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CORE TRAINING FOR DOCTORS

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Wrist joint aspiration

Introduction

Wrist joint aspiration is a diagnostic procedure used in patients with a suspected wrist joint effusion to obtain a sample of synovial fluid for analysis. In the acute setting, it is vital to consider septic arthritis as a medical emergency in which it is essential that aspiration is performed immediately and synovial fluid sent for laboratory analysis, before starting antibiotics to prevent irreversible joint damage. Alternative diagnoses of a wrist joint effusion include crystal-induced arthritis as well as autoimmune-mediated inflammatory arthritis, and aspiration with synovial fluid analysis may help to distinguish between these conditions, which are all likely to be encountered by junior hospital doctors during their training. This article describes the indications, technique and complications of wrist joint aspiration.

The same technique may also be used for intra-articular steroid injection of the wrist joint, but full discussion of this procedure is beyond the scope of this article and hence will only be mentioned in brief.

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When should the procedure be performed?

Joint aspiration should be considered in patients with clinical signs suggestive of a wrist joint effusion (such as pain, swelling, warmth, local tenderness and restriction of movement) to establish the underlying cause (*Table 1*). The procedure requires sterile equipment and an aseptic technique, and can be performed safely on the ward or in outpatients with relatively few contraindications (*Table 2*).

Aspiration should be performed urgently if septic arthritis is suspected. Factors which should raise this suspicion include:

- A history of bacteraemia or recent joint aspiration or surgery
- Signs of systemic illness (such as fevers and/or markedly raised inflammatory markers)
- Rapidly progressive symptoms
- Erythema overlying the joint (which may occur in all inflamed joints, but is especially common in septic arthritis and crystal arthropathies).

Although septic arthritis is usually monoarticular at onset, given time, it can spread sequentially to other (often adjacent) joints. Therefore, the presence of an oligoarthritis should not necessarily reduce

Table 1. Possible causes of wrist joint effusion and the corresponding synovial fluid appearances

	Synovial fluid appearance		
Condition	**Macroscopic**	**Microscopic**	**Mainstay of treatment**
Normal joint	Clear or slightly yellow, highly viscous	Few leukocytes and red cells	N/A
Septic arthritis	Turbid or pyogenic	Gram stain showing organism, High polymorph count (↓glucose and ↑lactic acid are supportive but rarely tested)	Combination antibiotics determined by local microbiological advice
Crystal arthropathy: gout or pseudogout	Turbid or milky	Gout: negatively birefringent needle-shaped monosodium urate crystals Pseudogout: Weakly positively birefringent rhomboid-shaped calcium pyrophosphate crystals	Colchicine, non-steroidal anti-inflammatory drugs, steroids
Inflammatory arthritis	Turbid	High polymorphonuclear leukocyte count	Disease modifying anti-rheumatic drugs

the clinical index of suspicion of a septic arthritis. Similarly, although a flare of inflammatory arthritis is more likely in a patient with a history of inflammatory arthritis, patients with pre-existing joint damage are more prone to septic arthritis. Consequently, if there is any suspicion of septic arthritis, joint aspiration should be performed without delay.

Wrist joint anatomy and choice of approach

The patient should be positioned comfortably, with the wrist joint pronated and slightly flexed, resting over a pillow to allow the muscles to relax. The radiocarpal joint space is best accessed via the triangular space between the mid-distal radius proximally and the scaphoid and lunate distally (*Figure 1*).

Method of joint aspiration

The indications for and potential side effects of the procedure should be discussed with the patient to obtain informed consent (*Table 3*) and ensure that there are no contraindications to the procedure (*Table 2*), including allergy to the dressing to be used. The appropriate equipment should then be assembled on a sterile field (*Table 4*).

Fluid should be aspirated using a sterile technique. First, with clean hands palpate the wrist joint to establish the site of injection and mark it by skin indentation (*Figure 1*) then wash hands and put on sterile gloves. At this point if a steroid injection is planned after aspiration, draw up lignocaine and steroid into an additional 5 ml syringe, and cap with a sheathed needle. Then clean the skin at the site of needle entry with chlorhexidine solution. Spray the skin with ethyl chloride freezing spray, and it will turn white when anaesthetized.

Following this the joint space should be entered by passage of a green (21G) needle on a 2.5 ml syringe. Hold the needle perpendicular to the skin surface, warn the patient of potential discomfort, and pass through the skin in the direction of the flexural surface of the wrist joint. A slight 'give' may be felt on entering the joint space. If there is undue resistance to the passage of the needle, a feeling of touching bone, or if the patient is in severe discomfort the needle should be withdrawn slightly, without exiting from the skin, and the direction adjusted before advancing. Alternatively, remove the needle and re-palpate to confirm the anatomical target (but the skin must be cleaned again before re-attempting aspiration). Aspiration of synovial fluid con-

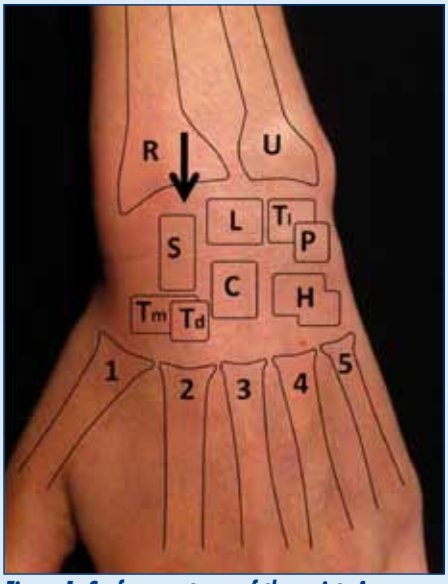

Figure 1. Surface anatomy of the wrist. Arrow marks radiocarpal joint space for injection. C = capitate; H = hamate and hook of hamate; L = lunate; P = pisiform; R = radius; S = scaphoid; Td = trapezoid; Tl = triquetral; Tm = trapezium; U = ulna.

Table 2. Indications for and contraindications to wrist joint aspiration

Indications	Red, hot, swollen or tender joint with palpable effusion
	Suspected septic arthritis or crystal-induced arthritis
	Treatment or pain relief by reducing intra-articular pressure (and injection of corticosteroid if sepsis excluded)
Contraindications	Lack of informed consent
	Prosthetic joint – consult orthopaedic surgeon
	Coagulopathy (international normalized ratio >1.5 and/or platelets <50x10^9/litre, seek specialist advice)
	Infection of overlying soft tissue or skin or bacteraemia (also avoid surface blood vessels)

Table 3. Consenting the patient

Intended benefits	To discover the cause of the effusion and enable appropriate treatment
Possible risks	Failure of procedure or need for several attempts
	Pain of needle insertion should not be significantly more uncomfortable than venepuncture and is short-lived
	Joint space infection is rare (0.000012–0.00007%) if sterile technique used (Hollander, 1970; Gray et al, 1981; Seror et al, 1999)
	Theoretical risk of bleeding (not reported, check blood clotting first)
If procedure followed by corticosteroid injection	Facial flushing (12%) (Courtney and Doherty, 2009)
	Post injection flare (15%) (Courtney and Doherty, 2009)
	Damage to local structures (cartilage, nerves, tendons), but no evidence of damage to joints (Raynauld et al, 2003)
	Cutaneous depigmentation or fat atrophy (Cassidy and Bole, 1966)

Table 4. Equipment required

Sterile gloves
Sterile field
Chlorhexidine wipes or cleansing solution in sterile gallipot
Sterile gauze
Sterile dressing
Ethyl chloride freezing spray, e.g. Cryogesic
Green needle (21G)
2.5 ml syringe (+ extra 5 ml syringe if steroid to be injected)
Sharps box
Sterile universal sample pots
Microscopy and culture form
Biochemistry form

firms correct positioning, but a maximum of 1–2 ml should be expected. If the needle appears to be in the joint space but fluid cannot be aspirated, seek senior advice or consider re-attempting the procedure under ultrasound guidance.

If injecting steroid, hold the needle in place, remove the syringe containing the aspirate and replace with the syringe containing steroid and local anaesthetic, and then the injection should be able to be given without resistance. The needle can then be removed and discarded with care. Cover the aspiration site with a sterile dressing and send the synovial fluid urgently to the laboratory for analysis (*Table 5*).

Post-procedure management

Ensure that the patient is comfortable and apply pressure with sterile gauze to the aspiration site to prevent bleeding before applying a sterile dressing. The patient should be advised to seek medical attention urgently in the unlikely event of the joint becoming more swollen, hot or erythematous, to exclude the possibility of an iatrogenic septic arthritis. Document the informed consent, explanation of risks and procedure itself in the medical notes as well as details of any complications and a record of the samples sent for analysis.

If septic arthritis is being considered samples should be sent to the lab for urgent analysis (*Table 5*), including Gram stain to guide antibiotic therapy. However, empirical antibiotic therapy according to local microbiological advice may be begun without delay, particularly if purulent synovial fluid is aspirated. Further treatment depends upon the clinical suspicion and subsequent findings from synovial fluid analysis (*Table 1*). For instance, a positive Gram stain and subsequent growth of an organism not only supports a diagnosis of septic arthritis but also guides appropriate antibiotic therapy. In contrast, a negative Gram stain and detection of crystals by polarized light microscopy confirms the diagnosis of crystal-induced arthritis and will guide subsequent treatment.

In the absence of a positive Gram stain and culture (after 24–48 hours) as well as a lack of crystals then septic and crystal arthritis are unlikely (although up to 38% cases of crystal arthropathy and 33% septic arthritis may have negative findings on synovial fluid analysis (Weston et al, 1999; Swan et al, 2002)). If, however, there is a low clinical suspicion of sepsis then treatment of other inflammatory arthritides with steroids or other immunosuppressive treatments may be initiated. It is therefore important to follow up synovial fluid sample results promptly to inform both the treating physician and patient of these results.

Table 5. Samples to send to laboratory

Microbiology	Gram stain, microscopy and culture (If aspirating a larger joint with a suspicion of sepsis, fluid directly inoculated into blood culture bottles may increase the yield)
	Acid- and alcohol-fast bacilli (+/- Ziehl–Neelsen stain)
	Polarized light microscopy for crystals
Biochemistry	Glucose, lactic acid (if sufficient fluid and septic arthritis suspected)

KEY POINTS

- Synovial fluid aspiration is a useful diagnostic procedure, and critical to the diagnosis of septic arthritis as well as crystal arthropathies.
- If septic arthritis is suspected, aspiration should be performed urgently before starting empirical antibiotics.
- Aseptic technique and sterile equipment should be used.
- If synovial fluid is not easily aspirated, consider aspiration under ultrasound guidance.
- Do not inject steroid if septic arthritis is a possibility.

Intra-articular steroid injection

Intra-articular steroid injections of the wrist joint may be used in the treatment of mono-articular flares of chronic inflammatory arthropathies when septic arthritis is not a clinical concern. The technique to needle the joint is essentially the same as that for aspiration described above, followed by administration of 1 ml of a steroid and lignocaine mixture. When obtaining consent, the patient should be informed that the beneficial effects of steroid injection may take up to 24 hours to take effect and last for up to 2 months. The additional complications relating particularly to the injection of steroids should be mentioned (*Table 3*). When confirming drug allergies, both latex and local anaesthetic should be specifically mentioned. Following the injection, patients should be advised to rest the joint as much as possible for 24 hours.

Conclusions

Wrist joint aspiration is a simple procedure in experienced hands, and can be carried out safely in the ward environment. Adequate preparation and discussion with the patient to ensure full cooperation is key to success. BJHM

Conflict of interest: none.

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