

Therapeutic Injections of Joints and Soft Tissues

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- Successful needle placement for joint and soft tissue aspiration and injection requires clear understanding of anatomy.
- Aspiration of joint and soft tissue fluids may be important for diagnosis and treatment.
- Joint or soft tissue injections with corticosteroids may be beneficial for short- and long-term treatment.

Therapeutic injections used in rheumatology include the articular, tenosynovial, and soft tissue injection of corticosteroids esters and the articular injection of hyaluronate and radioactive colloids. While the latter is controversial, corticosteroids and hyaluronate injections are in widespread use and will be discussed here.

CORTICOSTEROID INJECTIONS

Certain experience-derived criteria should guide these injections: (1) a prompt local improvement is desired; (2) evidence of efficacy is available; (3) alternative treatment methods have been discussed with the patient; (4) local damage inflicted by the injected steroid is judged unlikely; (5) possible untoward reactions have been informed; (6) treatment of the underlying condition, such as rheumatoid arthritis (RA), has been optimized; (7) the physician is familiar with the relevant anatomy; (8) the injected structure can be temporarily rested; and (9) a follow-up contact has been arranged.

Structures amenable to corticosteroid injection include diarthrodial joints, synovial tendon sheaths, superficial and deep bursae, and a variety of connective tissue structures. Fibromyalgia tender points should only be injected when an additional pathology responsive to steroids is believed to be contributing to the pain. Intracavitary injections are accurate when synovial fluid is withdrawn, when the needle can be moved radially within the cavity, and, retrospectively, if some room air left in place is shown to lie within the joint on follow-up x-ray film. Ultrasound (US) needle guidance, when available, improves accuracy and should lead to optimal results (1).

- **Efficacy.** Table 40-1 lists conditions in which corticosteroid infiltrations have been used. A long-term favorable response can be predicted in some. In others a steroid infiltration is a short-lived palliative. Finally, some conditions are refractory to this form of therapy. Therapeutic trials based on US-guided injections should help define the real utility of corticosteroid infiltrations wherever controversy remains.
- **Steroid preparations.** The more soluble steroid esters, such as methylprednisolone acetate, triamcinolone acetonide, and betametasone phosphate, have a weaker local action. On the other hand, triamcinolone hexacetonide, a barely soluble agent, has the greatest potency (29) and should be reserved for deep structures such as the elbow, the shoulder, and the knee. Proximal interphalangeal (PIP) and metacarpophalangeal (MCP) joints, subcutaneous bursae, tendon sheaths, and the carpal tunnel are best injected with one of the weaker esters to discourage tissue atrophy.
- **Steroid dose.** Optimal doses for each site and according to diagnoses are not well established. Table 40-1 show the doses I use expressed as methylprednisolone acetate.
- **Should a prefilled syringe or a multidose corticosteroid vial be used?** A recent survey on the rate of infection following local corticosteroid injections showed that prefilled syringes had a lesser rate of iatrogenic infections (1/162,000) than corticosteroids not packaged in a sterile syringe (1/21,000) (30).
- **Needle length.** The majority of infiltrations can be done with a 13-mm, 27-gauge needle (such as in insulin syringes; Figures 40-1–40-5). This is true for stenosing digital and thumb tenosynovitis, de Quervain's

TABLE 40-1. EFFICACY OF CORTICOSTEROID INJECTIONS.

CONDITION	HELPFUL	STEROID DOSE ^a	REFERENCE
Trigger finger	Yes	10–15 mg	2
Trigger thumb	Yes	10 mg	3
De Quervain's tenosynovitis	Yes	10–15 mg	4
MCP and PIP joints	Yes	10–15 mg	5
Mucoid cysts	Probably	5 mg	6
First carpometacarpal OA	No	10–15 mg ^b	7
Carpal tunnel syndrome	Yes	30–40 mg	8
Olecranon bursitis, nonseptic	Yes	20–30 mg	9
Tennis elbow	Short term	10–15 mg	10
Golfer's elbow	Yes	10 mg	11
Subacromial impingement	Probably	40 mg	12
Frozen shoulder	Yes	80 mg	13
Supraclavicular nerve block	Short term	40 mg	14
Acromioclavicular (AC) syndrome	Probably	10–15 mg	15
Cervical pain	No	–	16
Sciatica	No	–	17
Facet joints	No	–	18
Sacroiliac joints	Short term	–	19
Hip osteoarthritis	Short term	–	20
Knee osteoarthritis	Short term	40–80 mg	21
Knee RA	Short term	80 mg	22
Anserine syndrome	Yes	40 mg	23
Retrocalcaneal bursa	Probably	10–15 mg	24
Plantar fascia	Yes	20 mg	25
Posterior tibialis tenosynovitis	May encourage rupture		
Achilles tendinitis	May encourage rupture		
Morton's neuroma	Probably	20 mg	26
Isolated second MTP synovitis	Probably	10–15 mg	
Rheumatoid nodules	Yes	15–20 mg	27
Myofascial trigger points	Yes	Lidocaine	28
Fibromyalgia tender points?	Not shown	Lidocaine	

ABBREVIATIONS: MCP, metacarpophalangeal; MTP, metatarsophalangeal; OA, osteoarthritis; PIP, proximal interphalangeal; RA, rheumatoid arthritis.

^aDoses used by the author in methylprednisolone acetate; one half the dose if triamcinolone hexacetonide is used.

^bWhen clearly inflamed.

**FIGURE 40-1**

Trigger finger injection. In the second finger, needle entry is just distal to the proximal palmar crease.

disease, carpal tunnel syndrome, tennis elbow, and wrist and elbow (radiocapitular) injections. Shoulder and knee injections require a 35- or 38-mm, 21-gauge needle. In obese people, a trochanteric injection may call for the use of a spinal needle.

- **To dilute or not to dilute.** I am often asked: “Do you mix the steroid with a local anesthetic?” If one wants to limit the spread of the injection, such as in a trigger finger or thumb, tennis elbow, and retrocalcaneal

**FIGURE 40-2**

Trigger thumb injection. The needle is aimed at the thumb sesamoids.

**FIGURE 40-3**

de Quervain's tenosynovitis injection. The needle is aimed at the distended tendon sheath.

bursa, the straight steroid should be used. If a larger tissue volume needs to be infiltrated, such as in the trochanteric syndrome, adding a local anesthetic is advantageous.

- **Prepping the skin.** Alcohol or an iodopovidone solution may be used for antisepsis. Both are effective against bacteria, fungi, and viruses. Alcohol (70%–92%) acts by 1 minute and iodopovidone 10% by 2 minutes. I rub the skin three times and wait for the appropriate time. The last word on skin prepping has not been said (31).
- **Gloves.** Postinjection infection occurs irrespective of the use of sterile gloves (30). I believe the use of

**FIGURE 40-4**

Carpal tunnel syndrome injection. Note the needle entry 1.5 cm proximal to the distal wrist crease and ulnar to palmaris longus tendon.

gloves is desirable, at the very least in the operator's nondominant hand, to avoid inadvertent contamination by leaking fluid when the syringe used to drain the joint is replaced by the one containing the steroid (32).

- **Local anesthesia.** Some clinicians spare the use of local anesthesia because they rely on a quick, almost painless, effective thrust which brings the needle into the desired place. I use lidocaine 2% without epinephrine because my entries are often inaccurate and need to be retried.
- **Should a synovial effusion be drained prior to the injection?** In patients with RA, removal of a knee effusion prior to injecting the steroid improves outcome (33).
- **To avoid sudden disconnection of the needle while injecting a thick steroid suspension.** Hold the needle between index and thumb (of the nondominant hand) while you depress the plunger with the other hand's thumb.
- **Is it possible to inject an anticoagulated patient?** There is evidence that anticoagulated patients with an international normalized ratio (INR) in the therapeutic range can have the joints and soft tissues safely injected (34). Firm pressure should be exerted at the site for several minutes. Beware of carpal tunnel injections in this setting because a bleed, however small, could be disastrous.
- **Hemostasis in hand and wrist injections.** In hand and wrist injections, including carpal tunnel injections, raising the extremity straight up prevents venous bleed.
- **Should the injected structure be rested?** In knee synovitis, resting the joint for 24 hours following the steroid injection leads to a better outcome (35).



FIGURE 40-5

Tennis elbow injection. Needle entry is 2 to 3 mm distal to the lateral epicondyle.

TABLE 40-2. LOCAL AND SYSTEMIC REACTIONS TO THE INJECTED MATERIAL.

Facial flushing and palpitations
Skin atrophy
Fat atrophy
Hypopigmentation
Postinjection flare
Infection
Tendon rupture
Corticosteroid arthropathy
Osteonecrosis
Hyperglycemia
Pituitary inhibition
Anaphylaxis

- **How many injections are allowed in a given structure?** Three times total (not per year) appears to me to be the right answer. Realities of life dictate many exceptions to this rule.
- **Complications** (Table 40-2). A frequent untoward reaction is facial flushing with palpitations. This reaction seldom lasts more than 4 hours. In diabetics, depending on the steroid dose (consider, e.g., a diabetic patient with three trigger fingers plus a bilateral carpal tunnel syndrome) a transient elevation of serum glucose should be expected. Skin hypopigmentation at the injection site occurs frequently in dark skinned individuals after injecting a superficial structure, such as in de Quervain tenosynovitis.

INTRA-ARTICULAR HYALURONATES (VISCOSUPPLEMENTATION)

Intra-articular hyaluronates are often used for the treatment of pain in osteoarthritic joints (36). The beneficial effect of viscosupplementation has a delayed action but it lasts longer than intra-articular corticosteroids (37). Two types of agents are available. One is Hylan G-F 20, a high-molecular-weight preparation (MW 6,000,000). There are also lower molecular weight hyaluronan preparations in the range of MW 800,000 to 2,000,000. Viscosupplementation was initially used in the knee. However, other joints such as the shoulder, the hip, and the ankle have all been treated with benefit. The usual treatment course includes three weekly intra-articular

injections. Several untoward reactions may occur. Postinjection pain, with or without a joint effusion, is common. Another complication is a pseudo-septic synovitis. This worrisome reaction requires hospital admission and parenteral antibiotics pending culture results. A granulomatous reaction has also been reported. Finally, allergic reactions may occur in patients with avian protein allergy. Indications of viscosupplementation include (a) patients who cannot take anti-inflammatory medications and whose pain is unrelieved by analgesics and (b) patients with advanced osteoarthritis who refuse or are not candidates for surgery. Viscosupplementation is expensive. However, a recent cost analysis has shown superiority of viscosupplementation over appropriate care without viscosupplementation (38).

REFERENCES

- Naredo E, Cabero F, Beneyto P, et al. A randomized comparative study of short term response to blind injection versus sonographic-guided injection of local corticosteroids in patients with painful shoulder. *J Rheumatol* 2004;31:308–314.
- Murphy D, Failla JM, Koniuch MP. Steroid versus placebo injection for trigger finger. *J Hand Surg [Am]* 1995;20:628–631.
- Maneerit J, Sriworakun C, Budhraj N, et al. Trigger thumb: results of a prospective randomised study of percutaneous release with steroid injection versus steroid injection alone. *J Hand Surg [Br]* 2003;28:586–589.
- Zingas C, Failla JM, Van Holsbeeck M. Injection accuracy and clinical relief of de Quervain's tendinitis. *J Hand Surg [Am]* 1998;23:89–96.
- McCarty DJ, Marman JG, Grassanovich JL, et al. Treatment of rheumatoid joint inflammation with intrasynovial triamcinolone hexacetonide. *J Rheumatol* 1995;22:1631–1635.
- Rizzo M, Beckenbaugh RD. Treatment of mucous cysts of the fingers: review of 134 cases with minimum 2-year follow-up evaluation. *J Hand Surg [Am]* 2003;28:519–524.
- Meenagh GK, Patton J, Kynes C, et al. A randomised controlled trial of intra-articular corticosteroid injection of the carpometacarpal joint of the thumb in osteoarthritis. *Ann Rheum Dis* 2004;63:1260–1263.
- Hui AC, Wong S, Leung CH, et al. A randomized controlled trial of surgery vs steroid injection for carpal tunnel syndrome. *Neurology* 2005;64:2074–2078.
- Smith DL, McAfee JH, Lucas LM, et al. Treatment of nonseptic olecranon bursitis. A controlled, blinded prospective trial. *Arch Intern Med* 1989;149:2527–2530.
- Smidt N, Lewis M, Hay EM, et al. A comparison of two primary care trials on tennis elbow: issues of external validity. *Ann Rheum Dis* 2005;64:1406–1409.
- Stahl S, Kaufman T. The efficacy of an injection of steroids for medial epicondylitis. A prospective study of sixty elbows. *J Bone Joint Surg Am* 1997;79:1648–1652.
- Akgun K, Birtane M, Akarirmak U. Is local subacromial corticosteroid injection beneficial in subacromial impingement syndrome? *Clin Rheum* 2004;23:496–500.
- Carette S, Moffet H, Tardif J, et al. Intraarticular corticosteroids, supervised physiotherapy, or a combination of the two in the treatment of adhesive capsulitis of the shoulder: a placebo-controlled trial. *Arthritis Rheum* 2003;48:829–838.
- Vecchio PC, Adebajo AO, Hazleman BL. Suprascapular nerve block for persistent rotator cuff lesions. *J Rheumatol* 1993;20:453–455.
- Jacob AK, Sallay PI. Therapeutic efficacy of corticosteroid injections in the acromioclavicular joint. *Biomed Sci Instrum* 1997;34:380–385.
- Carette S, Fehlings MG. Clinical practice. Cervical radiculopathy. *N Engl J Med* 2005;353:392–399.
- Carette S, Leclaire R, Marcoux S, et al. Epidural corticosteroid injections for sciatica due to herniated nucleus pulposus. *N Engl J Med* 1997;336:1634–1640.
- Carette S, Marcoux S, Truchon R, et al. A controlled trial of corticosteroid injections into facet joints for chronic low back pain. *N Engl J Med* 1991;325:1002–1007.
- Zelle BA, Gruen GS, Brown S, et al. Sacroiliac joint dysfunction: evaluation and management. *Clin J Pain* 2005;21:446–455.
- Kullenberg B, Runesson R, Tuvhag R, et al. Intraarticular corticosteroid injection: pain relief in osteoarthritis of the hip? *J Rheumatol* 2004;31:2265–2268.
- Godwin M, Dawes M. Intra-articular steroid injections for painful knees. Systematic review with meta-analysis. *Can Fam Physician* 2004;50:241–248.
- Weitof T, Larsson A, Saxne T, et al. Changes of cartilage and bone markers after intra-articular glucocorticoid treatment with and without postinjection rest in patients with rheumatoid arthritis. *Ann Rheum Dis* 2005;64:1750–1753.
- Calvo-Alén J, Rua-Figueroa I, Erausquin C. Treatment of anserine bursitis. Local corticosteroid injection vs. a NSAID. A prospective study. *Rev Esp Reumatol* 1993;20:13–15.
- Canoso JJ, Wohlgethan JR, Newberg AH, et al. Aspiration of the retrocalcaneal bursa. *Ann Rheum Dis* 1984;43:308–312.
- Genc H, Saracoglu M, Nacir B, et al. Long-term ultrasonographic follow-up of plantar fasciitis patients treated with steroid injection. *Joint Bone Spine* 2005;72:61–65.
- Thomson CE, Gibson JN, Martin D. Interventions for the treatment of Morton's neuroma. *Cochrane Database Syst Rev* 2004;CD003118.
- Ching DW, Petrie JP, Klemp P, et al. Injection therapy of superficial rheumatoid nodules. *Br J Rheumatol* 1992;31:775–777.
- Kamanli A, Kaya A, Ardicoglu O, et al. Comparison of lidocaine injection, botulinum toxin injection, and dry needling to trigger points in myofascial pain syndrome. *Rheumatol Int* 2005;25:604–611.
- Eberhard BA, Sison MC, Gottlieb BS, et al. Comparison of the intraarticular effectiveness of triamcinolone hexacetonide and triamcinolone acetate in treatment of juvenile rheumatoid arthritis. *J Rheumatol* 2004;31:2507–2512.

30. Seror P, Pluvinage P, d'Andre FL, et al. Frequency of sepsis after local corticosteroid injection (an inquiry on 1160000 injections in rheumatological private practice in France). *Rheumatology* 1999;38:1272–1274.
31. Edwards PS, Lipp A, Holmes A. Preoperative skin antiseptics for preventing surgical wound infections after clean surgery [review]. *Cochrane Database Syst Rev* 2004: CD003949.
32. Yood RA. Use of gloves for rheumatology procedures. *Arthritis Rheum* 1993;36:575.
33. Weitoft T, Uddenfeldt P. Importance of synovial fluid aspiration when injecting intra-articular corticosteroids. *Ann Rheum Dis* 2000;59:233–235.
34. Thumboo J, O'Duffy JD. A prospective study of the safety of joint and soft tissue aspirations and injections in patients taking warfarin sodium. *Arthritis Rheum* 1998; 41:736–739.
35. Chakravarty K, Pharoah PD, Scott DG. A randomized controlled study of post-injection rest following intra-articular steroid therapy for knee synovitis. *Br J Rheumatol* 1994;33:464–468.
36. Bellamy N, Campbell J, Robinson V. Viscosupplementation for the treatment of osteoarthritis of the knee. *Cochrane Database Syst Rev* 2005:CD005321.
37. Caborn D, Rush J, Lanzer W, et al. Synvisc 901 Study Group. A randomized, single-blind comparison of the efficacy and tolerability of hylan G-F 20 and triamcinolone hexacetonide in patients with osteoarthritis of the knee. *J Rheumatol* 2004;31:333–343.
38. Torrance GW, Raynauld JP, Walker V. Canadian Knee OA Study Group. A prospective, randomized, pragmatic, health outcomes trial evaluating the incorporation of hylan G-F 20 into the treatment paradigm for patients with knee osteoarthritis (part 2 of 2): economic results. *Osteoarthr Cartil* 2002;10:518–527.