Joint Injection and Aspiration

This article is designed to give a general overview of joint injection and aspiration. Hands-on training and regular experience are essential. Injection techniques require knowledge of anatomy of the targeted area and a thorough understanding of the agents used. Successful joint and soft tissue aspiration and injection also rely on the physician’s understanding of the indications, contraindications and general techniques involved in these procedures. There are variations in technique and procedure and the techniques mentioned in this article are widely used but not necessarily definitive. Access to ultrasound to enable better targeting of steroid injections may improve efficacy.

Joint aspiration

Indications for joint aspiration

- Diagnostic:
  - Joint effusion of unknown origin.
  - Suspected septic arthritis.
  - Crystal arthritis: gout, pseudogout.
  - Haemorrhage (trauma).
  - Chronic arthritis: rheumatoid arthritis (RA), non-inflammatory (osteoarthritis, osteonecrosis).

- Therapeutic:
  - Reduction of intra-articular pressure - eg, remove exudate from a septic joint, relieve pain in a grossly swollen joint.

Aspirate analysis

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Appearance</th>
<th>Viscosity</th>
<th>Special findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Clear - yellow</td>
<td>High</td>
<td>Blood</td>
</tr>
<tr>
<td>Traumatic</td>
<td>Straw - red</td>
<td>High</td>
<td></td>
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<tr>
<td>Rheumatoid arthritis (RA)</td>
<td>Cloudy</td>
<td>Low</td>
<td>Latex RA haemagglutination titre</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>Clear - yellow</td>
<td>High (normal)</td>
<td>Possibly small fragments of cartilage</td>
</tr>
<tr>
<td>Gout</td>
<td>Cloudy</td>
<td>Decreased</td>
<td>Monosodium urate crystals (needle-like)</td>
</tr>
<tr>
<td>Pseudogout</td>
<td>Cloudy</td>
<td>Decreased</td>
<td>Calcium pyrophosphate crystals (rhomboid)</td>
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<tr>
<td>Septic arthritis</td>
<td>Turbid or purulent</td>
<td>Low</td>
<td>Culture positive</td>
</tr>
<tr>
<td>Tuberculous arthritis</td>
<td>Cloudy</td>
<td>Low</td>
<td>Culture positive for acid-fast bacillus</td>
</tr>
</tbody>
</table>

Joint injection

Benefit is experienced within a few days if successful, can last for months but can be as short as 2-3 weeks of symptom relief. Failure may be due to not entering the joint or to an incorrect diagnosis.

Drugs used

- **Corticosteroids**: short-acting (eg, hydrocortisone), intermediate-acting (eg, methylprednisolone, triamcinolone), long-acting (eg, dexamethasone).
- Local anaesthetics - eg, lidocaine, bupivacaine.
- Saline.
- Radioisotopes.
- Infliximab.
- There is some evidence to suggest intra-articular hyaluronic acid is effective and gives more prolonged pain relief than intra-articular corticosteroids. However, it is not used by most UK rheumatologists and is NOT recommended in current National Institute for Health and Care Excellence (NICE) guidance.
**Essentials**
- Thorough history and examination; investigations as indicated: carefully consider the differential diagnosis and avoid inappropriate injections.
- Consider other treatment options - eg, non-steroidal anti-inflammatory drugs (NSAIDs), physiotherapy.
- Explain the procedure to the patient.
- Informed consent: ensure the patient is fully aware of the potential benefits and risks of the procedure.
- Know the anatomy and never attempt any injections in the vicinity of known nerve or arterial landmarks.
- Never inject into the substance of a tendon.
- Thoroughly clean the area and use a totally aseptic technique; prepare the skin with 1% chlorhexidine in spirit or iodine solution. No touch technique.
- Always withdraw the syringe back first to ensure not injecting into a blood vessel.
- Inject slowly but with constant pressure.
- If local anaesthetic is required, inject local anaesthetic first; wait 3-5 minutes and then use a larger-bore needle to inject the corticosteroid. However, it may be preferred to inject the local anaesthetic and steroid in combination and so use just one needle.
- Send joint aspirate for microscopy and analysis if suspicious, or if there is a need to confirm the diagnosis.
- Give as few injections as possible to settle the problem; no more than four in any single joint.

**Indications for joint injection**[1]

**Joint conditions**
- Inflammatory arthritis - eg, RA.[7]
- Crystalloid arthropathies: gout, pseudogout.
- Synovitis.
- Advanced osteoarthritis.[8]

**Soft tissue conditions**
- Bursitis
- Tendinopathies
- Trigger points
- Ganglion cysts
- Neuromas
- Entrapment syndromes
- Fasciitis

**Contra-indications and cautions**[9]

**Contra-indications**
- Infection: septic arthritis, adjacent osteomyelitis, peri-articular cellulitis, severe dermatitis, soft tissue infection, sepsis, bacteraemia.
- Increased risk of causing joint infection - eg, immunosuppressed, broken skin over the injection point.
- Trauma: haemarthrosis, fracture.
- Very unstable joint - eg, Charcot joint.
- Impending (scheduled within days) joint replacement surgery.
- Joint prosthesis.
- History of allergy to injectable constituents.
- Poorly controlled diabetes mellitus.
- Uncontrolled bleeding disorder or coagulopathy.

**Cautions**
- Those with diabetes: should closely monitor their blood glucose for two weeks following injection.[10]
- Anticoagulated, bleeding disorder.
- Immunosuppressed.
- Psychogenic pain, severe anxiety.
- Neurogenic disease.
- Active infections (eg, tuberculosis).
- Hypothyroidism.

**Patient advice**
- Advise the patient to rest the joint for 1-2 days and to avoid strenuous use for five days.
- Warn the patient that the joint may be painful for a while and advise on use of analgesics.
- Following injection, patients should be warned that they might experience worsening symptoms during the first 24-48 hours (related to a possible steroid flare) which can be treated with ice and NSAIDs. If pain is severe or increasing after 48 hours, seek advice.
- Warn about possible other side-effects. Advise to seek help if systemic side-effects develop suggesting infection.
- Arrange appropriate follow-up.

**Side-effects**
Often the result of poor technique, too large a dose, too frequent a dose, or failure to mix and dissolve the medications properly.

Local

- Infection (1/10,000).
- Post-injection flare of pain (2-5%); reduced incidence with rest for 24 hours.
- Skin discoloration; improves with time.
- Subcutaneous fat atrophy.
- Bleeding (rare).[2]
- Soft tissue calcification with repeated injection at the same site
- Joint injury (do not move the needle from side to side within the joint); cartilage damage and osteoporosis: avoid repeated injections (no more than four injections in each location per year).
- Tendon atrophy and rupture (<1%): avoid direct tendon injection.[11]
- Pericapsular calcification (>40%).
- Avascular necrosis.

Systemic

- Flushing of skin.
- Temporary impairment of diabetic control.
- Vasovagal reaction.
- Anaphylaxis (rare but adrenaline (epinephrine), etc, should be close at hand).

Knee joint injection[12]

See also separate Knee Assessment article.

- The patient should lie still on a couch with their leg slightly flexed and a pillow under the knee.
- Using an aseptic technique, entry can be made from either the lateral or medial side of the patella.
- Insert the needle horizontally into the joint, in the gap between the femur and the patella.
- Aspiration and injection can be performed through the same needle.
- When the needle is behind the patella, it is in the joint space.
- After aspiration and/or injection, the joint should be rested for 24 hours.[7]
Shoulder joint injection

See also separate Shoulder Examination and Shoulder Pain articles.

There is currently no major evidence for the benefit of steroid injections for shoulder problems. Subacromial corticosteroid injection for rotator cuff disease and intra-articular injection for adhesive capsulitis (frozen shoulder) may be beneficial, although their effect may be small and not well maintained.[13] One study carried out did not indicate that local corticosteroid injection is more effective than systemic corticosteroid injection for short-term improvement in rotator cuff disease.[14]

Indications
- Glenohumeral joint injection: osteoarthritis, adhesive capsulitis, RA, rotator cuff lesions.
- Acromioclavicular joint: acromioclavicular joint problems - eg, osteoarthritis (a common cause of shoulder pain in people aged over 50 years) and distal clavicular osteolysis.
- Subacromial injections: adhesive capsulitis, subacromial bursitis (may occur in gout, reactive arthritis, trauma or RA), impingement syndrome, rotator cuff tendinosis. Subacromial injections of corticosteroids are effective for improvement of subacromial pain for up to nine months. They are also probably more effective than NSAID medication.[15]
- Bicipital groove: bicipital tendinitis.

Glenohumeral joint
- The joint is most easily accessible with the patient sitting, the patient's arm resting comfortably at the side and the shoulder externally rotated.
- Essential landmarks include the head of the humerus, the coracoid process and the acromion.[16]

Anterior injection into the glenohumeral joint
- The needle should be placed below the acromion process, 1 cm lateral to the coracoid process and immediately medial to the head of the humerus.
- Advance the needle horizontally, directed posteriorly and slightly superiorly and laterally.
- If the needle hits against bone, it should be pulled back and redirected at a slightly different angle.[16]

Subacromial bursa
Posterior injection into the subacromial bursa
- The posterior approach to the subacromial bursa is easier and generally safer.
- The entry point is 1 cm inferior and medial to the posterior corner of the acromion.
- Pass an 18-gauge needle up under the acromion to its full depth.
- The steroid and local anaesthetic should flow freely into the space without any resistance or significant discomfort to the patient.

Lateral approach into the subacromial bursa
- The patient sits with the arm loosely at the side and not rotated.
- Palpate the most lateral point of the shoulder and make a thumbnail indentation about half an inch below the tip of the acromion process.
- Advance the needle medially below the acromion process, horizontally and in a slightly posterior direction along the line of the supraspinous fossa.

Acromioclavicular joint
- Patients are placed in the supine or seated position, with the affected arm resting comfortably at their side.
- To identify the joint, palpate the clavicle distally to its termination, at which point a slight depression will be felt at the joint articulation.
- The acromioclavicular joint has a very small joint space. Therefore inject only 0.2-0.5 ml of steroid (local anaesthetic is not necessary) with a 5/8 inch needle.
- Palpate the joint space and insert the needle superiorly or anteriorly, ensuring that only the tip of the needle enters the joint space.
- The joint space may be difficult to enter because of obstruction by an osteophyte.
- With a superior approach, it is easy to push the needle too far and enter the shoulder capsule.

Bicipital tendonitis
- The patient sits with their affected arm loosely by their side and externally rotated.
- Make a thumbnail indentation directly over the most tender spot in the bicipital groove, which is easily palpated (at the anterolateral tip of the head of the humerus).
- Inject just below the skin mark and direct the needle at 30° in an upward direction into the bicipital groove, parallel to the groove. When the needle point enters the tendon, resistance increases sharply.
- Maintain gentle pressure on the plunger while at the same time withdrawing the needle slowly until the resistance disappears. At this point, the needle is in the synovial sheath and the solution should then be injected.

Elbow joint injection[17]
Further reading & references

- The patient should be in a supine position with the elbow flexed to 45° and the hand in a neutral position resting on the patient’s thigh.
- The elbow joint is injected from a lateral approach in order to avoid the ulnar nerve.
- The needle is inserted into the soft tissue at the centre of the triangle formed by the lateral olecranon, the head of the radius and the lateral epicondyle and directed to the medial epicondyle. If the needle hits against bone, it should be pulled back and redirected at a slightly different angle.

Ankle joint injection

- Sit the patient either in a supine position with the ankle relaxed, or seated with their shin vertical and foot horizontal.
- The ankle joint is injected using an anterior approach.
- Landmarks: identify the space between the anterior border of the medial malleolus and the medial border of the tibialis anterior tendon. Palpate for the articulation of the talus and tibia. See document reference for illustrations.\[18\]
- Reduced resistance should be felt on entering the joint space. Confirm position by aspirating fluid.
- Inject 1 ml methylprednisolone acetate (40 mg/mL). Remove the needle and syringe and apply a sterile dressing.
- Passive foot movement helps to distribute the injection.
- The patient should remain lying or sitting for several minutes after injection.
- Some advise that the patient should be monitored for a further 30 minutes to ensure no adverse reactions but this is probably unnecessary.

Injections into other areas

- Hip: indications for greater trochanteric bursa injection include acute and chronic inflammation associated with osteoarthritis, RA, repetitive use and other traumatic injuries to the area.\[12\]
- Wrist and hand - eg, carpal tunnel syndrome, de Quervain’s tenosynovitis, osteoarthritis of the first carpometacarpal joint, wrist ganglion cysts and digital flexor tenosynovitis (trigger finger).\[19\]
- Foot - eg, the first metatarsophalangeal joint (for advanced osteoarthritis, RA, other inflammatory arthritis such as gout, or synovitis), persistent pain and disability resulting from tarsal tunnel syndrome, painful interdigital space (eg, Morton’s neuroma).\[18\]

Soft tissue injections

Therapeutic injections (lidocaine plus a corticosteroid) are useful, both because they are therapeutic and also because they can help to differentiate impingement from other problems. For example, if a patient does not improve after a subacromial injection, has normal X-rays and an inconclusive examination, the rotator cuff may not be the problem.

Indications for soft tissue injection

- Tenosynovitis - eg, de Quervain’s tenosynovitis.
- Elbow epicondylitis.
- Bursitis - eg, olecranon bursitis, housemaid’s knee, Achilles bursitis.
- Tendinopathies - eg, Achilles tendinopathy: corticosteroid injection is beneficial in the short term for the treatment of tendinopathies but may be worse than other treatments in the intermediate and long term.\[20\]
- Nerve compression - eg, carpal tunnel syndrome.
- Plantar fasciitis.

Further reading & references

- Lockman LE; Knee joint injections and aspirations: The triangle technique, Canadian Family Physician, November 2006

6. Osteoarthritis; NICE CKS, April 2015 (UK access only)

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