Injections

General Principles

Injections can decrease inflammation and improve function. Injections can also cause significant adverse effects including tissue necrosis and infection. There are many corticosteroid preparations. The most commonly used compounds are:

Hydrocortisone	fast onset	short duration	mildly potent
Prednisolone terbutate	fast onset	intermed. duration	mod. potent
Methylprednisolone**	slow onset	intermed duration	mod. potent
Triamcinolone	mod onset	intermed duration	mod. potent
Betamethasone	fast onset	long duration	very potent

How Steroids Work

Corticosteroids suppress inflammation. They decrease collagenase and prostaglandin formation and formation of granulation tissue. They block glucose uptake in the tissues, enhance protein breakdown, and decrease new protein synthesis in muscle, skin, bone and connective tissue, and lymphoid tissue.

Usual Doses of Methylprednisolone (40mg per ml)

Dose	Anatomic site
5-10mg	Phalangeal joints
20-30mg	Wrist
20-30mg	Elbow and ankle
40-80mg	Shoulder, hip or knee

Indications

Rheumatoid arthritis (RA): Treatment of active synovitis with corticosteroid injections improves symptoms in the injected joint 50% of the time and lasts from several days to weeks. Repeated injections are generally effective and are not shown to accelerate destructive changes in the injected joints.

Osteoarthritis (OA): Treatment of OA with corticosteroid injection is less effective than with RA. The joints most helped are the knee and interphalangeal or MCP joints of the hand.

Crystal-Induced Arthritis: Treatment of gout or pseudo-gout with corticosteroid injections can be especially helpful for those with comorbid conditions or allergies that prohibit use of systemic medications.

Tenosynovitis and Bursitis: Flexor tenosynovitis (trigger finger) and de Quervain tenosynovitis at the wrist respond well to corticosteroid injections into the tenosynovial sheath. Bursitis from shoulder impingement often responds to a single injection. Trochanteric bursitis responds well but may require multiple injections.

Olecranon and prepatellar intrabursal injections carry an increased risk for infection. These areas should only be injected with steroid when the patient's problem has not resolved with time and there is clearly no evidence of underlying infection (tap).

Diabetic patients are at risk for serious infection and for systemic effects of absorbed corticosteroids.

Greene, Walter B., 2001. Essentials of Musculoskeletal Care. American Academy of Orthopedic Surgeons. Rosemont, Illinois.

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Amount of displacement of fracture fragments	Description
Nondisplaced	fragments are in anatomic alignment
Displaced	fragments are no longer in anatomic alignment
Angulated	fragments are malaligned (measure angulation)
Bayoneted	distal fragment longitudinally overlaps the proximal frag
Distracted	distal fragment is separated from the proximal frag (gap)

Skin Integrity	Description
Closed	skin over and near fracture is intact
Open	skin over and near the fracture is lacerated OR abraded

Adverse Outcomes of Fractures

Any fracture can result in delayed or malunion. Limb function can be affected by nearby joint contracture, stiffness, limb shortening or malalignment. Osteomyelitis may develop if fracture is open. Nerve and/or vascular damage may occur with severe fractures. Compartment syndrome can evolve with excess swelling. Complex regional sympathetic dystrophy is rare.

Referral

Never hesitate to call for opinion (know how to describe the fracture well prior to calling). Patients with open, unstable, irreducible, suspected compartment syndrome, nerve, vascular or muscle damage need further eval. Displaced fractures require further evaluation. Pediatric patients with fractures anywhere near a growth plate or around the elbow need further evaluation. Ankle fractures are tricky, request consult.

Unstable fractures include both bone, comminuted, oblique, spiral and intra-articular.

Pearls

Educate your patients well on cast care (neuro-vascular compromise) and always see them if there are concerns. Never be afraid to remove a cast. You can always re-apply it later. If concerned about swelling, don't be afraid to bi-valve a cast (saw the cast in half, re-apply and wrap w/ ace wrap). Don't keep joints immobilized longer than necessary; this will result in increased stiffness. Toddler fractures take 1 week per year of life to heal. Teens take 4-6 weeks. Adults take 6+ weeks. If worried about the retention of the fracture line, bring pt back every week and a few weeks and x-ray. It is necessary to x-ray unstable fractures every week.

Splinting

Splinting of fractures, dislocations or tendon ruptures often is required as part if initial emergency management. A well-applied splint reduces pain, bleeding and swelling by immobilizing the injured part. Splinting also helps prevent a number of problems: further damage by sharp edges of bone, laceration of skin, constriction of vessels by malaligned bone, and further contamination of open fracture.

Splinting is preferred whenever additional swelling is expected. This usually occurs in the first 2-3 days of all fractures and the majority of sprains. Splint when referral is planned. Splinting is often a definitive method of care (most finger and some toe fractures).

Acute casting may be necessary for the following reasons: fractures that require reduction, fractures involving two adjacent bones, spiral fractures, strong muscle forces (mid-shaft humerus), and fracture dislocations. (consider bi-valving cast)

General Principles

1) Remove clothing and inspect area thoroughly
2) Document pulse, cap refill and neurologic status distal to fracture
3) Cover all wounds w/ dry, sterile dressing. Notify receiving physician of all open wounds.
4) Immobilize joints above and below fracture site.
5) With joint injuries, immobilize bones above and below joint.
6) Pad all rigid splints to prevent local pressure
7) Support limb and injury site until splint has set
8) Align a limb severely deformed with constant gentle manual traction so that it can be incorporated into a splint.
9) If you encounter resistance to limb alignment when you apply traction, splint the limb in the position of the deformity.
10) When in doubt, splint.

Supplies

Prefabricated plastic, fabric or metal splints are used for very short periods of time. If the splint is to be used for more than a few hours, custom application of a well-padded plaster or fiberglass splint is preferred. Plaster is used more frequently because it is cheaper, more readily available, more versatile and more moldable.

Materials

Thumb/finger	1 or 2 rolls 4" cast padding (adults)
	1 or 2 rolls 3" cast padding (children)
	4"X15" splint, six thick (adults)
	3" roll folded into splint of approp length (children)
	2" or 3" elastic bandage
	Tepid water, gloves

Joint Assessment

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An orthopedic assessment should be performed in a consistent manner every time. This will get one accustomed to a routine and help prevent an incomplete exam. A good physical exam is necessary even if one does not know the entire anatomy. A good reference book can help decipher the exam findings later. I recommend the Atlas of Human Anatomy, by Frank H. Netter, MD. I also recommend Essentials of Musculoskeletal Care published by the American Academy of Orthopedic Surgeons.

Essentials in Musculoskeletal Care by AAOS- ISBN # 0892032170

Netter's Exam book- ISBN # 978-1-41603699-9

Basic Exam

On every patient, in every clinic setting and for every musculoskeletal complaint, the following basic components of the exam should be addressed and documented. Always include side to side comparison. Always remove clothing with modesty in mind.

Inspection

General presentation (distress, grimacing, alert, crying, happy)

Gait (antalgic, wheelchair, cane, rotation of leg, try to watch them walk into exam room)

Skin (intact, bruising, swelling, deformity, atrophy)

Palpation (crepitance, tenderness, deformity)

Range of Motion (if unsure of what it is called, measure every way you can move the joint and look up later)

Strength (5/5 scale, painful areas)

Special exams (joint specific)

Neurologic (2 point discrimination, reflexes, gross sensation)

Vascular (pulses, skin temp, edema, hair growth)

O Onset
L Location
D Duration
C Character
A Associated
R Radiation,
T Treatment
Social ADLs

Shoulder Inspection & Palpation

Anterior view- examine skin and bony structure

Poster view- Look for symmetry and muscle atrophy.

Jerk Test- 90 flexion and max internal rotation with elbow at 90. Adduct arm across body in horizontal plane while pushing humerus in posterior direction. Positive of posterior subluxation or dislocation occurs.

Knee Inspection & Palpation

Anterior view- valgus or varus deformities, asymmetry of alignment, thigh atrophy

Posterior view- atrophy of thigh and calf, swelling in popliteal fossa

Gait

Knee effusion- suprapatellar region is where it will be visible. Milking helps see it, feel for ballottment

Patella- locate patellar and quadriceps tendons. Displace patella laterally and medially. Watch for apprehension/pain "Fairbanks". Palpate the tibial tuberosity

Patellar tracking-palpate patella as knee flexes and extends. Crepitus is noted with pf arthritis although doesn't correlate with severity.

Infrapatellar bursa- below patella on either side of patellar tendon, check for swelling. Will be dumbbell-like

Joint line tenderness- flex knee and identify joint line (soft spot). Tenderness can be associated with meniscal tear. Find the medial joint line and mark an X with the pen.

Knee Range of Motion- flexion extension. Normal 5-135 to 145

Knee Muscle Testing- Quadriceps, hamstrings

Knee Special Tests

Patellar instability apprehension sign "Perkins"- Patient seated, knee extended, displace patella laterally and then flex knee to 30. With instability, this maneuver displaces the patella to an abnormal position on the lateral femoral condyle. Patient often perceives pain and becomes apprehensive.

Meniscal tear "McMurray circumduction test"- Flex knee to max pain free position. Hold that position while externally rotating the foot then gradually extend the knee while maintaining the tibia in external rotation. This maneuver stresses the medial meniscus and often elicits a localized medial compartment click and/or pain in patients with a tear. The same maneuver performed while rotating the foot internally will stress the lateral meniscus. Pain free flexion beyond 90 is necessary for this test to be useful.

MCL- Valgus stress test- Knee extended then flexed at 25. Apply stress at the lateral side of knee. If opens up in full extension, severe injury.

LCL- Varus stress test- Knee extended and then flexed at 25. Reverse the stress pattern used for the MCL. If opens up in full extension, severe injury.

Faber "Figure of 4 test"- Flexion/abduction/external rotation maneuver to detect hip and SI joint pathology. With patient supine, place the affected hip in flexion, abduction and external rotation and then press the hip back into extension by placing the foot of the opposite tibia. If the maneuver is painful, the n the hip or SI region may be affected.

Baby- Developmental Dysplasia of the Hip

Ortolani- newborns

Barlow-newborns

Galeazzi-toddlers

- Nice clip on you tube to show technique 

Ottawa Ankle Rules

Ankle sprains graded I-III

I-	Stretching	Tender to palp; mild swelling; normal function
II-	Partial Tearing	Tender to palp; mod swelling & ecchymosis, some instability, ↓wt bear
III-	Complete Rupture	Pain; marked ecchymosis/edema; gross instability; no wt bear

Usually don't need x-rays for grades I & II. Per Ottawa rules, x-rays are necessary for the patient who:

1. Is unable to bear weight initially after injury or when examined
2. Has tenderness over the posterior edge of the distal 6cm or distal tip of the medial or lateral malleolus
3. Has tenderness over the fifth metatarsal or tarsal navicular