

INFECTIVE ARTHRITIS: DIAGNOSIS AND MANAGEMENT TECHNIQUES

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Categories : [Vets](#)

Date : September 5, 2011

James Grierson provides practical advice on diagnosing and managing infective arthritis in small animals

Summary

Joint infections are often encountered in general practice and, contrary to the belief of some, they are not always secondary to a surgical intervention or local wounds. Understanding the pathophysiology of joint infections allows the clinician to be aware of the serious complications associated with this problem. It also allows better understanding of management strategies. Early identification of infections through imaging, joint fluid cytology along with culture and sensitivity is important for decision making and management. The vast majority of cases do not require surgery and can be managed with medical management alone with a good prognosis for resolution and return to function.

Key words

joint, sepsis, infection, antibiotics, cytology

INFECTIVE (septic) arthritis is an inflammatory arthropathy caused by an infective agent, most commonly bacteria. Due to the consequences of an animal having a bacterial infection within a joint, accurate diagnosis and differentiation from other arthropathies is extremely important.

Aetiology

A history of recent surgery is not the only cause of infective arthritis in dogs and cats and other reasons must be considered, including:

- penetrating trauma;
- haematogenous spread;
- ear infection;
- gastrointestinal infection;
- urinary tract infection;
- pyoderma;
- anal sac infections; and
- omphalophlebitis (very young puppies/kittens).

The most common route of infection is hotly debated and is extremely variable, with the top cause being dependent on which references are consulted. In one study, 38 out of 58 cases were caused by haematogenous spread¹, and in another study only five out of 19 cases were thought to be haematogenous².

It is well recognised that pre-existing joint disease can predispose to haematogenous spread. Examples of this include osteoarthritis, immunemediated joint disease and blunt trauma that can precede the infection by a few days.

A number of bacteria have been cultured from joint infections with the most common isolates being *Staphylococcus* species, particularly *S Intermedius* and *Streptococcus* species. Other bacteria, including anaerobic bacteria, have also been isolated and mixed infections can also occur.

Pathophysiology

The pathophysiology of any disease can be a little daunting. [Figure 1](#) is a summary of the process that occurs following infection of the synovium. The end result of this process is the destruction of articular cartilage and irreversible changes within the joint.

History and findings

Infected joints can occur in dogs and cats of all ages. In dogs, there is a tendency for larger breeds to be affected more than the smaller breeds and males are predisposed to the condition at a ratio of 2: 1.

The history in most cases is one of acute-onset single limb lameness. In some cases, the lameness can be chronic, with a more insidious onset often resulting in a less severe lameness than animals with acute-onset problems. The subsequent progression of the lameness can then be an indicator as to aetiology as most traumatic injuries improve in 24 to 48 hours, whereas infection will not. Systemic illness is an uncommon finding with an infected joint.

Typical physical examination findings are:

- lameness – more chronic cases may be mild;
- warm swollen joint with pain on manipulation;
- redness or discolouration of overlying skin;
- joint effusion;
- local lymph node enlargement;
- muscle atrophy; and
- monoarticular.

Diagnosis

An infected joint can resemble other arthropathies and the history and physical examination findings do not provide a definitive diagnosis. This can only be confirmed by synovial fluid and/or synovial membrane culture of the offending organism. Unfortunately, culture is not always successful – 50 per cent to 80 per cent only, but a probable diagnosis can be achieved by cytological evaluation of joint fluid in the context of history, physical examination findings and radiological findings.

The plan for an animal in which you suspect an infected joint is:

- **radiography;**
- **synovial fluid analysis;**
- **synovial membrane biopsy;** and

- **other laboratory tests.**

Radiography

Always take two views of the joint(s) that you suspect are affected following physical examination. Any radiographic changes seen will vary with duration and type of infection. Typically, in the early stages there may be evidence of joint effusions and soft tissue swelling around the joint. As time progresses, one to two weeks following infection, there will be evidence of periarticular periosteal bone reaction, occasionally mineralisation of soft tissue and occasionally subchondral bone erosions ([Figure 2](#) and [Figure 3](#)). In the more chronic cases of joint infection, there can be bone erosions, narrowing joint space due to loss of cartilage and subluxation of the joint due to soft tissue damage.

There is a variable radiographic appearance of animals with infected joints, with potential overlap between this condition and other joint pathologies. Radiographs alone cannot be relied on to establish a definitive diagnosis.

Synovial fluid analysis

This is an essential part in the investigation of any joint disease and is simple and quick to perform without the need for expensive kit, and in some cases it can be done under sedation.

In the panel left there is a useful checklist of items to have available prior to obtaining a sample of joint fluid.

When preparing to perform a joint tap, it is important to be aware of the landmarks for each particular joint that you are going to sample to reduce the risk of iatrogenic damage to periarticular structures.

It is beyond the limit of this article to describe all the different landmarks for joint taps and readers are referred to alternative sources^{3, 4}.

Standard technique for performing a joint tap is to:

- clip and prep area aseptically (hibiscrub);
- spirit area;
- wear sterile gloves;
- insert needle into the joint;

- aspirate slowly; and
- stop aspirating before removing the needle.

Cytological analysis can be performed from synovial fluid placed into ethylenediaminetetraacetic acid (EDTA) and plain tubes, or from smears made directly on slides at the time of sampling. You will often find that you don't have enough fluid to place into EDTA and therefore making smears can be the only way to get a cytological analysis of the fluid. [Table 1](#) shows the normal and abnormal parameters for synovial fluid.

If sampling allows, try to submit some of the fluid for bacterial culture. As stated earlier, it is not always possible to get a positive result and to ensure the best chance it is ideally placed into blood culture medium that is then incubated by the lab overnight prior to plating out. Alternatively, a small amount of the joint fluid can be placed on to a swab and then submitted for culture.

Ideally, any sample of joint fluid would be taken before starting antibiotic therapy. However, research has shown no association between antibiotic administration and production of a positive result⁵, so this is not as critical as you might think.

I prefer to look at all samples myself using a Diff-Quik stain, as this allows immediate results and therefore an earlier diagnosis so I can begin appropriate treatment without delay. Joint cytology is relatively straightforward and septic smears are easy to recognise due to the high number of neutrophils ([Figure 4](#)).

Synovial membrane biopsy

Synovial membrane biopsy is a much more invasive test that requires a surgical procedure to be performed; it is easily done during an open approach to the joint and produces more reliable culture results. It is important that the sample is kept moist prior to submission.

Other laboratory tests

Routine haematology and biochemistry are indicated, particularly to rule out concurrent disease, but results are often unrewarding. If there is no indication as to why a joint has become infected then a chest and abdomen radiograph may be indicated to look for a cause.

Treatment/prognosis

The important thing about management of any infected joint is prompt recognition of the problem and then treatment.

The principal treatment methods for all infected joints are drainage, lavage, debridement and a prolonged course of systemic antibiotics, with the choice of drug ideally based on culture and sensitivity testing.

Interestingly, there is no difference in outcome between surgical and medical management versus medical management alone⁵. As a general rule, I would manage all infected joints in a closed manner rather than through an open surgical approach.

An open surgical approach (such as a surgical arthrotomy) would be reserved for management of more severe cases. These may include:

- repeat offenders – joints where a minimally invasive approach has failed to be successful in the past;
- case in which debridement is likely to be required due to the presence of large amounts of necrotic tissue;
- infected implant removal;
- excessively thick joint fluid making needle drainage difficult (subjective); and
- if there is a requirement for a synovial biopsy.

Although infected joints can be managed medically with no intervention, I would always recommend lavage of the joint unless there is a good reason not to. The benefits include removal of pus and bacteria from the joint, therefore reducing contamination, and also removal of inflammatory mediators that may provide some degree of pain relief.

Joint lavage

This can be performed in one of two ways. If equipment and expertise permit then it can be performed via arthroscopy ([Figure 5](#)). This allows visual inspection of the joint, debridement, and the large portals used for scope and cannula placement aid in the removal of fibrinopurulent clots. However, adequate joint lavage can also be done more simply using wide bore needles.

• Needle lavage:

- clip and prepare area aseptically;
- place inlet and outlet needles into the joint – 16g-20g;
- some clinicians use an outlet needle slightly smaller than the inlet needle to allow distension of

the joint and aid in lavage of the entire joint space.

- use sterile saline or Hartmann's as a lavage solution, warmed slightly;
- high fluid flow can be achieved via the use of a rapid infuser, 100 to 120 psi (690-830 kPa);
- 20ml or 50ml syringe can be used if a rapid infuser is not available; and
- aim to flush one to two litres through the joint.

Antibiotic selection

Ideally, any antibiotic selection should be based on recent culture and sensitivity. Often, results are not available for a few days and there is a need to start therapy at the earliest opportunity.

Knowing the most common bacterial isolates can assist in the choice of antibiotics prior to culture results being available. It is well documented that staphs and streps are often isolated from infected joints and therefore choosing a broad spectrum antibiotic with known action against these agents is a good first step.

The antibiotic chosen should therefore be bactericidal β -lactamase-resistant with activity against gram-positive and gram-negative organisms. The ideal choice would be either cefuroxime or amoxicillin/clavulanate at 20mg/kg given IV initially and then continued with oral medication for a minimum of four to six weeks or two weeks after resolution of clinical signs. In most cases, a response should be seen within five to seven days.

Administration of long-acting antibiotics is to be avoided unless based on culture and sensitivity as inappropriate usage can lead to increased bacterial resistance.

Additional treatments

Management of infected joints goes beyond lavage and antibiotic therapy and it is important to consider all aspects of joint management. In particular, the following points should be considered:

- analgesia – a multimodal approach is often best with the use of NSAIDs supplemented by opioids in the acute stages of the disease process;
- rest – patients with infected joints should have restricted exercise to prevent further damage to the weakened cartilage and periarticular structures;
- ice packs – a simple yet very effective way of reducing swelling and providing pain relief. Typically, plan would be 10 to 15 minutes of application four to six times per day. The use of warm

packs is contraindicated in any infected tissues;

- limb support can be used to minimise cartilage damage. Often this is difficult to perform satisfactorily and cartilage damage can be minimised with appropriate rest; and
- joint mobilisation and physiotherapy is an underused utility. Maintaining joint mobility by performing a passive range of motion exercises is an important aspect to postoperative care. Liaising with a veterinary physiotherapist early on in the treatment would be beneficial for these cases.

Follow-up

In cases of joint infection, it is important to follow up the cases closely as improvement in clinical signs does not always mean that the infection has completely cleared. Repeating joint taps one to two weeks following cessation of the antibiotic course allows more informed management decisions to be made.

Some patients may have a residual lameness due to immune responses secondary to the initial bacterial infection. These cases may respond to low dose steroid treatment (prednisolone 0.1mg/kg to 0.2mg/kg PO q24h) but this should only be given following a negative culture result.

Prognosis

The prognosis with joint infection is extremely variable and depends on the original disease process and, to some degree, the chronicity of the infection. Owners should be informed that return to normal function is unlikely due to joint damage, so all cases would warrant a guarded prognosis.

Medical and/or surgical management are often successful in resolving infection, but frequently unsuccessful in restoring full joint function. Studies have documented poorer outcomes associated with increased bodyweight of the patient, increased duration of lameness and a higher nucleated cell count of the joint fluid.

Prompt diagnosis and appropriate treatment are critical to a good prognosis.

References:

- 1. Bennet D and Taylor D J (1988). Bacterial infective arthritis in the dog, *Journal of Small Animal Practice* **29**: 207-230.
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- 4. Moore A P (2009). How to do joint taps. Available at www.andersonsturgess.com/index.php/download_file/-/view/190 (Accessed 15 January 2011)
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CHECKLIST

- Sterile gloves
- Syringes – 2ml and 5ml
- Needles – 21g (green) and 23g (blue), 1–1½ inch depending on joint
- Microscope slides – labelled
- EDTA and plain tube
- Bacteriology swab
- Blood culture medium