion is high, it is imperative to treat as septic arthritis even in the absence of laboratory confirmation.

Synovial fluid microscopy is not only the gold standard investigation for the diagnosis of sepsis, but also of crystal arthritis. Examination of synovial fluid under polarized light may reveal either urate or pyrophosphate crystals caused by gout or pseudogout.

Other potential markers of sepsis within the synovial fluid have been studied. These include synovial white cell count (WCC) levels (Coutlakis, 2002) and inflammatory cytokines such as tumour necrosis factor and interleukin-6 (Soderquist et al, 1998). None has been shown to improve diagnostic accuracy beyond that achieved by standard microbiological techniques.

### Other laboratory investigations

The WCC, erythrocyte sedimentation rate (ESR) and/or C-reactive protein (CRP) should be measured, but the same principal of lack of sensitivity and specificity applies. The absence of a rise in any of these three markers does not exclude the diagnosis of sepsis, and inflammation of any cause may lead to a raised WCC, ESR or CRP level.

Blood cultures should always be taken, as in a significant proportion of patients with joint sepsis they may be positive in the presence of negative synovial fluid cultures.

### Radiological investigation

A plain radiograph of the affected joint or joints should be performed but this is not an urgent investigation and if the patient presents out of hours it can wait until the next day. A plain X-ray in this circumstance is not a diagnostic tool but rather a baseline investigation upon which to base future radiographical comparisons. It may show evidence of chondrocalcinosis or osteoarthritis, but these findings do not exclude the presence of sepsis (since pre-existing joint disease is a significant risk factor for sepsis). Other radiological techniques, such as magnetic resonance imaging (MRI) and radionuclide imaging, have been shown to broadly discriminate between inflammatory and non-inflammatory arthritides. No modality, however, has been shown to be able to distinguish between different causes of inflammation and therefore further radiological investigation of the acute hot joint is not instructive diagnostically (Nijhof et al, 1997). MRI, however, may be useful in the context of septic arthritis as it may show the extent of any osteomyelitic involvement (Karchevsky et al, 2004).

### Management of the acute hot joint

If sepsis is suspected then the patient should always be admitted to hospital and, after synovial and blood cultures have been taken, intravenous antibiotic therapy should be commenced pending the results of further investigation. *Table 2* provides a guide to suggested antibiotic regimens. There is, however, no good evidence base for these recommendations (Stengel et al, 2001) and decisions on the choice and duration of antibiotic therapy should always be made in conjunction with advice from the local microbiology department.

If a joint is proven to be septic then it should be drained to dryness as often as is necessary. There is no evidence to indicate that needle aspiration or arthroscopic drainage differ in their efficacy, so both are acceptable methods of removing pus (Goldenberg et al, 1975). Intravenous antibiotics should be given for 2 weeks, and oral antibiotics for at least 4 weeks thereafter or until the inflammatory markers have returned to within normal limits. If the sepsis is failing to resolve then specialist help should be sought.

If gout is diagnosed then initial treatment should be with non-steroidal anti-inflammatory drugs (NSAIDs). In larger joints the intra-articular injection of corticosteroids can bring rapid relief. Colchicine can be used to settle an acute attack if NSAIDs are contraindicated. Allopurinol, to reduce urate levels into the lower half of the normal range, should not be started during an acute attack but only when the attack has settled. Even then its introduction may need to be covered with NSAIDs or colchicine to avoid a flare up.

If a systemic inflammatory arthritis is suspected then prompt referral to a rheumatologist is recommended. Early introduction of disease-modifying therapy is often indicated in these patients to avoid joint destruction.

## Conclusions

Diagnosis of the acutely hot swollen joint is difficult. The authors have outlined features suggestive of septic arthritis – not the most common but the most serious cause of a hot swollen joint. The authors propose some initial antibiotic choices for this condition, and outline some alternative diagnoses. These include crystal arthritis, bursitis and tendonitis, and a monoarticular presentation of a polyarthritis.

**Table 2. Suggested regimen for the antibiotic treatment of joint sepsis**

| Patient group | Antibiotic choice |
|---|---|
| No risk factors for atypical organisms | Flucloxacillin 2 g intravenously four times a day. Local policy may be to add a second agent such as fusidic acid 500 mg three times a day orally, or gentamicin. If penicillin allergic, clindamycin 450–600 mg four times daily, or second or third generation cephalosporin |
| High risk of gram negative sepsis (elderly, frail, recurrent urinary tract infection, recent abdominal surgery) | Second or third generation cephalosporin, e.g. cefuroxime 1.5 g three times a day. Local policy may be to add flucloxacillin. Discuss allergic patients with microbiology – gram stain may influence antibiotic choice |
| Methicillin-resistant *Staphylococcus aureus* (MRSA) risk (known MRSA, recent inpatient, nursing home resident, leg ulcers, catheters or other factors determined locally) | Vancomycin plus second or third generation cephalosporin |
| Suspected gonococcus or meningococcus | Ceftriaxone, or similar dependent on local policy/resistance |
| Intravenous drug users | Discuss with microbiologist |
| Intensive care unit patients, known colonization of other organs (e.g. cystic fibrosis) | Discuss with microbiologist |

### KEY POINTS

- A septic joint has a high morbidity and mortality. If it is suspected, investigation and initial management are urgent.
- Septic arthritis is not always accompanied by fever, raised white cell count or inflammatory markers, or positive microbiological cultures.
- Other causes of an acute hot joint are more common but not nearly so serious.
- An acute hot joint should always be aspirated (the exception being the prosthetic joint where orthopaedic advice should be sought) to look for sepsis or crystal arthropathy – if in doubt seek specialist advice.
- Always commence antibiotics if septic arthritis is suspected but start them after synovial fluid and blood cultures have been taken.
- Crystal arthritis will respond well to non-steroidal anti-inflammatory drugs or intra-articular corticosteroids.
- If a systemic inflammatory arthritis is suspected refer early to a rheumatologist.

The most important recommendation of this review is that sepsis should be excluded in all cases of acute mono- or oligo-arthritis, and that in almost all cases this requires needle aspiration of the joint. Many trainee doctors seeing these patients are anxious about this procedure, and fear introducing infection into the joint. It is vital that this fear is counterbalanced by the knowledge that diagnosis requires joint aspiration, just as the diagnosis or exclusion of meningitis requires a lumbar puncture. BJHM

*Some of these recommendations arise from colleagues who participated with the authors in a guideline-working group convened by the British Society of Rheumatology. Other members of the group are Dr Max Field (Centre for Rheumatic Diseases, Royal Infirmary, Glasgow), Dr Adrian Jones (City Hospital, Nottingham), Dr Gabrielle Kingsley (University Hospital Lewisham, London), Dr David Walker (Freeman Hospital, Newcastle), Mr Mark Phillips (King's College Hospital, London), Mr Christopher Bradish (Royal Orthopaedic Hospital, Birmingham), Dr Stephen Metcalf (Queen Elizabeth Hospital, London), Dr Vivienne Weston (University Hospital, Nottingham), Dr Adrian McLauchlan (Heatherington Group Practice, London SW4), Ms Rahana Mohammed (Arthritis Care).*

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