

A Guide to Joint Injection Techniques



Juan J Canoso

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John H Klippel and Paul A Dieppe

M Mosby-Wolfe
MEDICAL COMMUNICATIONS

SEARLE

- Synovial aspiration is the basic diagnostic tool in rheumatology.
- Synovial fluid analysis allows distinction between inflammatory and noninflammatory conditions and provides direct proof of crystal arthropathy, infection and hemarthrosis.
- Major diagnostic errors can be made by simply assuming the nature of an effusion.
- Corticosteroid injections and infiltrations are basic treatment tools in rheumatology, orthopedics and general medicine.
- Synovial aspiration and corticosteroid injections and infiltrations carry minimal risk to the patient when properly indicated and performed.
- Technical difficulties vary; some of these procedures require specialized knowledge for optimal results.

Joints and periarticular structures such as bursae and tendon sheaths may need aspiration for diagnostic or therapeutic purposes. In addition, corticosteroids and other drugs are often injected in and around soft tissue periarticular lesions to treat regional pain syndromes (Fig. 1). The principles and practice of inserting a needle into either a joint cavity or periarticular lesion are very similar.

INDICATIONS FOR ASPIRATING OR INJECTING MUSCULOSKELETAL TISSUES

ASPIRATING FLUID FOR DIAGNOSTIC OR THERAPEUTIC PURPOSES

In patients in whom sepsis, crystal synovitis or bleeding is the suspected cause of a joint, bursal or tendon sheath lesion, aspiration and analysis of the fluid is essential for diagnosis¹⁻³. In addition, in patients who have poorly defined forms of arthritis, knowledge of the nature of the synovial fluid, particularly the inflammatory cell content, will complement findings from the history and physical examination and help provide the basic framework for diagnosis and treatment. In patients with tense joint or bursal effusions, aspiration of synovial fluid provides prompt relief of pain and permits the patient to move or bear weight on the affected joint. Finally, in hemarthrosis or septic arthritis, the blood and pus within a synovial cavity may be toxic to the joint cartilage and synovial membrane, so evacuation of the fluid is necessary to avoid permanent joint damage. Large articular effusions should be drained as fully as possible to decrease pressure, improve synovial circulation and prevent muscle atrophy.

Synovial fluid should be aspirated into sterile syringes, which are either capped or immediately aliquoted into sterile containers.

INDICATIONS FOR ASPIRATING OR INJECTING JOINTS	
Diagnosis	<ul style="list-style-type: none"> Mandatory if septic arthritis suspected Strongly advised if crystal arthritis or hemarthrosis suspected Differentiation of inflammatory from noninflammatory arthritis Imaging studies – arthroscopy and arthrography Synovial biopsy
Therapy	<ul style="list-style-type: none"> To remove tense effusions to relieve pain and improve function To remove blood or pus from a joint For injection of corticosteroids and other intra-articular therapies For tidal lavage of joints

Fig. 1 Indications for aspirating or injecting joints.

Anticoagulants can help avoid the formation of fibrin clots, making the fluid easier to handle and assisting in analyses of the cellular content. If unusual or chronic infections are suspected it may be prudent to inoculate some of the fluid into appropriate growth media (such as chocolate agar for gonococcal infections) immediately after aspiration. The fluid should be inspected for the presence of blood and to see how opaque it is, which is a rough guide to cell content. Three laboratory investigations should then be carried out on all fluids aspirated for diagnostic purposes:

- the total and differential cell count,
- examination for organisms (gram stain, culture, etc.),
- polarized light microscopy for the presence of urate or pyrophosphate crystals.

As crystal synovitis and infections can coexist it is never wise to rely on one of these investigations alone. The cellular content is indicative of the type of arthritis (Fig. 2). Other special investigations that can be of value include cytology and the assay of a variety of biochemical markers of connective tissue turnover, such as products of the synthesis and degradation of cartilage aggrecan.

PRACTICAL PROCEDURE AND AFTERCARE

Technical considerations

Some joints are easier to enter than others. There is a rank order of technical difficulty in which knee aspiration stands as the easiest procedure and sacroiliac joint injection^{4,5} as the most difficult. Because sacroiliac joint injection, facet joint injection⁶ and epidural block⁷ fall in the specialism of interventional radiology they are not discussed further in this chapter.

SYNOVIAL FLUID FINDINGS				
	Normal	Osteoarthritis	Rheumatoid and other inflammatory arthritis	Septic arthritis
Gross appearance	Clear	Clear	Opaque	Opaque
Volume (ml)	0–1	1–10	5–50	5–50
Viscosity	High	High	Low	Low
Total white cell count/mm ³	<200	200–10,000	5000–75,000	>50,000
% Polymorphonuclear cells	<25%	<50%	>50%	>75%

Fig. 2 Knee joint synovial fluid findings in common forms of arthritis.

The procedure

Aspiration or injection of joints or soft tissues is an outpatient procedure that does not require specialized equipment (see Fig. 3). Universal precautions must be followed during the procedure; gloves are recommended and required by medical practice regulations in many countries.

The patient should be placed in a comfortable supine or recumbent position (in case of possible fainting, as well as to aid relaxation), and the procedure must be fully explained. Prior to cleaning the skin, bony and other landmarks need to be identified by palpation and the needle site marked in some way, such as with a thumbnail imprint in the skin. The skin must then be carefully cleaned with antiseptic agents. For local anesthesia, the skin and subcutaneous tissues can be infiltrated down to the level of the periarticular lesion or joint capsule using 1% lidocaine (lignocaine) without epinephrine (adrenaline) and a small-bore needle. However, physicians experienced with the procedure often prefer to use topical ethyl chloride or no anesthetic at all. This is often appropriate for joint aspiration, as it is difficult to anesthetize the capsule, so a single, simple, quick needle thrust may be much less painful than the local anesthesia. With the proper technique, the needle passes freely through the extra-articular tissues and a 'pop' is felt as the needle enters the joint. The ease with which fluid can be withdrawn depends on the needle size used, viscosity of the fluid, extent of synovitis and presence of any fibrin clots or 'rice bodies' in the joint fluid. Free flow of fluid is often suddenly interrupted due to clogging of the needle end by the synovial membrane or debris. Rotating the needle, withdrawing it slightly or even re-injecting a little of the fluid will often help unclog the needle and allow additional fluid to be withdrawn. If corticosteroids or other substances are to be injected, this can be done through the same needle, but removing the aspirating syringe from the needle hub may be difficult and require forceps.

EQUIPMENT REQUIRED FOR JOINT AND SOFT TISSUE INJECTIONS	
Skin preparation	Antiseptic solution (povidone-iodine), alcohol swabs, 4 × 4 gauze pads
Local anesthetics	1% lidocaine
Needles	23–27 gauge needles for local anesthetic; 18 gauge for large to moderate size joints (knees, shoulders, ankles, etc.); 23–25 gauge for small joints (wrists, MCP's, etc.)
Syringes	3 or 5ml syringe for anesthetic-steroid injection and 10–50ml syringe for fluid aspiration
Miscellaneous	Gloves; forceps for removing needles from syringe; specimen tubes/plates for cultures and fluid studies

Fig. 3 Equipment required for joint and soft tissue injections. All of the required supplies should be assembled in advance. Very importantly, the needle should be long enough to reach the intended place and have a caliber adequate to the nature of the fluid. While standard needle lengths work well in thin patients, longer needles and even a spinal needle may be required in obese patients. Purulent effusions require #18 or #16 needles. A failure to fully drain a septic joint indicates large debris or loculation and calls for tidal lavage (*vide infra*), arthroscopy or arthrotomy.

At the end of any procedure, the needle should be swiftly withdrawn, and light pressure put on the needle site of the skin. The application of a simple adhesive plaster for a few hours afterwards is all that is usually required thereafter.

Aftercare

There is a great deal of variation in the advice given to patients after aspiration or therapeutic injection of joints or soft tissues. Some doctors give no specific instructions, others recommend a prolonged period of rest to help facilitate the best possible therapeutic response. In most cases, it is sensible for patients to rest the affected joint for 24–48 hours after a therapeutic injection, to minimize leakage of the therapeutic agent and improve the anti-inflammatory response. However, this advice must depend on the patient's circumstances.

CONTRAINDICATIONS AND COMPLICATIONS

CONTRAINDICATIONS

There are few absolute contraindications to joint or soft tissue aspirations and injections; if infection is suspected then fluid should always be aspirated from a joint. In other indications, the procedures should probably be avoided if there is infection of the overlying skin

or subcutaneous tissues or if bacteremia is suspected. The presence of a significant bleeding disorder or diathesis, such as a patient receiving anticoagulant therapy or with severe thrombocytopenia, may also preclude joint aspiration. However, if it is deemed necessary for diagnosis or therapy, the procedure may be carried out after an injection of factor VIII in a hemophiliac for example, or with other appropriate cover for the bleeding disorder. Aspiration of a joint with a prosthesis in it carries a particularly high risk of infection, and is often best left to surgeons using full aseptic techniques.

Lack of response to previous injections may be a relative contraindication to therapeutic injections and, if there is any suspicion of infection being the underlying cause of the musculoskeletal problem, corticosteroids must not be injected, for fear of exacerbating the infection.

COMPLICATIONS

There are surprisingly few complications of these procedures. The most significant issue is the risk of infection, and care must always be taken to use sterile 'no-touch' techniques, as well as avoiding corticosteroids in those who could have existing sepsis. It is estimated that the risk of a septic arthritis following aspiration or corticosteroid injection is in the order of 1 per 15,000 procedures⁸. Patients who have severe immunodeficiency problems, as well as those with implants, may be at greater risk.

Other complications can arise from misplaced injections. The best described problem is tendon rupture following corticosteroid injections for tendinitis. The risk can be minimized by avoiding injection into the tendon itself, and no therapeutic agent should be injected against any unexpected resistance. Occasionally nerve damage can also result from a misplaced injection, for example median nerve atrophy following attempted injections for a carpal tunnel syndrome.

CORTICOSTEROID INJECTIONS

Corticosteroid injections are frequently used to achieve local anti-inflammatory activity. The indications for their use include the presence of persistent inflammation at a single site in the absence of a contraindication, such as suspicion of infection (see below). Synovial joints and other cavities should generally be injected with a long-acting, crystalline form of corticosteroid such as triamcinolone hexacetonide or acetate. These agents are taken up by the synovial lining cells, allowing continued local release into the targeted area. Only a relatively small proportion escapes into the general circulation but, during the first 24 hours after injection, patients may experience flushing or other evidence of a corticosteroid 'pulse'. For periarticular injections, particularly subcutaneous bursae and de Quervain's tenosynovitis, methylprednisolone acetate should be used, as the more potent triamcinolone hexacetonide is likely to induce skin atrophy. Local anesthetic is sometimes mixed with corticosteroids for

such injections. In the case of some periarticular lesions, for example rotator cuff lesions around the shoulder, this can have the advantage of confirming the correct placement of the injection, as the local anesthetic should result in almost immediate relief of the problem if the injection is correctly placed.

Corticosteroid doses vary with the structure injected. For each of the described procedures below a dose range is shown based on the use of methylprednisolone acetate 40mg/ml. If the more potent triamcinolone hexacetonide 20mg/ml is used, the lower figure of the range should be chosen.

Corticosteroid injections are used in joints, bursae, tendon sheaths and entheses⁹. Some of these procedures are easy to perform while others are technically demanding or have dubious results. The simple procedures include infiltrations for trigger finger^{10,11}, carpal tunnel syndrome^{12,13}, ganglia, olecranon bursitis^{14,15}, rotator cuff tendinitis, trochanteric bursitis, anserine¹⁶ bursitis and 'trigger points'. The technically demanding group includes injections for de Quervain's tenosynovitis^{17,18}, lateral epicondylitis (tennis elbow)¹⁹, medial epicondylitis (golfer's elbow), suprascapular nerve block²⁰ (see Chapter 2.13), iliopsoas bursitis²¹, ischial 'bursitis', Achilles tendinitis, retrocalcaneal bursitis²², plantar fasciitis, posterior tibialis tenosynovitis and Morton's neuroma²³. Intracavitary position of the needle can be ascertained by withdrawing some articular fluid or checking to see if the cavity distends as fluid is injected. In the soft tissues, correct positioning may be ascertained by elimination of pain by a preceding lidocaine infiltration. Rest of the injected site for 48 hours following the procedure is generally recommended. Additional rest may lead to better results and should be considered under special circumstances.

COMPLICATIONS OF CORTICOSTEROID INJECTIONS AND INFILTRATIONS

Facial flushing. Very common, occurring in perhaps 40% of cases. Transient and inconsequential, it may nevertheless worry patients who have not been warned.

Postinjection flare. Corticosteroid crystal-induced synovitis occurs in about 5% of intra-articular injections. Pain appears several hours following the procedure and may last from a few hours to 1 day. Persisting pain and mounting swelling may indicate missed or iatrogenic infection; these joints should be re-aspirated for gram stain and aerobic and anaerobic cultures. Tennis elbow infiltrations are often followed by protracted pain, which may last several weeks. Repeated tennis elbow infiltrations are believed to contribute to the development of chronic pain.

Skin atrophy. This is a frequent complication of superficial infiltrations and olecranon bursa injections. The condition is characterized by cigarette paper-like skin, recurrent ecchymosis and chronic pressure pain. Post-injection atrophy is more likely to develop in elderly individuals.

Skin hypopigmentation. Superficial corticosteroid infiltrations such as

those used in de Quervain's tenosynovitis often cause a hypopigmented patch which may be quite disfiguring in people with dark skin. The condition resolves in a few months to 2 years.

Infection. This is an extremely rare complication of corticosteroid injections, except for injections in the olecranon bursa. Postinjection septic bursitis may occur from exacerbation of a missed infection (infections of superficial bursae may be quite subdued) or may be caused by contamination of a sterile bursa through the needle track. The skin at the elbow tip has little recoil. Taps made at the bursal apex, where the skin is maximally stretched, often create a leaking point that may act as a portal of entry.

Tendon rupture. A ruptured tendon following a corticosteroid injection may indicate abuse of the procedure, intratendinous injection or coincidental rupture caused by the very condition that lead to the injection. Athletes who have received multiple infiltrations around the Achilles' tendon are at a high risk of tendon rupture. Conditions that lead to spontaneous tendon rupture include dorsal wrist tenosynovitis and posterior tibialis tenosynovitis in rheumatoid arthritis (RA), chronic subacromial impingement damaging the rotator cuff and the long biceps tendon, senile changes in the supraspinatus or long biceps tendon, chronic corticosteroid use, fluoroquinolone-induced tendinitis, uremia, hyperparathyroidism and systemic lupus erythematosus.

Corticosteroid arthropathy. Abuse of intra-articular injections may result in a Charcot's-like arthropathy similar to the one described in calcium pyrophosphate crystal deposition disease (see Chapter 8.16).

Osteonecrosis. This is a reported complication of abused articular or soft tissue corticosteroid infiltrations.

Corticosteroid-induced osteoporosis. Patients who have been serially injected, for recurrent tendinitis, for example, are at an enhanced risk of osteoporosis during the injection period, particularly if additional factors are present such as prolonged bed rest or a low calcium intake. Intra-articular corticosteroids are said to have less effect on bone than do oral corticosteroids²⁴. However, the relative safety of the intra-articular route has not been shown in clinical trials.

Other systemic complications. Corticosteroid injections cause transient pituitary inhibition, lasting up to several days. Serial infiltrations may cause adrenal suppression.

ASSOCIATED PROCEDURES

A number of other agents apart from corticosteroids have been used for intra-articular or periarticular therapy via injection. Examples include the radioactive colloids such as yttrium-90, which can irradiate the synovium to achieve a form of chemical synovectomy, other sclerosing agents and long-acting local anesthetics, sometimes used alone to help sort out the origin of musculoskeletal pain.

There are a number of other procedures outlined in Chapters 2.13 and 2.14 that may require joint puncture, which include:

- **Imaging joints with contrast agents:** injection of contrast agents with or without air can help image soft tissue and cartilage lesions in joints using radiography (arthrography).
- **Joint lavage:** tidal lavage of joints with saline, through a simple percutaneous cannula, or during arthroscopy can result in lasting relief of pain and inflammation in chronic arthritis.
- **Synovial biopsy:** synovial biopsy can be of diagnostic value, and is essential for the diagnosis of pigmented villonodular synovitis and other neoplastic lesions, as well as sometimes being necessary to diagnose chronic infections such as tuberculosis and foreign body synovitis. This can be done percutaneously, using a 'Parker Pearson' needle, or through arthroscopy.
- **Needle arthroscopy and 'chondroscopy':** full arthroscopic examination and surgery is largely the province of the orthopedic surgeon. However, arthroscopic examination of some joints, especially the knee, can be carried out under local anesthesia, particularly if modern small-bore arthroscopes (needlescopes) are used. This can be of value in examining the synovium and cartilage (chondroscopy) and in joint lavage, as well as allowing biopsy under direct vision.

THE WRIST AND HAND

FINGER AND METACARPOPHALANGEAL JOINTS

Indications. Injection in RA, psoriatic arthritis, active Bouchard's nodes.

Corticosteroid dose. 10–15mg methylprednisone (no. 25 or no. 27 needle).

Approach. Dorsolateral with the digit in semiflexion (see Figs 12.4 & 12.5). Corticosteroid injection produces circumferential distention of the joint. Multiple joints may be injected in one session.

Precautions. Do not overdistend joint(s). Fluid has a tendency to back up; keep firm pressure with a sterile gauze for at least 5 minutes following the procedure.

Complications. Joint hyperlaxity, capsular calcification (frequent but inconsequential).

FLEXOR TENDON SHEATHS

Indications. Injection in trigger finger; flexor tenosynovitis in RA, psoriatic arthritis.

Corticosteroid dose. 15–20mg methylprednisone mixed with 1–2ml lidocaine (no. 25 or no. 27 needle or no. 23 butterfly).

Approach. Just distal to palmar crease of thumb, proximal palmar crease (index), distal palmar crease (long, ring and little fingers) with needle held at a 45° distal inclination (Fig. 6).

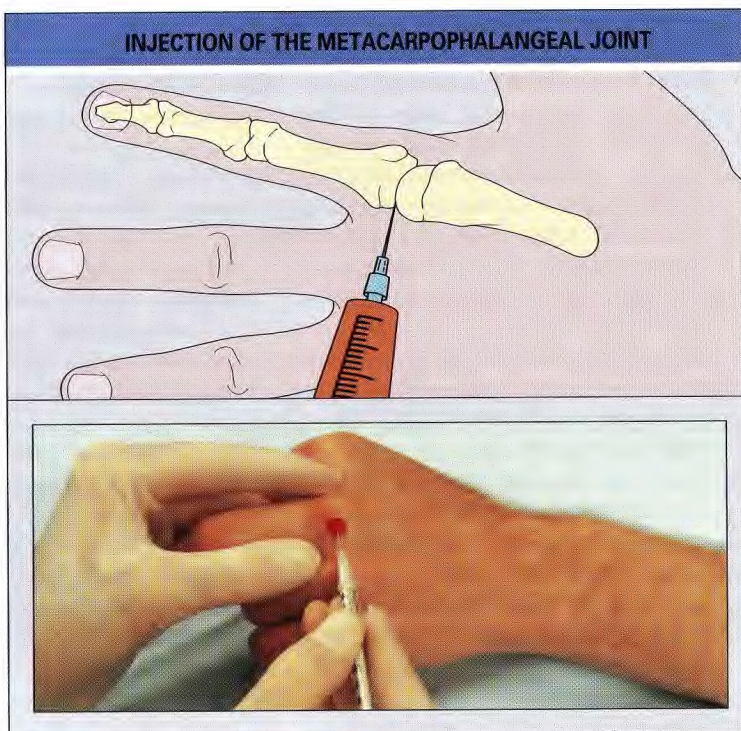


Fig. 4 Injection of the metacarpophalangeal joint.

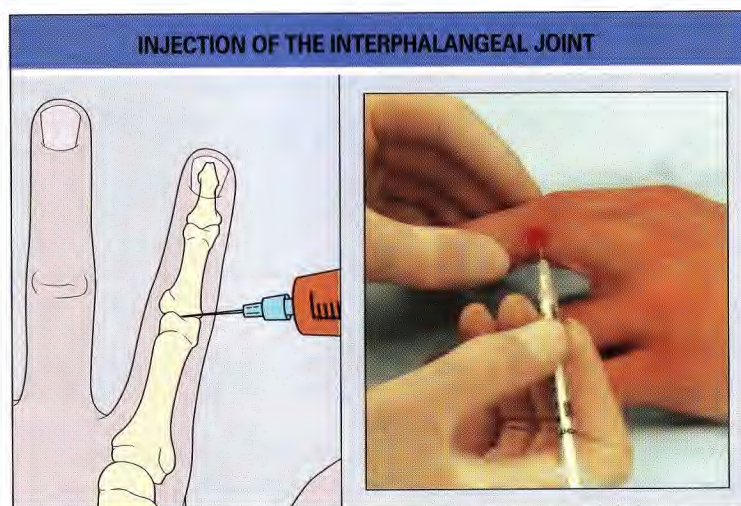


Fig. 5 Injection of the proximal interphalangeal joint.

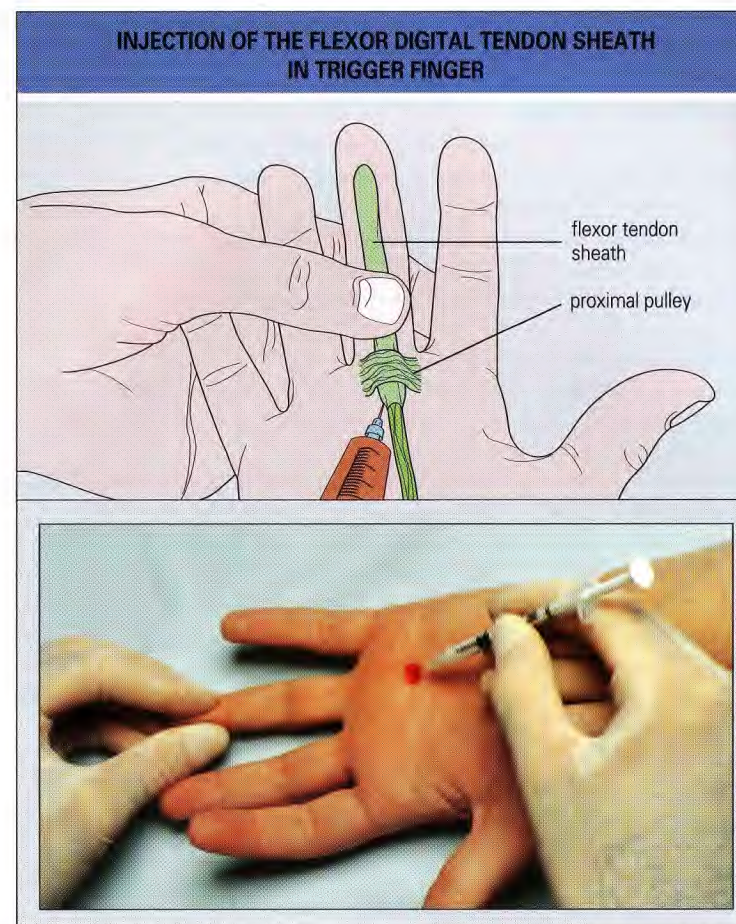


Fig. 6 Injection of the flexor digital tendon sheath in trigger finger.

Precautions. Avoid intratendinous injection. Reciprocal needle movements upon gentle finger motion indicate tendon engagement; back up by the millimeter, free the needle and inject. Up to three injections given 3 weeks apart are allowed.

Complications. Superficial extravasation may produce asymptomatic focal palmar fat atrophy. Large published series comment on a lack of tendon rupture and iatrogenic infection.

DE QUERVAIN'S TENOSYNOVITIS

Indications. Most instances of inflammation of the common sheath of the abductor pollicis longus and extensor pollicis brevis result from hand overuse. Corticosteroid injections are highly successful in these cases.

Corticosteroid dose. 20–30mg methylprednisolone acetate (no. 25 needle).

Approach. The needle is aimed towards the radial styloid, which underlies the sheath. The needle is then pulled back by the millimeter and injection is attempted. Successful injection distends the sheath distally to the metacarpal base.

Precautions. Make sure that the corticosteroid remains within the sheath. Do not infiltrate grossly thickened sheaths, as mycobacterial infection may be present.

Complications. As mentioned previously, skin hypopigmentation frequently complicates this procedure. Skin atrophy, leading to recurring ecchymosis, is particularly prevalent in elderly patients.

CARPAL TUNNEL SYNDROME

Indications. Injection treatment is indicated in all etiologies of carpal tunnel syndrome (CTS) except acute cases due to fracture, hemorrhage, infection and CTS of late pregnancy.

Corticosteroid dose. 30–40mg methylprednisone mixed with 2–3ml lidocaine (no. 22 or no. 25 needle or no. 23 butterfly).

Approach. Just distal to the distal wrist crease and just medial to palmaris longus (PL) tendon (Fig. 7). If the PL tendon is absent (25% of people lack the PL tendon), use the midline. The needle is inserted to a depth of 1cm with a 45° distal inclination and a 45° lateral inclination.

Precautions. Paresthesias indicate median nerve engagement; if they occur, reposition the needle. Reciprocal needle motion upon gentle finger motion (which should be rehearsed beforehand) indicates tendon engagement; again, reposition the needle.

Complications. Transient increase of paresthesias.

Note: A properly made resting splint to hold the wrist in the neutral position provides the lowest pressures within the carpal tunnel.

FIRST CARPOMETACARPAL JOINT

Indications. Painful osteoarthritis (OA). The patient presents with a 'square hand' with grating and tenderness at the prominence.

Corticosteroid dose. 15–30mg methylprednisone (no. 23 or no. 25 needle).

Approach. Within the anatomic snuffbox. After localizing the joint line at the base of the first metacarpal, the joint is entered at the anatomic snuffbox between the common sheath of the abductor pollicis longus and extensor pollicis brevis anteriorly and the extensor pollicis longus posteriorly. To optimally expose the joint the thumb is flexed across the palm towards the little finger.

Precautions. Avoid the radial artery. The course of this vessel varies and may encircle the joint line.

Complications. None, as long as the radial artery is avoided.

WRIST

Indications. For diagnosis in acute arthritis. Most cases of acute wrist arthritis are due to calcium pyrophosphate dihydrate pseudogout, gout and septic arthritis. For injection in RA, other sterile synovitis and

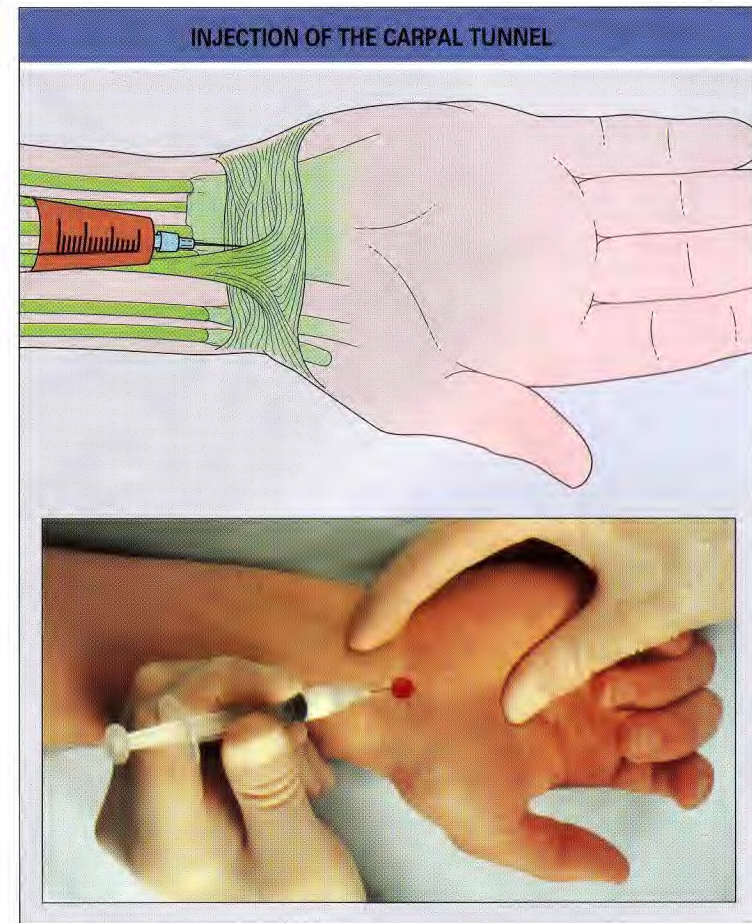


Fig. 7 Injection of the carpal tunnel.

OA such as associated with chondrocalcinosis and hemochromatosis. *Corticosteroid dose.* 30–40mg methylprednisone (no. 23 needle). Aspiration should be attempted before injection. For aspiration alone use a no. 20 or no. 18 needle.

Approach. Dorsal, just distal to Lister's tubercle (a bone prominence in the dorsal distal radius where the extensor pollicis longus bends radially to reach the thumb), just ulnar to the extensor pollicis longus tendon (Fig. 8). The wrist should be slightly palmar flexed to facilitate the procedure.

Precautions. There are no important neurovascular structures of concern at this site.

Complications. None.

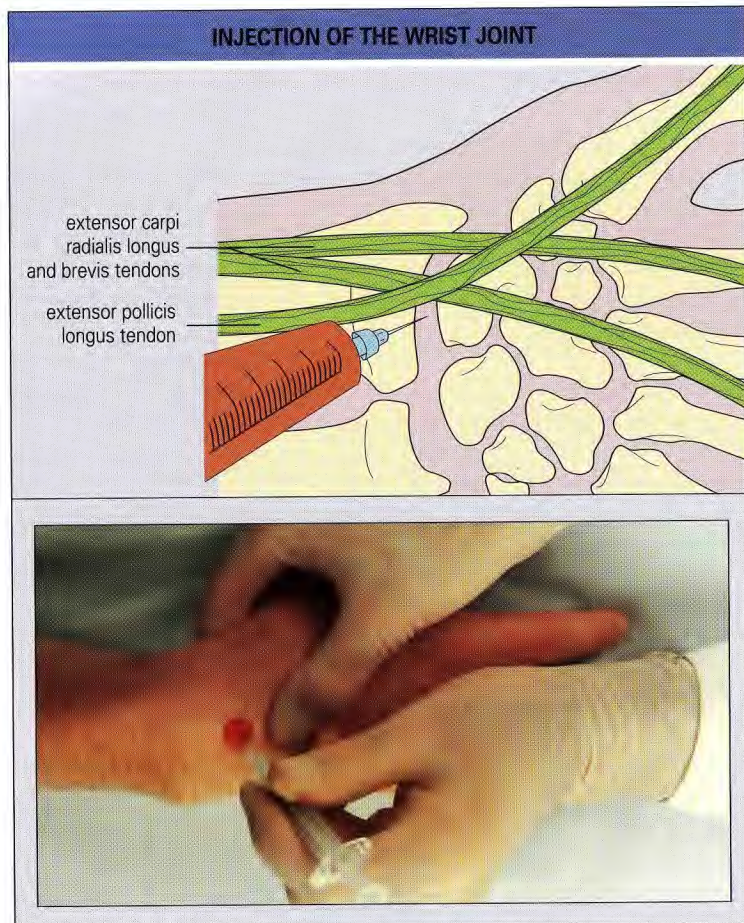


Fig. 8 Injection of the wrist joint.

GANGLIA

Indications. Local corticosteroids are highly effective in the treatment of routine dorsal ganglia. Ganglia within the carpal tunnel, which impinge on neurovascular structures, or that are larger than 3cm in diameter, should be treated surgically.

Corticosteroid dose. Depends on the lesion; usually 15–20mg methylprednisone (no. 20 or no. 18 needle; thinner needles may be clogged).

Approach. The needle is aimed to the center of the lesion, which is aspirated prior to injection. Ganglia contain a very viscous, translucent fluid. Fluids with other characteristics indicate that the lesion is not a ganglion; they should therefore be cultured and inspected for crystals.

Precautions. In wrist ganglia, rule out radial artery aneurysm, which mimics a ganglion. These lesions are expansile with the pulse, as

opposed to the focal pulsation caused by a normal adjacent radial artery.
Complications. None.

THE ELBOW REGION

ELBOW

Indications. Aspiration in acute arthritis, injection in RA and psoriatic arthritis.

Corticosteroid dose. 30–40mg methylprednisone (no. 22 needle). Aspiration should be attempted before injection. For aspiration alone use a no. 20 or no. 18 needle, depending on the suspected diagnosis.

Approach. There are three commonly used entries. For all entries the elbow is held flexed at 90°.

- **Posterior approach.** The depression in the midline between the two halves of the triceps tendon is palpated at the back of the elbow. The needle is then passed perpendicular to the skin into the olecranon fossa (see Fig. 9).

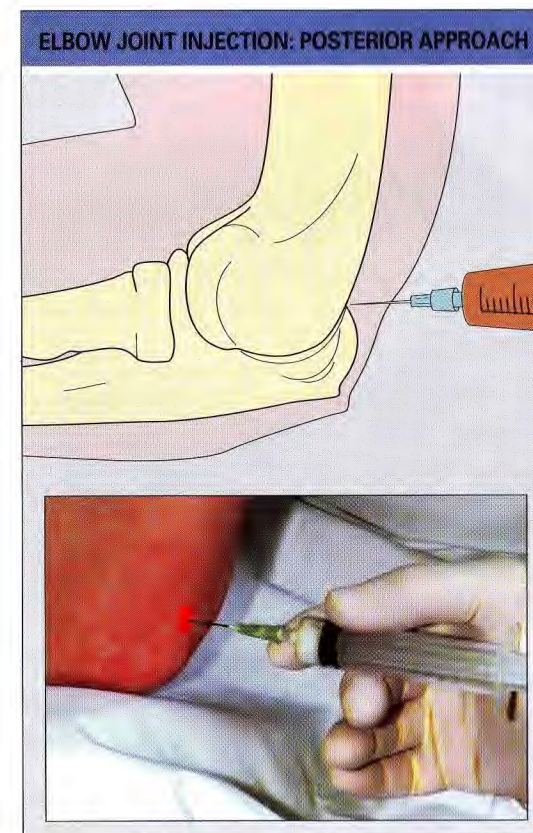


Fig. 9 Elbow joint injection: posterior approach.

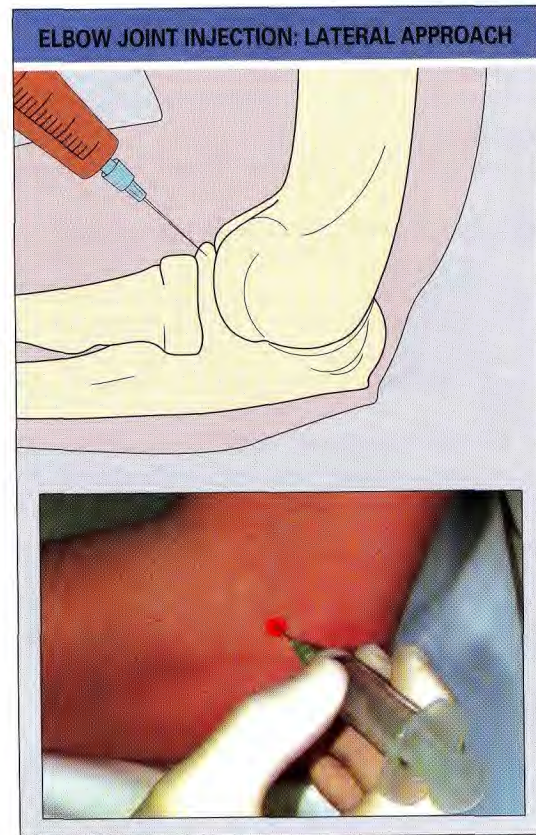


Fig. 10 Elbow joint injection: lateral approach.

- Inferolateral approach. The midpoint cleft between the olecranon tip and the lateral epicondyle is palpated. The needle is then inserted perpendicularly, aiming at the center of the joint.
- Lateral approach. The radiocapitular joint may be entered from the side, just proximal to the radial head. The needle is passed tangentially between the two bones, rather than directly (see Fig. 10).

Precautions. There are no neurovascular structures in the vicinity.

Complications. None.

OLECRANON BURSA

Indications. For diagnosis of effusion and for treatment of aseptic bursitis (traumatic or idiopathic) in cases that are refractory to conservative treatment. A negative bursal fluid culture is required for the procedure to be performed.

Corticosteroid dose. 20mg of methylprednisolone acetate (no. 22 needle). Aspiration should be attempted before injection. For aspiration alone use a no. 20 needle.

Approach. Lateral through normal skin, aiming at the center of the bursa.

Precautions. Taps at the tip of the bursa may create a chronic leak. Medial entries may damage the ulnar nerve.

Complications. Skin atrophy, pain on leaning and septic bursitis are recognized complications of the intrabursal administration of 20mg of triamcinolone hexacetonide¹⁴. The injection of 20mg of methylprednisolone acetate has not caused complications¹⁵.

Note: In traumatic or idiopathic olecranon bursitis conservative treatment is recommended, namely avoiding leaning on the elbow, for 3 months. Intrabursal corticosteroids may be tried in cases that fail to resolve.

TENNIS ELBOW

Indications. Failure of conservative treatment. To speed up recovery in high performance athletes, although this is a controversial procedure.

Corticosteroid dose. 10–20mg methylprednisone (no. 22 needle).

Approach. At the most tender point (Fig. 11). Pass the needle to periosteal contact and infiltrate with 2–3ml lidocaine. Failure to erad-

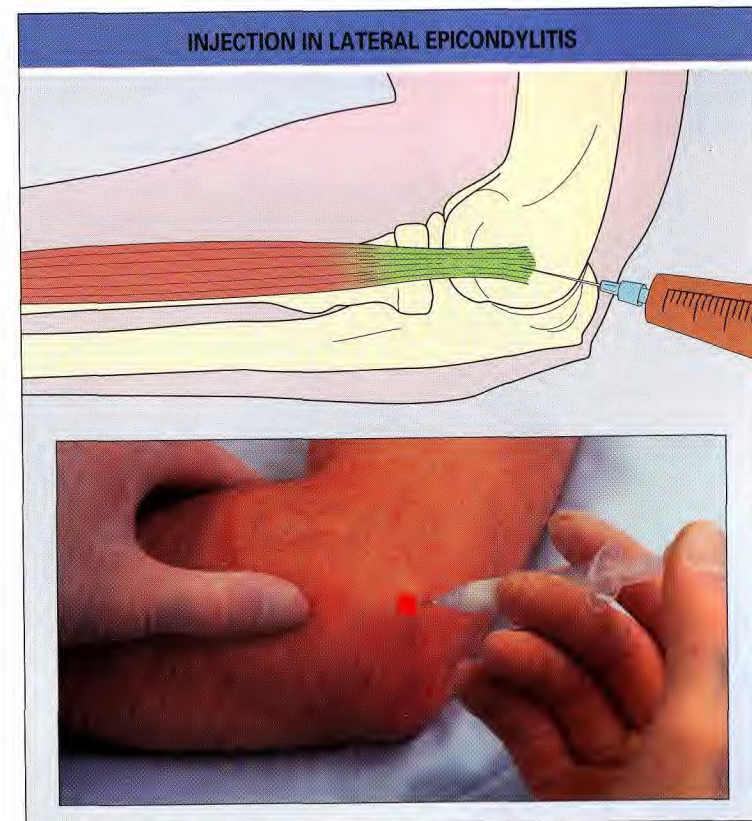


Fig. 11 Injection of corticosteroid and local anesthetic into the common extensor tendon origin at the lateral humeral epicondyle.

icate pain on resisted wrist dorsiflexion indicates the wrong injection site; reposition needle and reinfiltrate with lidocaine. The corticosteroid should be infiltrated deeply, at the tenoperiosteal junction.

Precautions. Avoid injecting too superficially.

Complications. Transient increase in pain in 40% of patients. Repeated corticosteroid infiltrations may result in chronic pain.

Note: The current trend is to be conservative, avoiding infiltrations. Lack of improvement with lidocaine infiltration suggests an alternative diagnosis such as compressive neuropathy of the deep branch of the radial nerve or cervical radiculopathy.

THE SHOULDER REGION

SHOULDER (GLENOHUMERAL JOINT)

Indications. Aspiration in acute arthritis; injection in RA, spondyloarthropathy, the initial stages of frozen shoulder; OA.

Corticosteroid dose. 40–60mg methylprednisone (no. 22 needle).

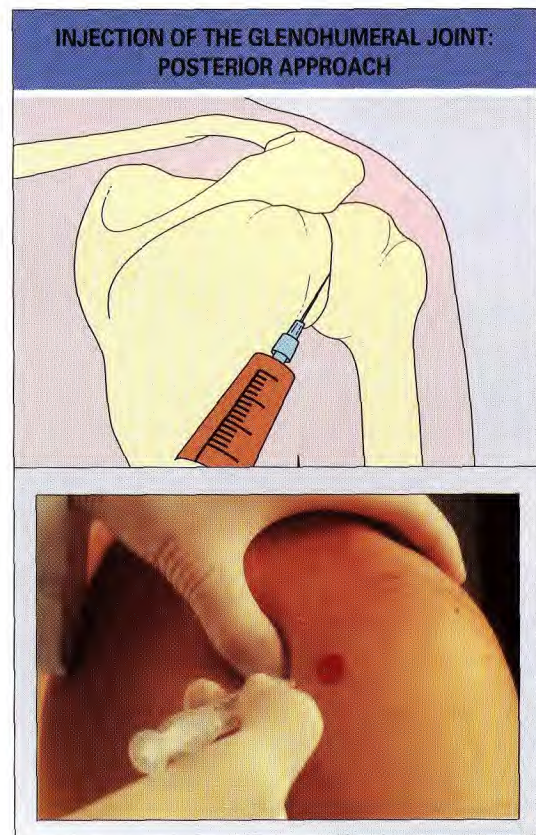


Fig. 12 Injection of the glenohumeral joint: posterior approach.

Aspiration should be attempted before injection. In the frozen shoulder, injection into the joint may be difficult on account of the capsular restriction. For aspiration alone use a no. 20 or larger needle.

Approach. Two entries are described, the posterior approach, which is often preferred because it causes less apprehension and pain, and the needle is farther away from neurovascular structures, and the anterior approach.

- Posterior approach. The patient should be sitting. The posterior margin of the acromion is palpated. The needle is then inserted posteroanteriorly 1cm below and 1cm medial to posterior corner of the acromion, aiming towards the coracoid process until bone is touched at the articular space (Fig. 12.12).
- Anterior approach: Again, the patient should be sitting (landmarks are lost in the recumbent position) with the arm hanging at the side of the body, elbow flexed 90°, and forearm in the sagittal plane. The needle is entered anteroposteriorly 1cm distal and 1cm lateral to the coracoid process (Fig. 13). Prior to each advancement of the needle some lidocaine is injected, so the needle is moving through

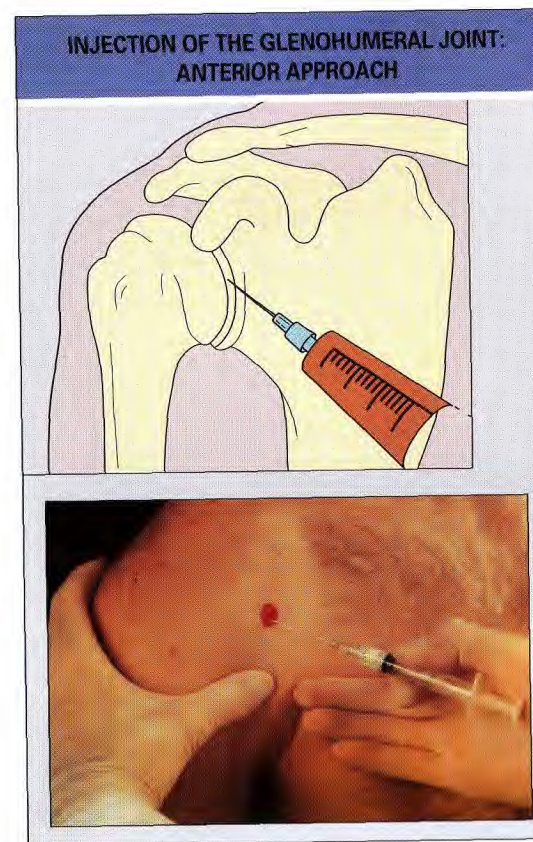


Fig. 13 Injection of the glenohumeral joint: anterior approach.

an anesthetized front. Once the bone is touched (which happens soon after the capsular toughness is felt) the forearm is very gently and passively brought into internal rotation as the needle is pushed into the articular space.

Precautions. Use a chair with armrests, have an assistant present, watch for fainting.

Complications. Vasovagal syndrome. Prior to the procedure patients should be asked about previous fainting upon venipuncture or other minor procedures. Any such experience dictates a posterior approach. Misplaced anterior injections may encounter neurovascular structures.

Note: Glenohumeral joint aspiration may be difficult. In cases of acute arthritis in which a 'dry tap' results, the procedure should be repeated under fluoroscopic or echo control.

SUBACROMIAL BURSA

Indications. Injection may be indicated in subacromial impingement and some cases of calcific tendinitis.

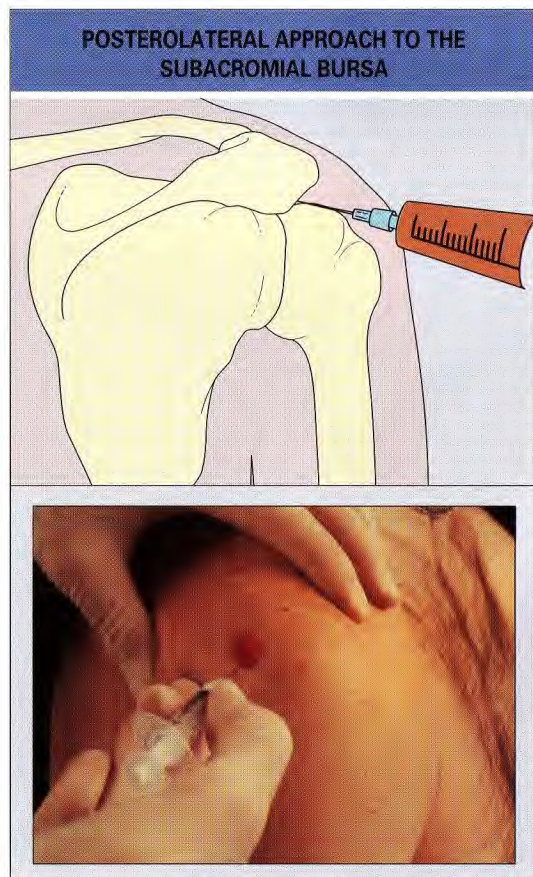


Fig. 14
Posterolateral
approach to the
subacromial bursa.

Corticosteroid dose. 30–40mg methylprednisone (no. 22 or no. 25 needle).

Approach. There are several possible entries. Two are described here, the posterolateral approach and the anterior approach. Adequate muscle relaxation is important, as it allows a better palpation of the gap between the acromion and humeral head.

- **Posterolateral approach.** The needle is aimed anteromedially ensuring that it passes under the acromion (Fig. 14). Easy flow indicates bursal injection.
- **Anterior approach.** A front of lidocaine is required in this approach. The needle is aimed anteroposteriorly flush with the inferior surface of the acromion, 1cm lateral to the acromioclavicular joint (see Fig. 15). Once the tough coracoacromial ligament is passed, tissue resistance to the lidocaine ceases. Easy flow indicates a bursal location of the needle.

Precautions. Use a chair with armrests, have an assistant present, watch for fainting.

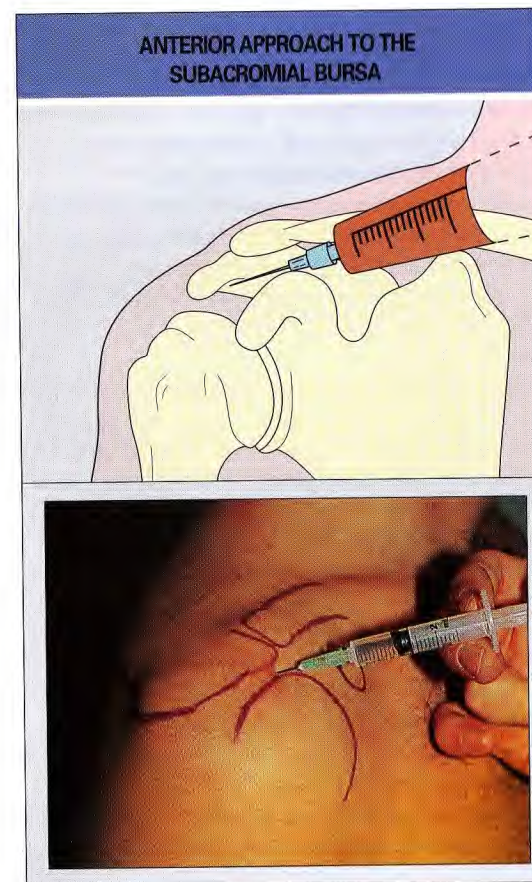


Fig. 15 Anterior
approach to the
subacromial bursa.

Complications. None.

Note: Subacromial bursa injections are technically difficult. Only about 50% of injections fall on target. However, even if the bursal sac is not entered, the results may be excellent.

ACROMIOCLAVICULAR JOINT

Indications. Aspiration in acute arthritis, injection in OA, RA and spondyloarthropathy.

Corticosteroid dose. 10–20mg methylprednisone (no. 23 butterfly or no. 22 needle). Aspiration should be attempted before injection. For aspiration alone use a no. 20 needle.

Approach. Aim the needle perpendicular to the articular cleft; advance it by 0.5cm; aspirate or inject to distend joint.

Precautions. The procedure is difficult because the acromioclavicular (AC) joint is very narrow and has a partial meniscus. Septic AC arthritis should be suspected in drug addicts and in patients who have, or have recently had, an indwelling subclavian catheter. If sepsis is suspected, corticosteroids should not be injected.

Complications. None.

BICIPITAL TENDINITIS

Indications. Bicipital tenosynovitis. This is a tenuous indication, as most cases of bicipital tendinitis are caused by subacromial impingement, which is best treated by subacromial bursa injection.

Corticosteroid dose. 15–20mg methylprednisone (no. 22 or no. 25 needle).

Approach. The bicipital tendon should be palpated and a mark made on the skin. The needle is then directed somewhat superiorly, tangentially to the tendon (Fig. 16). A deeper injection is also possible if easy flow of fluid is obtained.

Precautions. Inject under low pressure.

Complications. The integrity of the biceps tendon may be already compromised by the usual underlying condition, subacromial impingement. Thus, the relatively common postinjection ruptures may reflect this underlying damage as much as a direct effect of the corticosteroid on the tendon. This is the reason why the author does not favor direct injection of the bicipital tendon sheath.

THE SPINE

INTERSPINOUS LIGAMENTS

Indications. Reactive arthritis, ankylosing spondylitis with interspinous ligament enthesopathy.

Corticosteroid dose. 15–20mg methylprednisone (no. 22 needle).

Approach. Posteroanterior at the midline between the vertebral spinous processes; infiltrate ligament and its attachments. Several levels may have to be treated.

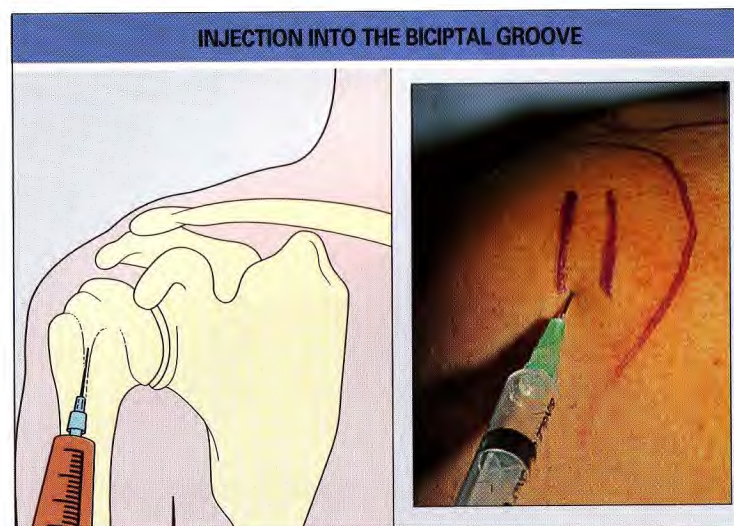


Fig. 16 Injection into the bicipital groove.

Precautions. This is an intraligamentous infiltration and a fair amount of pressure is required. There is no need to infiltrate deeper than 1.5cm; this precaution should keep the needle away from the dural sac.

Complications. None.

THE HIP REGION

HIP

Indications. Diagnosis of septic arthritis of the hip, including the differential diagnosis of septic arthritis versus aseptic loosening in a prosthetic hip.

Corticosteroid dose. None: the procedure is performed strictly for diagnosis.

Approach. Hip aspiration is performed with the patient lying supine and the affected leg in external rotation. The femoral neck projection follows a line bisecting the angle between the inguinal ligament and the femoral artery. The needle is inserted cephalad medially, one finger breadth lateral to the femoral artery and two finger breadths distal to the inguinal ligament (Fig. 17).

Precautions. The danger of injuring the femoral neurovascular bundle is averted by using an imaging procedure as control.

Complications. None.

Note: Hip aspiration belongs in the realm of orthopedics and radiology. The yield of the procedure can be maximized by using fluoroscopic, ultrasound or computed tomography (CT) guidance.

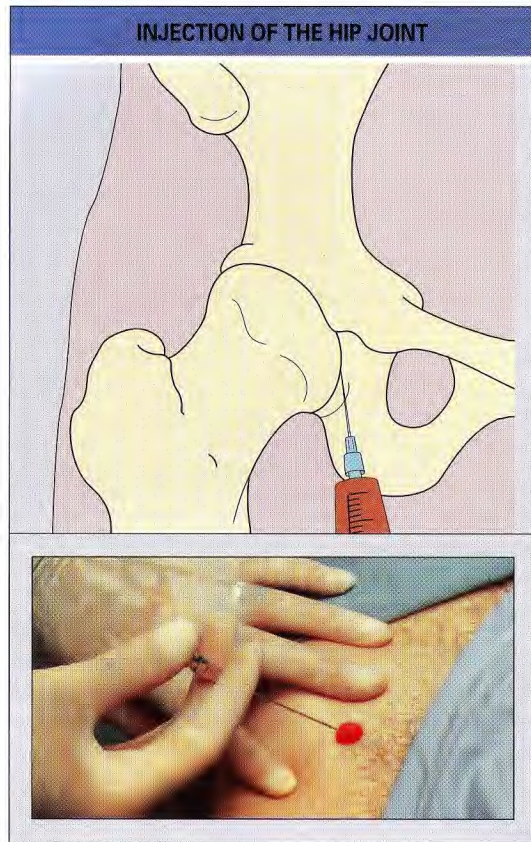


Fig. 17 Injection of the hip joint.

ILIOPSOAS BURSA

Indications. Painful iliopsoas bursitis.

Corticosteroid dose. 30–40mg methylprednisone mixed with 3ml of 1% lidocaine (no. 22 needle). Aspiration should be attempted before injection.

Approach. As for hip aspiration. Once the femoral head is contacted, the needle is withdrawn by the millimeter and small amounts of a contrast medium are injected until the iliopsoas bursa is outlined. At this time the corticosteroid is injected.

Precautions. The use of a contrast medium is essential for injecting intrabursally, rather than within the joint or in more superficial planes.

Complications. None.

TROCHANTERIC 'BURSA'

Indications. Trochanteric 'bursitis' syndrome.

Corticosteroid dose. 30–40mg mixed with 3ml of 1% lidocaine (no. 22 1.5 inch needle; a spinal needle may be required in obese patients).

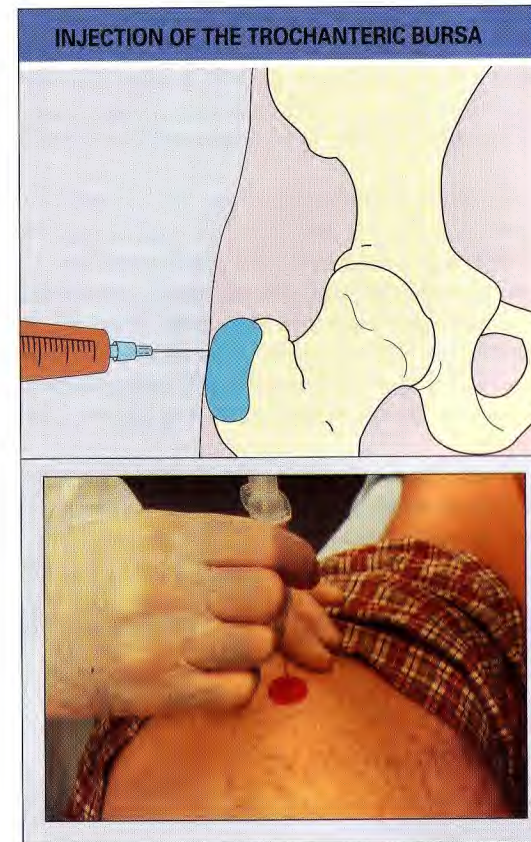


Fig. 18 Injection of the trochanteric bursa.

Approach. With the patient lying on his or her opposite side, the greater trochanter is identified by distal to proximal palpation along the femur. The point of maximal tenderness is usually located at the posterior corner of the greater trochanter. The needle is inserted vertically to make periosteal contact (Fig. 18).

- Step 1. Lidocaine should then be infiltrated radially to cover the base of a cone 3cm in diameter, half on bone and half in the proximal soft tissues.
- Step 2. If pain is relieved, the mixture of corticosteroid and lidocaine is infiltrated in the same area. Experienced physicians may skip Step 1.

Precautions. The needle should be of sufficient length to reach the bone.

Complications. None.

Note: Rather than bursitis, this process represents a stress enthesopathy at the gluteus medium and minimus insertion. The cause of the excessive pull should be sought (foot, knee, hip or back disorder, a discrepancy leg length) and addressed to achieve sustained relief.

THE KNEE REGION

KNEE

Indications. For diagnosis in any joint effusion. For corticosteroid injection in RA, spondyloarthropathies, OA, occasionally in crystal-induced synovitis.

Corticosteroid dose. 40–60mg methylprednisone (no. 22 needle). Aspiration should be attempted before injection. For aspiration alone use a no. 20 or no. 18 needle, depending on the clinical suspicion.

Approach. Medial, aiming needle to the patellar undersurface mid-distance between the upper and lower poles of the patella (Fig. 19). A medial approach is preferred because the lateral patellofemoral cleft is narrower than the medial and the joint capsule is tougher laterally than medially. There are, however, many possible entries to the knee and the choice is very personal.

Precautions. Beware of superimposed septic arthritis in RA patients. Postpone the injection of an acutely inflamed joint until a negative synovial fluid culture result becomes available.

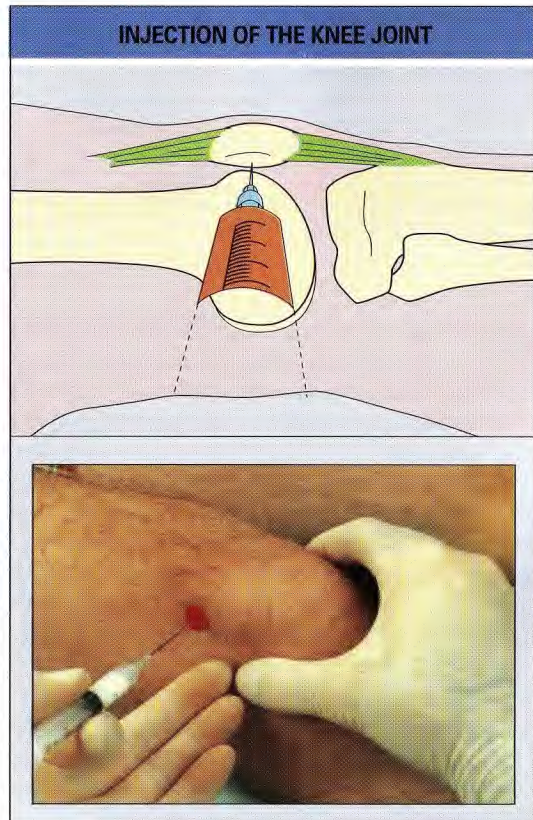


Fig. 19 Injection of the knee joint.

Note: If SF analysis has not been performed any fluid removed during the procedure should be studied for cell count, differential, crystals, and culture. Because corticosteroid crystals remain in joints for weeks and even months an erroneous diagnosis of gout or pseudogout can be made in a previously injected patient.

Complications. None.

BAKER'S CYST

Aspiration or injection of the cyst is unnecessary. In adults, Baker's cysts develop in connecting gastrocnemius–semimembranosus bursae and depend for their persistence and growth on excessive SF produced in the knee. Baker's cysts are best treated by correcting the causative knee disorder with systemic treatment, corticosteroid injection or surgery such as arthroscopic meniscectomy or synovectomy.

ANSERINE 'BURSITIS'

Indications. The syndrome of anserine bursitis.

Corticosteroid dose. 20–30mg methylprednisone mixed with 2–3ml of lidocaine (no. 22 needle).

Approach. The injection site is best determined by following the medial tendinous border of the thigh, with the knee in semiflexion, to the tibia where a mark is placed. The knee is then brought to extension and the needle is entered perpendicularly to tibial contact. An area 3cm in diameter is infiltrated adjacent to the periosteum.

Precautions. Paresthesias extending along the medial leg indicate engagement of the saphenous nerve; reposition needle.

Complications. None.

Note: Because anserine bursitis is almost always secondary (genu valgum, patellofemoral OA, etc.) the condition is expected to recur unless the primary process has been addressed. A vigorous program of isometric quadriceps exercises should be initiated at once.

THE ANKLE AND FOOT

ANKLE

Indications. As for the knee.

Corticosteroid dose. 40–60mg methylprednisone (no. 22 needle). Aspiration should be attempted before injection. For aspiration alone use a no. 20 needle.

Approach. With the patient supine on the examination table, seek the cleft between tibia and talus by gently flexing and extending the foot. Insert the needle vertically medial to the anterior tibialis tendon (Fig. 20).

Precautions. Avoid the dorsalis pedis artery.

Complications. None.

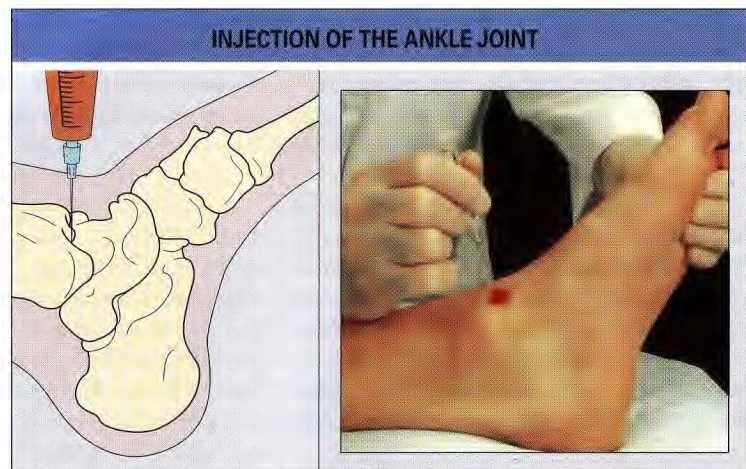


Fig. 20 Injection of the ankle joint.

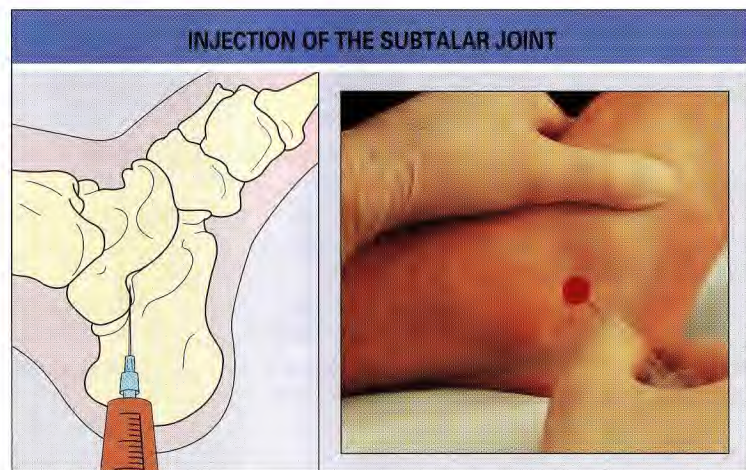


Fig. 21 Injection of the subtalar joint.

SUBTALAR JOINT

Indications. As for the knee.

Corticosteroid dose: 20–30mg methylprednisone (no. 22 needle). Aspiration should be attempted before injection. For aspiration alone use a no. 20 needle.

Approach. By gently inverting and everting the foot find the soft cleft (sinus tarsi) anterior to the lateral malleolus. Insert the needle perpendicularly towards the tip of the medial malleolus (Fig. 21). Aspiration of fluid proves an articular insertion. Inject under low pressure.

Precautions. None.

Complications. None.

POSTERIOR TIBIALIS TENDON SHEATH

Indications. Posterior tibialis tenosynovitis in RA and spondyloarthropathies; tarsal tunnel syndrome.

Corticosteroid dose. 20–30mg methylprednisone (no. 22 needle).

Approach. Patient lies supine with the injected leg resting on the contralateral knee. The needle is inserted perpendicularly, three finger breadths proximal to the tip of the medial malleolus and flush with the posterior surface of tibia to a depth of about 1.5cm. Inject under low pressure. Fluid may be felt distending the sheath.

Precautions. Aspirate first to make sure that the posterior tibial artery has not been punctured. Plantar paresthesias indicate engagement of the posterior tibial nerve. Avoid intratendinous injection by assuring free flow of the corticosteroid. *This procedure should only be performed by rheumatologists, orthopedists or other health professionals with a thorough knowledge of anatomy.*

Complications. The posterior tibialis tendon is prone to spontaneous rupture in RA. A misplaced (intratendinous) injection enhances this tendency.

RETROCALCANEAL BURSA

Indications. Refractory Achilles' tendon enthesitis in the spondyloarthropathies; RA.

Corticosteroid dose. 15–20mg methylprednisone (no. 22 needle or butterfly). Aspiration should be attempted before injection. Presence of fluid (usually a trace) proves intrabursal location. *Do not inject if the intrabursal position of the needle cannot be shown.*

Approach. Patient lies prone on examination table with foot outside mattress. Allow calf relaxation.

- Posterior approach. The needle is advanced vertically, transtendinous, aiming at the posterior superior calcaneal angle. Touch the bone and back up 1mm.
- Lateral approach. An alternative is a lateral approach. Bursal pressures may be decreased by keeping the foot in a slight plantar flexion.

Precautions. Do not inject large volumes; high pressures produce back flow as the needle is removed. The distal leg and foot should be placed in a cast for 10 days to achieve maximal anti-inflammatory effect. *This procedure should only be performed by rheumatologists, orthopedists, or other health professionals with a thorough knowledge of anatomy.*

Complications. Tendon rupture is possible and more than one reinjection is discouraged. A period of 2–3 weeks should elapse between the initial injection and the first (and last) reinjection.

PLANTAR FASCIA ATTACHMENT

Indications. Refractory plantar fasciitis in the spondyloarthropathies.

Corticosteroid dose. 20–30mg methylprednisone diluted with 2ml of lidocaine (no. 22 needle).

Approach. Medial, needle parallel to the plantar skin 2cm deep to plantar surface. Aim the needle into the medial plantar tubercle of the calcaneus. Resilience indicates fascial location. Relocate the needle and inject deeply and superficially to the fibrous fascia.

Precautions. This procedure should only be performed by rheumatologists, orthopedists or other health professionals with a thorough knowledge of anatomy.

Complications. Repeated infiltrations result in fat atrophy and pressure plantar heel pain. Discourage more than one reinjection (2–3 weeks after the initial injection).

MORTON'S NEUROMA

Indications. Morton's neuroma.

Corticosteroid dose. 20–30mg mixed with 1ml lidocaine (no. 22 needle).

Approach. Dorsal between metatarsal heads. The needle must be advanced plantarly about 2cm and pass through the intermetatarsal ligament, which is indicated by tough fibrous resistance.

Precautions. Inject under low pressure. This procedure should only be performed by rheumatologists, orthopedists or other health professionals with a thorough knowledge of anatomy.

Complications. None are expected; up to two reinjections 2–3 weeks apart are allowed.

METATARSOPHALANGEAL JOINTS

Indications. Aspiration for the diagnosis of gout (usually the first metatarsophalangeal). Injection in hallux rigidus, RA and the spondyloarthropathies.

Corticosteroid dose. 10–20mg (no. 22 needle). Attempt aspiration before injection. For aspiration alone use a no. 22 needle.

Approach. Dorsal, lateral or medial to extensor tendon. Slight passive plantar flexion facilitates the procedure (Fig. 22).

Precautions. None.

Complications. None.

TRIGGER POINTS IN THE MYOFASCIAL SYNDROMES

Indications. Acute cases if pressure on a point or nodule consistently reproduces pain.

Corticosteroid dose. 3–5ml of lidocaine or bupivacaine (no. 22 needle). Do not use corticosteroids.

Approach. Aim at a tender point or the center of a nodule, which should be infiltrated radially throughout the indurated area.

Precautions. None.

Complications. None.

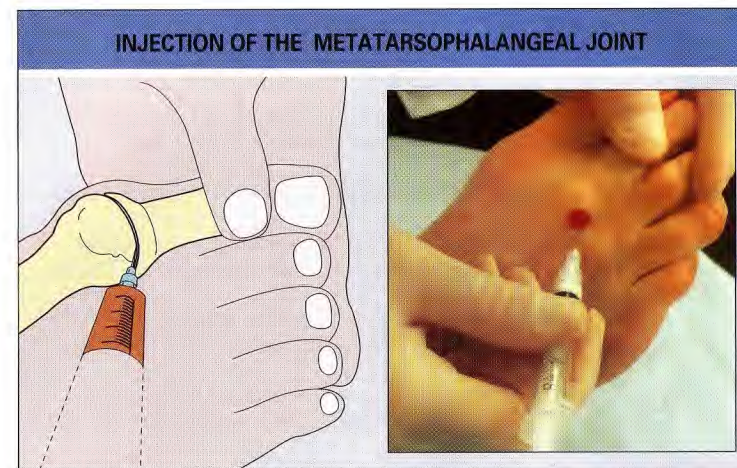


Fig. 22 Injection of the MTP joint.

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Lynton House, 7-12 Tavistock Square, London WC1H 9LB, England.