Corticosteroid injections and arthrocentesis

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ABSTRACT

OBJECTIVE To review current standards of practice of arthrocentesis and corticosteroid injections in soft tissue and joints in managing common musculoskeletal conditions. To outline common indications, contraindications, and possible complications of these therapeutic modalities and to describe common techniques used in them.

QUALITY OF EVIDENCE Many of our recommendations are based on expert opinion and surveys of clinical practice by experts in the field. Where appropriate, randomized controlled trials are used to support various aspects of corticosteroid injection and joint aspiration.

MAIN MESSAGE Many complaints to primary care physicians are musculoskeletal in origin, and many are related to infectious or inflammatory conditions of joints or soft tissues. Arthrocentesis and intra-articular and soft tissue corticosteroid injection are therapeutic techniques readily available to family practitioners. There is no consensus on best practice for patient preparation, choice of corticosteroid, or specific injection technique. There are, however, accepted standards of practice and universal precautions.

CONCLUSION Family physicians have an important role in managing many common musculoskeletal conditions.

RÉSUMÉ

OBJECTIF Passer en revue les normes actuelles de pratique concernant l’arthrocentèse et l’injection de corticostéroïdes dans les tissus mous et les articulations pour la prise en charge des problèmes musculosquelettiques courants. Exposer les indications et les contre-indications habituelles ainsi que les complications possibles de ces modalités thérapeutiques, et décrire les techniques actuellement utilisées.

QUALITÉ DES DONNÉES Plusieurs de nos recommandations se fondent sur l’opinion d’experts et sur des enquêtes auprès de pratiques cliniques expertes en la matière. S’il y avait lieu, des études aléatoires contrôlées étaient utilisées à l’appui de divers aspects de l’injection de corticostéroïdes et de la ponction articulaire.

PRINCIPAL MESSAGE Plusieurs des plaintes présentées aux médecins de première ligne sont d’origine musculosquelettique et plusieurs sont associées à des problèmes infectieux ou inflammatoires des articulations ou des tissus mous. L’arthrocentèse et l’injection intra-articulaire et dans les tissus mous de corticostéroïdes sont des techniques thérapeutiques facilement à la portée des praticiens de la médecine familiale. Les pratiques exemplaires pour la préparation du patient, le choix des corticostéroïdes ou la technique d’injection privilégiée ne font pas l’unanimité. Par ailleurs, il existe des normes acceptées de pratique et des précautions universelles.

CONCLUSION Les médecins de famille ont un rôle important à jouer dans la prise en charge des problèmes musculosquelettiques courants.

This article has been peer reviewed.
Cet article a fait l’objet d’une évaluation externe.
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Musculoskeletal complaints account for a substantial proportion of all primary care visits. Many of these conditions, whether soft tissue or skeletal in origin, can be managed by general practitioners to varying degrees based on their level of comfort and training in dealing with such conditions. Joint aspiration (arthrocentesis) and intra-articular and soft tissue corticosteroid injection are important tools in both diagnosis and therapy of many common musculoskeletal problems encountered in primary care.

Many of these techniques, while perhaps considered within the realm of orthopedists' or rheumatologists' practice, are in fact accessible to GPs and can be used readily for appropriately selected patients with great success. Corticosteroid injection has long been an accepted intervention in managing specific inflammatory conditions of the musculoskeletal system. It is important to understand that it is used (in most cases) as adjunctive therapy for treating a particular condition.

Corticosteroid injection has been referred to as a bridge, providing immediate relief from symptoms while more definitive, disease-modifying therapy is being instituted. For the most part, corticosteroid injection should be thought of as having little effect on the disease process, although several subprimatine animal studies have indicated that this might not be the case.

Overuse of steroid injection in the past, lack of familiarity with the procedure, and the ever-present concern about complications has meant that intra-articular and soft tissue steroid injection is often rejected in favour of continued systemic treatment with nonsteroidal anti-inflammatory drugs. The potential complications of this approach to management of inflammatory conditions, however, have been documented. Fortunately, such complications have become less of a problem since the introduction of cyclooxygenase-2 inhibitors.

Despite long use of aspiration and injection in clinical practice, no consensus on such matters as patient preparation, injection and aspiration techniques, or choice of corticosteroid exists. There are, however, certain accepted precautions and recognized standards of practice readily accessible to GPs that facilitate effective and safe performance. A theoretic understanding and procedural knowledge of these techniques will help physicians manage many musculoskeletal conditions effectively.

Quality of evidence
MEDLINE was searched using the MeSH words arthrocentesis, aspiration, injection, and methods. Where appropriate, references from retrieved publications were searched for additional relevant studies.

When feasible, randomized controlled trials were included to support various aspects of corticosteroid injection and aspiration. Much of the evidence reported is based on expert opinion and on surveys of clinical practice by experts in the field. No prospective trials have been carried out to investigate any particular method of patient preparation, injection technique, or choice of compound. While the strength of the evidence presented might seem scientifically limited, it represents the standard of practice currently accepted by experts in the field.

Indications for aspiration and injection
Aspiration. Aspiration is an efficacious procedure readily available to primary care physicians and useful in diagnosing (based on synovial fluid analysis) and managing many infectious and inflammatory diseases. Such use includes early diagnosis of septic arthritis and crystalline arthropathy and relief of painfully distended joints.

In addition, a recent study has shown aspiration to be of great benefit for treating symptoms of rheumatoid arthritis when used in conjunction with intra-articular corticosteroid injection. Expedient diagnosis and treatment of such a condition is critical for optimizing functional outcomes and avoiding severe adverse consequences. Because diagnosis and intervention are usually required on an urgent basis, however, rheumatoid arthritis is best managed in an emergency room.

Corticosteroid injection. Intra-articular and soft tissue corticosteroid injection is most appropriately considered as adjuvant therapy. The number of conditions for which this therapy has been found beneficial continues to increase (Tables 1 and 2).

Possible complications
As with most medical procedures (invasive or otherwise), aspiration and corticosteroid injection carry the potential for complications. These can arise either as a result of the procedure itself, or in the form of an adverse response to an injected compound.

Perhaps the most feared complication is iatrogenic infection, such as septic arthritis. While potentially
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Corticosteroid injections are commonly used for the treatment of various joint conditions. While effective, they come with potential complications. The risk of septic arthritis, a feared complication, is low. Hollander reported one infection after 14,000 injections, and similar results were observed at the Mayo Clinic. Sterile technique is crucial to minimize infection risk. Other complications include systemic reactions such as flushing and hypersensitivity, and local effects like atrophy and flare. Careful patient preparation and appropriate dose selection are essential.

### Table 1. Indications for intra-articular corticosteroid injection

- Rheumatoid arthritis (adult and juvenile)
- Osteoarthritis
- Crystalline arthropathies (gout and pseudogout)
- Systemic lupus erythematosus and mixed connective tissue disease
- Traumatic arthritis
- Shoulder periartitis (adhesive capsulitis)
- Seronegative arthropathies

### Table 2. Indications for nonarticular corticosteroid injection

- Bursitis (anserine, subacromial, prepatellar, trochanteric, olecranon, etc)
- Ganglion
- Tendonitis (bicipital, rotator cuff, etc)
- Plantar fasciitis (when conservative therapy fails)
- Epicondylitis (medial and lateral)
- Tenosynovitis
- Entrapment neuropathies (e.g., carpal tunnel)
- Trigger finger

### Table 3. Possible complications following corticosteroid injection

**SYSTEMIC**
- Flush
- Hypersensitivity reaction
- Diabetic hyperglycemia (rare)

**LOCAL**
- Local skin atrophy and depigmentation
- Tendon atrophy and rupture
- Hemarthrosis (possible following aspiration)
- Destruction of cartilage (conflicting evidence)
- Local nerve injury
- Steroid flare
- Septic arthritis (very rare)

### Table 4. Contraindications to corticosteroid injection

**ABSOLUTE CONTRAINDICATIONS**
- Joint sepsis
- Prosthesis
- Fracture
- Bacteremia

**RELATIVE CONTRAINDICATIONS**
- Joint instability
- Coagulopathy
- Cellulitis
- Poor response to prior injections at that site
- More than three or four injections of a particular joint within the past year

Generally, when injecting a joint, the goal is maximum duration of relief. Therefore, a long-acting, low-solubility preparation, such as triamcinolone hexacetonide, should be considered. Such preparations have less chance of substantial systemic absorption. More soluble, shorter-acting preparations, such as methylprednisolone acetate, should be considered when injecting soft tissues. Such preparations are preferable to less soluble agents in this situation because they are less likely to result in atrophy of such tissues as tendons, ligaments, and fascia.

As to appropriate dose, there is again no agreement. Centeno and Moore surveyed members of the American College of Rheumatology and found that they most commonly used a dose of 40 mg (1 mL), regardless of the particular preparation used, for injecting...
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large joints. A general guide to typical doses and volume of corticosteroid used at various anatomical sites is presented in Table 5. To achieve these volumes, common practice is to combine the corticosteroid with a local anesthetic, such as lidocaine. This serves to increase the volume for wider distribution of the steroid and indicate accurate placement of the injection by effecting immediate relief of the presenting symptom.

General principles and patient preparation
There is no current consensus on preparing patients for joint and soft tissue corticosteroid injection or arthrocentesis. This might, in part, be why physicians are occasionally hesitant to perform the procedure.

Universal precautions and aseptic technique should be practised. The skin over the area to be injected should be free of any infection. Physicians should wash their hands thoroughly before this procedure. Universal blood and body fluid precautions mandate use of gloves, and sterile gloves also allow physicians to palpate the prepared area without contaminating the field. The area to be injected or aspirated should be wiped first with an antiseptic solution, such as povidone-iodine, and allowed to dry. Sterile draping has not been shown to reduce risk of infectious complications.12 Disposable sterile needles and syringes should be used.

When injection follows aspiration, it sometimes helps to stabilize the needle in position with a hemostat and remove the aspirate syringe. The injection syringe can then be connected without having to re-insert the needle. This reduces the risk of introducing infection and minimizes patient discomfort. Alternatively, a three-way stopcock can be used with both aspiration and corticosteroid-containing syringes attached to a single needle.

<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>DOSE (MG)*</th>
<th>VOLUME OF INJECTION (ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee joint</td>
<td>40-60</td>
<td>1-4</td>
</tr>
<tr>
<td>Shoulder joint</td>
<td>30</td>
<td>1-4</td>
</tr>
<tr>
<td>Elbow joint</td>
<td>20-30</td>
<td>1-4</td>
</tr>
<tr>
<td>Ankle joint</td>
<td>20-30</td>
<td>0.5-1</td>
</tr>
<tr>
<td>Wrist joint</td>
<td>20</td>
<td>0.5-1</td>
</tr>
<tr>
<td>Interphalangeal joint</td>
<td>5-10</td>
<td>0.25-0.5</td>
</tr>
<tr>
<td>Metacarpophalangeal joint</td>
<td>5-10</td>
<td>0.25-0.5</td>
</tr>
<tr>
<td>Metatarsophalangeal joint</td>
<td>5-10</td>
<td>0.25-0.5</td>
</tr>
<tr>
<td>Bursa</td>
<td>20</td>
<td>0.5-1.5</td>
</tr>
<tr>
<td>Tendon sheath</td>
<td>5-20</td>
<td>0.25-1</td>
</tr>
</tbody>
</table>

*Doses shown are for triamcinolone hexacetonide for joints and methyprednisolone acetate for soft tissues.

Figure 1. Shoulder joint and subacromial bursa: For an anterior approach to the shoulder joint, the arm is mildly externally rotated; the needle (1) is inserted lateral to the coracoid process and medial to the humeral head and directed posteriorly. If resistance is encountered, withdraw the needle slightly, redirect, and advance again. Lack of resistance to injection indicates placement within the joint space. The subacromial bursa is entered by inserting the needle (2) approximately 1 to 2 cm inferior to the lateral border of the acromion. The needle is directed slightly superiorly through the deltoid and into the subacromial space.
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Use of local anesthetic before corticosteroid injection is deemed unnecessary by most physicians, but, if a large (e.g., 18-gauge) needle is required, which is often the case with aspiration, local anesthetic is useful. Otherwise, use of relatively small (22- to 25-gauge) needles reduces discomfort.

After injection, patients should be advised to rest the area involved for at least 24 hours. This has been shown, in at least one study, to improve the efficacy of steroid injection. Brief active and passive range-of-motion exercises immediately following intra-articular steroid injection might be useful for distributing the medication more effectively within the affected structure. Patients should be advised of possible side effects and told what to look for in terms of complications. Use of simple analgesics might be indicated to relieve postinjection pain.

Intra-articular and soft tissue injection sites

Some of the more frequently injected joints and soft tissues (shoulder; subacromial bursa; elbow; lateral epicondyle; carpal tunnel; metacarpophalangeal and interphalangeal joints, and trochanteric bursa of the hip, knee, and ankle) are shown in Figures 1 to 7. Several other soft tissue inflammatory conditions that often respond well to corticosteroid injection are listed in Table 2.

Conclusion

Afflictions of the musculoskeletal system account for a substantial proportion of conditions presenting to primary care physicians. Some of these, such as septic arthritis, need to be recognized immediately and treated promptly and are best managed in an emergency room. Many more could be adequately managed by GPs familiar with, and comfortable performing, these procedures.

Despite lack of consensus on such matters as patient preparation, choice of agent, and specific methods of injection, use of sterile technique and some basic understanding of anatomy, indications, contraindications, and possible complications will allow family physicians to provide appropriate management in many situations.

Competing interests

None declared

Figure 2. Elbow joint and lateral epicondyle: The elbow joint can be approached posteriorly (1) or laterally (2). Using the lateral approach, the elbow is flexed 90° and the needle (2) is inserted perpendicular to the plane of the skin at a point midway between the olecranon and the lateral epicondyle of the humerus. For tennis elbow, the area of maximal tenderness should be easily palpated (usually at the origin of the extensor carpi radialis brevis). The injection needle is placed into the area of maximal tenderness, which is usually over the lateral epicondyle (3). The needle is then withdrawn, slightly repositioned, and the injection repeated several times to adequately infiltrate the area surrounding the tendon. Care should be taken to avoid injecting the tendon proper. Placement into the tendon itself will result in resistance to injection. If this occurs, reposition the needle. The point of maximal tenderness in medial epicondylitis is injected in a similar fashion to the lateral epicondyle. Care must be taken to avoid the ulnar nerve that travels posterior to the medial epicondyle.
**Figure 3. Carpal tunnel:** Due to the close proximity of neurovascular structures, this injection should be left to physicians experienced in the procedure. The carpal tunnel can be entered by inserting the needle just ulnar to the palmaris longus tendon (or flexor carpi radialis if the palmaris longus is absent) at the level of the distal wrist crease with the needle angled at approximately 45° to the forearm. Avoid injecting the median nerve, which will be indicated by paresthesia in the hand. If this occurs, withdraw the needle slightly, as this will position the tip appropriately in the carpal tunnel.

**Figure 4. Metacarpophalangeal and interphalangeal joints:** These joints are easily injected when swollen. The needle should be inserted into the metacarpophalangeal joint (2) between the collateral ligaments and the dorsal expansion of the extensor tendons. When entering the joint, the needle should be directed slightly obliquely. The interphalangeal joint is entered laterally with the needle (1) perpendicular to the skin. Proper location will result in distention upon injection. It is important to avoid injecting tendons and ligaments, which will be indicated by resistance to injection.
**Figure 5.** Trochanteric bursa of the hip: Follow the iliotibial tract to the greater trochanter and palpate to find the point of maximal tenderness. Insert the needle and inject the area. A longer needle is often required to reach this bursa depending upon the size of the patient.

**Figure 6.** Knee joint: The knee is the most accessible joint in the body for injection and aspiration. Medial or lateral (as illustrated) approaches can be used. Patients should be positioned supine with the knee in full extension. The needle is inserted perpendicular to the skin just below the superior border of the patella on the medial or lateral side of the joint and directed parallel to the floor. Ease of injection indicates proper location in the joint capsule.

**Editor's key points**
- Joint aspiration and intra-articular and soft tissue corticosteroid injection are important tools for diagnosis and treatment of musculoskeletal disorders.
- Steroid injection should be considered a “bridge” treatment for providing immediate relief from symptoms while more definitive, disease-modifying therapy is being instituted.
- By taking accepted precautions, family physicians can readily perform aspiration and corticosteroid injection safely and effectively for many musculoskeletal problems.

**Points de repère du rédacteur**
- La ponction articulaire et l’injection intra-articulaire et dans les tissus mous de corticostéroïdes sont des interventions importantes dans le diagnostic et le traitement des troubles musculosquelettiques.
- L’injection de corticostéroïdes devrait être considérée comme un traitement « passerelle » pour procurer un soulagement immédiat des symptômes en attendant qu’une thérapie plus définitive et modificateur de la maladie soit instaurée.
- En prenant les précautions communément acceptées, les médecins de famille peuvent aisément effectuer, en toute sécurité et efficacement, les ponctions et les injections de corticostéroïdes dans le cas de nombreux problèmes musculosquelettiques.
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Figure 7. Ankle joint: With the foot in neutral position, the needle is inserted just distal to a line connecting the medial and lateral malleoli, just medial to the tibialis anterior tendon and lateral to the medial malleoli. The needle is directed posteriorly toward the base of the calcaneus.

References