

# Joint and Soft Tissue Injection / Arthrocentesis

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# Outline

- Indications for Arthrocentesis / Joint Injection
- Preparation for Injection
- Glucocorticoid Preparations for Injection
- Contraindications to Injection
- Efficacy of Injections
- Complications
- Intra-articular Use of Viscosupplementation



# Joint Injections

- Only a temporary treatment measure
  - Relief due to local anesthetic injected with corticosteroids, relief due to distention of contracted joint space, systemic effects of corticosteroids
- Can provide short- and long-term benefit in certain conditions
- Pain and inflammation in joints, bursa, and tendons respond well to injection
- With appropriate systemic therapy is added, long-lasting remission may be achieved
- Minimizes hazards of systemic corticosteroid therapy, while applying medication directly to site of inflammation



# Indications for Arthrocentesis

- Single most important indication is to rule out joint infection!
- Obtain synovial fluid for diagnostic purposes
  - Acute monoarthritis: leading diagnosis infection or crystalline arthritis; arthrocentesis mandatory procedure
  - Chronic, polyarthritis: arthrocentesis to differentiate between inflammatory diseases, degenerative arthritis or crystalline arthropathy



# Indications for Arthrocentesis

- Septic Arthritis
- Hemarthrosis
- Crystal synovitis
- Acute large effusion
- Effusion interfering with function



# Joint Injections Indications

- Intra-articular
  - Inflammatory arthritis localized to one or a few joints
    - RA, gout, pseudogout
  - Joint synovitis unresponsive to drugs
  - To aid the correction of joint deformity
  - Osteoarthritis affecting one or a few joints
- Local
  - Enthesopathies (tendonitis)
  - Overuse disorders (e.g. tennis elbow, trigger finger)
  - Bursitis
  - Myofascial pain syndromes
  - Compression neuropathies (e.g. carpal tunnel syndrome)

# Joint injection Indications

- Systemic disease (e.g. Rheumatoid Arthritis) appears to be generally controlled but inflammation remains in one or more joints
- When one or a few joints are inflamed - once infection excluded
- To assist in rehabilitation and prevent disability
- Particularly refractory joint inflammation that does not seem to be responding to appropriate therapy
- Pain in OA exhibiting local inflammatory signs
- Soft-tissue regional disorders



# Joint Injection Indications

- In crystalline arthritis (gout and pseudogout), a corticosteroid injection after aspiration often achieves prompt and significant resolution of symptoms while long-term therapy is being implemented
- In osteoarthritis - somewhat more controversial
  - Pain may arise from structures outside of the joint capsule (e.g. pes anserine bursa)





# Soft tissue Injections

- Useful in many localized musculoskeletal disorders in addition to systemic inflammatory conditions
- Inflammation of tendons, tendon sheaths, or tendon insertions may warrant injection: e.g., Rotator cuff, bicipital tendon, and extensor pollicis brevis and abductor pollicis longus of the thumb (for DeQuervain's tenosynovitis)



# Soft tissue Injections

- Bursitis is relatively common and injection of the subacromial (shoulder), greater trochanteric (hip), olecranon (elbow), anserine (knee), and prepatellar (knee) bursae is easily performed and often produces excellent results
- Greater trochanteric bursitis – associated with lateral hip pain in contradistinction from hip joint pain referred to groin



# Soft Tissue Injections

- Injections of the medial epicondyle (for golfer's elbow) and lateral epicondyle (for tennis elbow) can have good results, especially when used together with conservative therapy
- Injection can also be considered for adhesive capsulitis (frozen shoulder), synovial cysts, flexor tenosynovitis (trigger finger), entrapment neuropathies (carpal tunnel syndrome), plantar fasciitis and myofascial pain syndromes- trigger point injections
- Intramuscular injection can provide benefit for days to weeks
  - Relieve polyarticular inflammation without using oral preparations or multiple intra-articular injections



# FDA indication for triamcinolone

- Intra-articular or soft-tissue administration of triamcinolone 10- and 40-mg/mL injectable suspension is indicated as short-term adjunctive therapy for acute gouty arthritis, acute and subacute bursitis, acute nonspecific tenosynovitis, epicondylitis, rheumatoid arthritis, synovitis, or osteoarthritis.



# FDA indication for intramuscular triamcinolone injections

- Triamcinolone 40-mg/mL intramuscular injection is indicated for the treatment of allergic states; dermatologic, gastrointestinal, neoplastic, ophthalmic, respiratory, and renal diseases; endocrine and rheumatic disorders; nervous system conditions; and other conditions such as trichinosis with neurologic/myocardial involvement

# Injection and Arthrocentesis Procedures

- Informed consent
- Universal precautions and aseptic technique
- Topical anesthetic (eg, ethyl chloride) or small quantity of 1% or 2% lidocaine hydrochloride is injected subcutaneously with a 25- to 27-gauge needle



# Injection and Arthrocentesis Procedures

- Use a small quantity of 1% or 2% lidocaine (or 0.25% bupivacaine) with the corticosteroid preparation to provide temporary analgesia at injection and to dilute the crystalline suspension so it is better diffused in the injected structure
- Move injected joint through physiologic range of motion following injection – promotes drug delivery
- Some limitation of joint use following injection may enhance therapeutic benefit
  - One trial showed 24 hours of rest post injection of knees with triamcinolone did significantly better 6 months later vs. injected knees that did not rest



# Injection and Arthrocentesis Procedures

- Synovial fluid analysis, including complete blood cell count with differential, gram stain, and crystal analysis (remember 3 C's)
- Purple-top tube containing ethylenediaminetetraacetic acid (EDTA) is preferred; A green-top tube containing heparin is often acceptable





# Action of Corticosteroids

- Decrease inflammatory reaction by limiting capillary dilatation and permeability of vascular structures
- Restrict accumulation of PMN leukocytes and macrophages
- Decrease release of vasoactive kinins
- Inhibit release of destructive enzymes
- New research suggests inhibition of release of arachidonic acid from phospholipids thereby decreasing formation of prostaglandins which contribute to the inflammatory process



# Characteristics of Synovial Fluid in Normal and Abnormal Conditions

Characteristic	Normal	Non-inflammatory	Inflammatory	Septic
Color	Clear	Straw/Yellow	Yellow	Variable
Clarity	Transparent	Transparent	Hazy/Opaque	Opaque
Viscosity	High	High	Low	Low-High
WBC count	0-200	200-2000	2000-75,000	>50,000
% Neutrophils	Low	Low	Med-High	High

# Potencies and Solubility

Corticosteroid preparation	HC equivalents (per mg)	Concentration (mg/mL)	Solubility (%wt/vol)
Methylprednisolone sodium succinate (MPS) and acetate	25	6	NA
Triamcinolone acetonide	5	10, 40	0.004
Triamcinolone hexacetomide	5	20	0.0002
Methylprednisolone acetate	5	20, 40, 80	0.001

consider high soluble preparations if patients have injection reactions

# Doses of Corticosteroids for Injection

Structure	Dose (mg)	Volume of Injection (mL)
<b>Large joint</b>		
Knee	40-60	1-4
Shoulder	30	1-4
Elbow	20-30	1-4
<b>Medium joint</b>		
Ankle	20-30	0.5-1
Wrist	20	0.5-1
<b>Small joint</b>		
IP, MCP, MTP	5-10	0.25-0.50
<b>Small Soft tissue</b>		
Bursa	20	0.5-1.5
Tendon Sheath	5-20	0.25-1

# Injections in Specific Disorders

- Rheumatoid Arthritis
  - Watch for over dependence on IA injections
  - Extra articular features respond well to injection
    - Entrapment neuropathies: Carpal tunnel, cubital tunnel and tarsal tunnel
    - Rheumatoid nodules
- Osteoarthritis
  - Sometimes more pain relief with injection in soft tissue around joint than joint injection itself
- Crystalline Arthropathy
  - If no sign of infection, appropriate to inject corticosteroid immediately following arthrocentesis



# Contraindications and Cautions

- Absolute contraindications
  - suspected infection
  - bacteremia
  - prosthetic joint
  - preceding injury or fracture
- Relative contraindications
  - joint instability
  - bleeding diatheses (hemophilia, anticoagulation therapy, thrombocytopenia)
    - Injections/aspirations low risk in patients on warfarin (INR < 4.5)
  - overlying cellulitis or infection
  - lack of prior response to injection



# Efficacy of Joint Injections

- Efficacious in rheumatoid arthritis - can suppress synovitis for days to months
- No conclusive data on whether corticosteroid injection of a joint retards erosion or ultimately influences progression of disease
- Soft-tissue injection has been found to provide substantial benefits in tendinitis and bursitis



# Efficacy of Joint Injections

- Data on efficacy in osteoarthritis - conflicting
- Rest the affected structure for 24 hours after corticosteroid injection
- Limiting injection of the same joint or soft-tissue structure to every third or fourth month for large, weight-bearing joints for the nearly normal joint
- Patients with established arthritis with few treatment alternatives can be injected more frequently





# Efficacy of Joint Injections

- Evidence supports short term (up to 2 weeks) improvement in symptoms of OA in the knee
- Significant improvement also shown in the only methodologically sound studies addressing long term response (16-24 weeks)
- Dose equivalent to 50 mg prednisone may be needed to show benefit at 16-24 weeks

# Potential Complications Arthrocentesis

- Infection (1:1000 to 1:16,000)
  - In several studies examining risk factors for septic joints, up to 20% of infected joints had been injected within previous 3 months
- Bleeding/hemarthrosis
- Vasovagal syncope
- Pain – most common complication
  - Transient, associated with inflammatory signs
  - Seen in 6% of injections in RA patients in one series
  - Resolves in 4-24 hours; treat with rest, analgesics, ice
  - Usually due to use of less-soluble corticosteroid preparations
- Cartilage injury
  - Not supported by studies in primates or clinical observation



# Potential Complications of Corticosteroid Injections

- Adrenal suppression, hyperglycemia, diaphoresis, erythema, and warmth
- Abnormal uterine bleeding uncommon
- Iatrogenic infection
- Hemarthrosis
- Steroid arthropathy
- Soft tissue atrophy, loss of pigmented skin cells, tendon rupture, nerve damage
  - Confine injections to adjacent synovial sheaths and bursae



# Intra-articular Use of Viscosupplementation

- Hyaluronic acids (HA) - alternatives to glucocorticoids in patients with Osteoarthritis of the knee
- In OA, concentration and size of HA reduced
- Mechanism of action felt to be due short term lubrication, anti-inflammatory effects through binding of inflammatory mediators & destructive enzymes and stimulation of synovial cells to produce more “normal” hyaluronic acid



# Potential Benefits of Viscosupplementation

- Improve the lubricating properties of the synovial fluid
- Reduce or stop the pain from osteoarthritis of the knee
- Improve mobility and provide a higher and more comfortable level of activity



# Hyaluronic Acids

## Safety Issues

- No reports of product-associated deaths (21 years on the market)
- No known oral medication reactions
- Egg/chicken allergy reactions
  - Rare hypersensitivity – acute/anaphylactoid reactions
- Local reactions – most common side effect
  - Injection site pain – usually mild & self limiting
- Pseudoseptic reactions
  - Seen only with Hyalan G-F 20 (Synvisc)



# Diagnosis for Treatment

- Viscosupplementation – Medicare approval
- Considered a device, not a medication
- Diagnosis: Osteoarthritis of the knee or shoulder
- Must have radiographic evidence of OA in the joint
- Must document simple pharmacological therapy or exercise / Physical Therapy tried with lack of significant response
- Not approved for frequency more often than Q 6 months
- Use in shoulder – now FDA approved!

# Clinical Considerations

- Contraindications:
  - Allergy to sodium hyaluronate preparation
  - Infection or skin disease in the area of injection site
- Use 18-21 gauge 1 1/2 inch needle





# FDA Approved Viscosupplementation Agents

Name	Number of weekly Injections	Source
Sodium Hyaluronate (Hyalgan)	5	Avian
Sodium Hyaluronate (Supartz)	5	Avian
High molecular weight hyaluronan (Orthovisc)	3-4	Avian
Sodium Hyaluronate (Euflexxa)	3	Non-avian
Hylan G-F 20 (Synvisc)	3	Avian

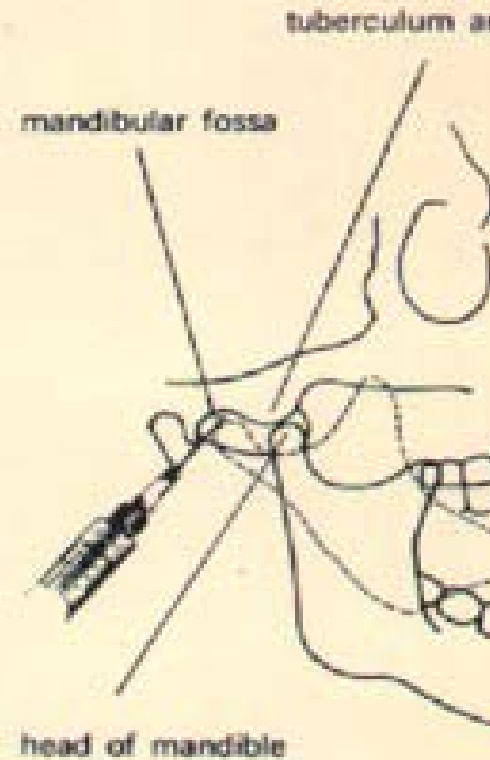
# Summary

- Augment systemic and local conservative treatment
- Long-lasting benefits
- Inflammatory and crystalline arthritis, synovitis, tendinitis, bursitis, and many other conditions respond well to injection
- Corticosteroid preparations should be chosen on the basis of solubility and potency desired and the size of structure to be injected

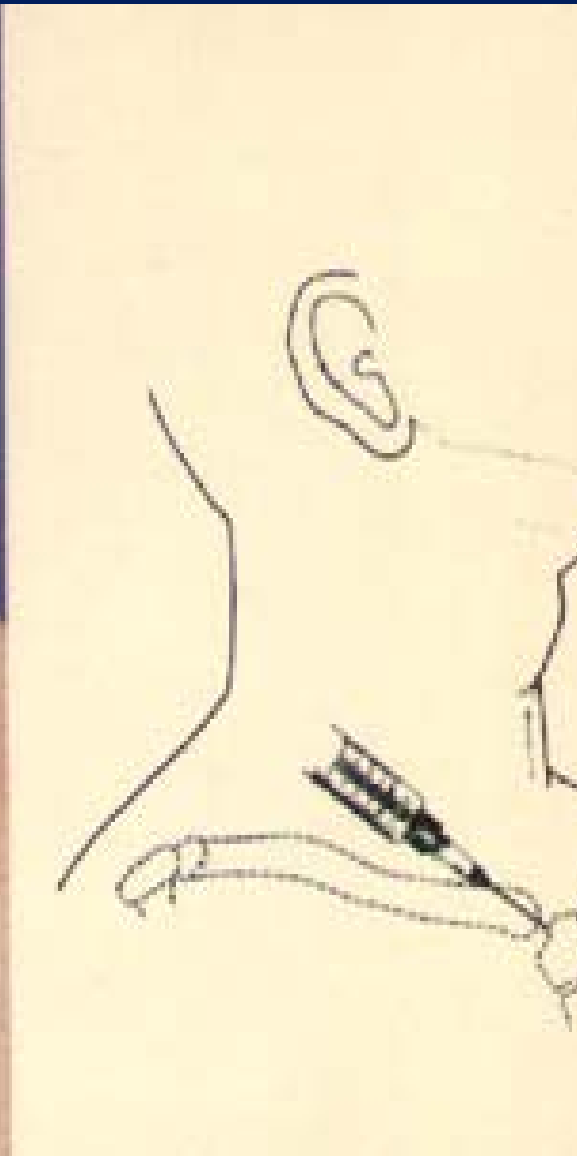
The head of the mandible can be palpated when the jaw is moved. When the mouth is opened, the head of the mandible moves forward and downward to a position below the mandibular fossa and the fossa can be felt as a groove. Insert the needle into the groove.



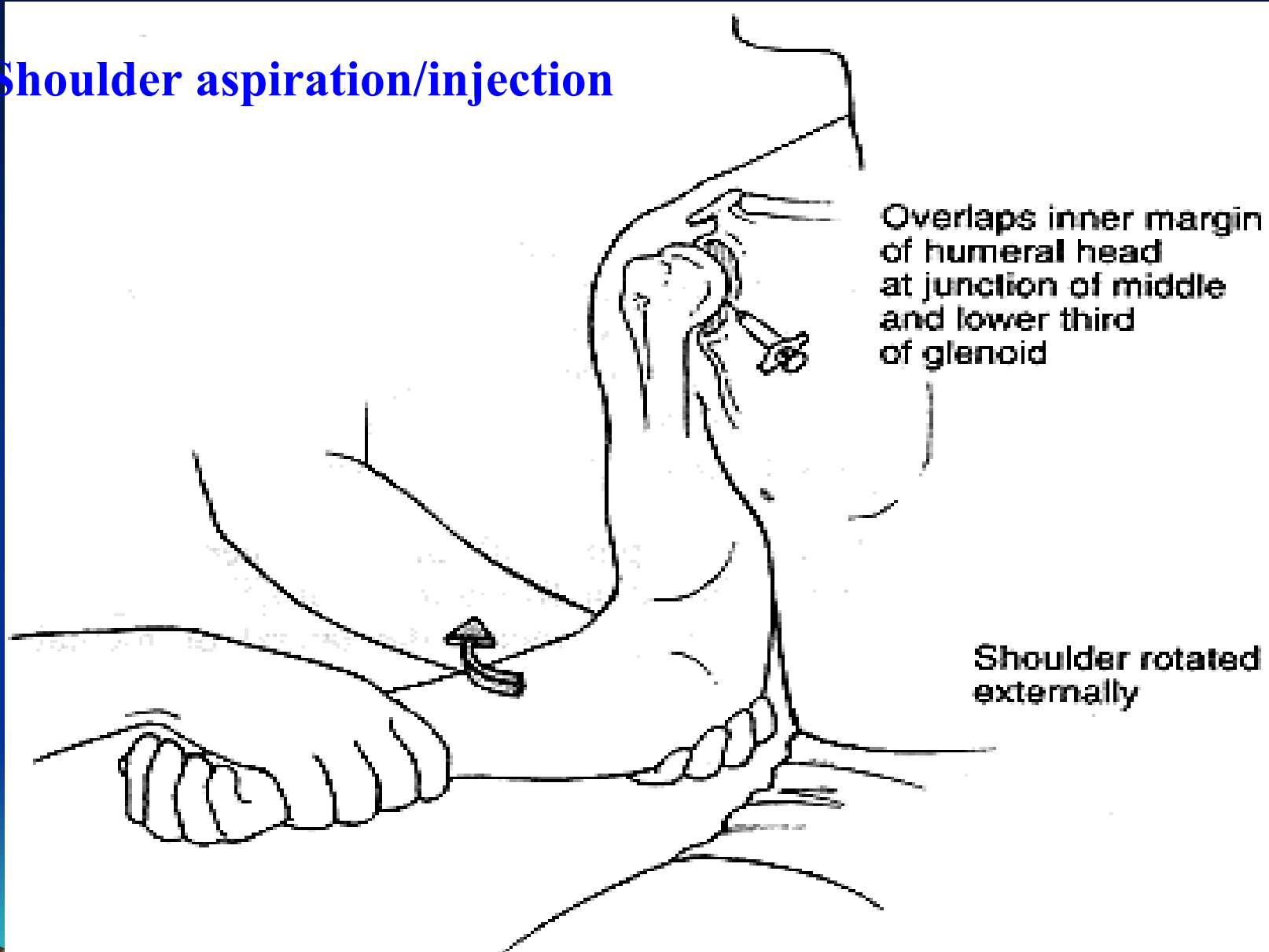
## Temporomandibular

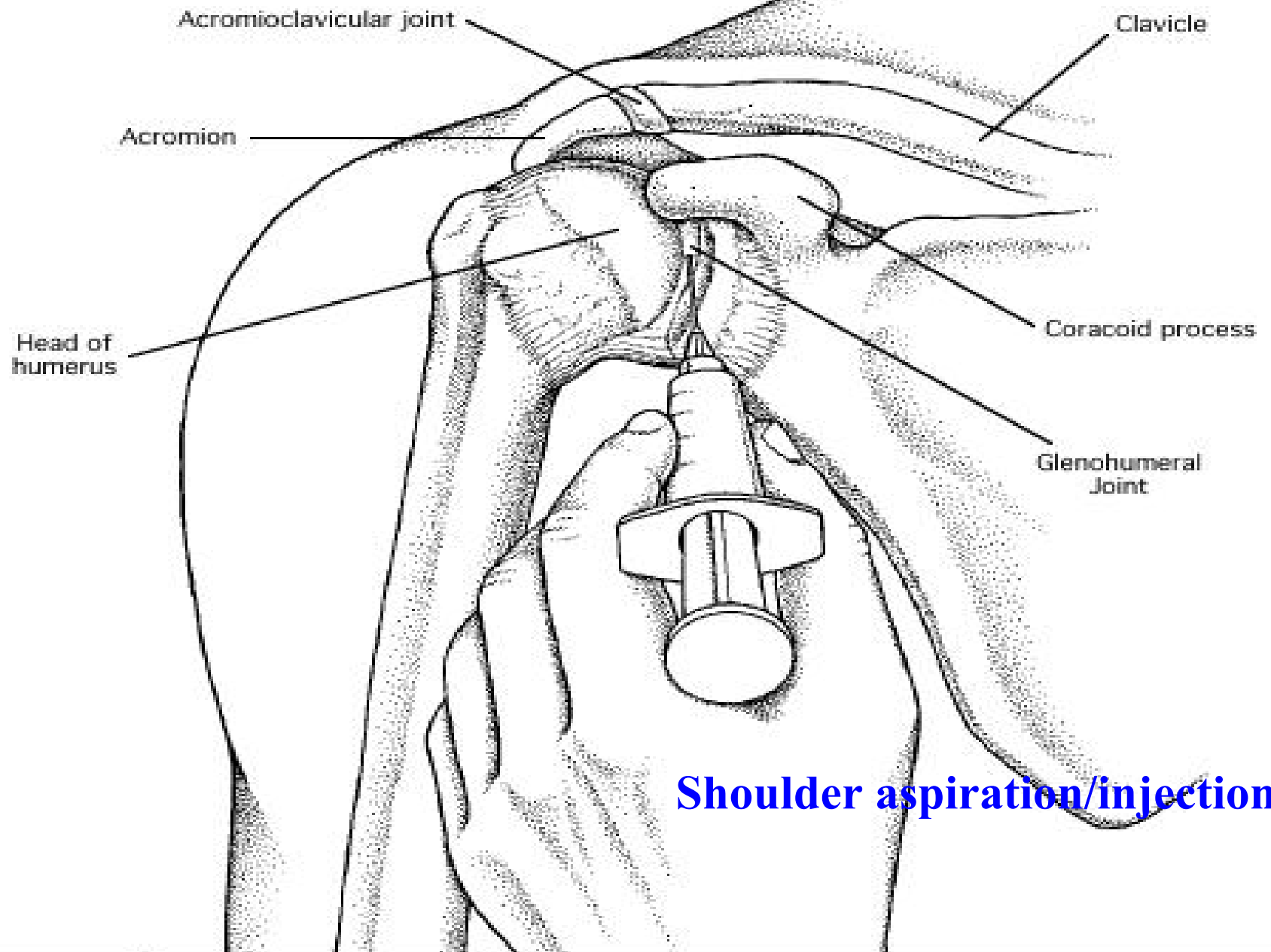


The needle is inserted from the anterior surface of the skin overlying the joint. However, since a fibro-cartilagenous disc occupies the joint cavity, it is necessary to select a point which offers the least resistance to the inserted needle.



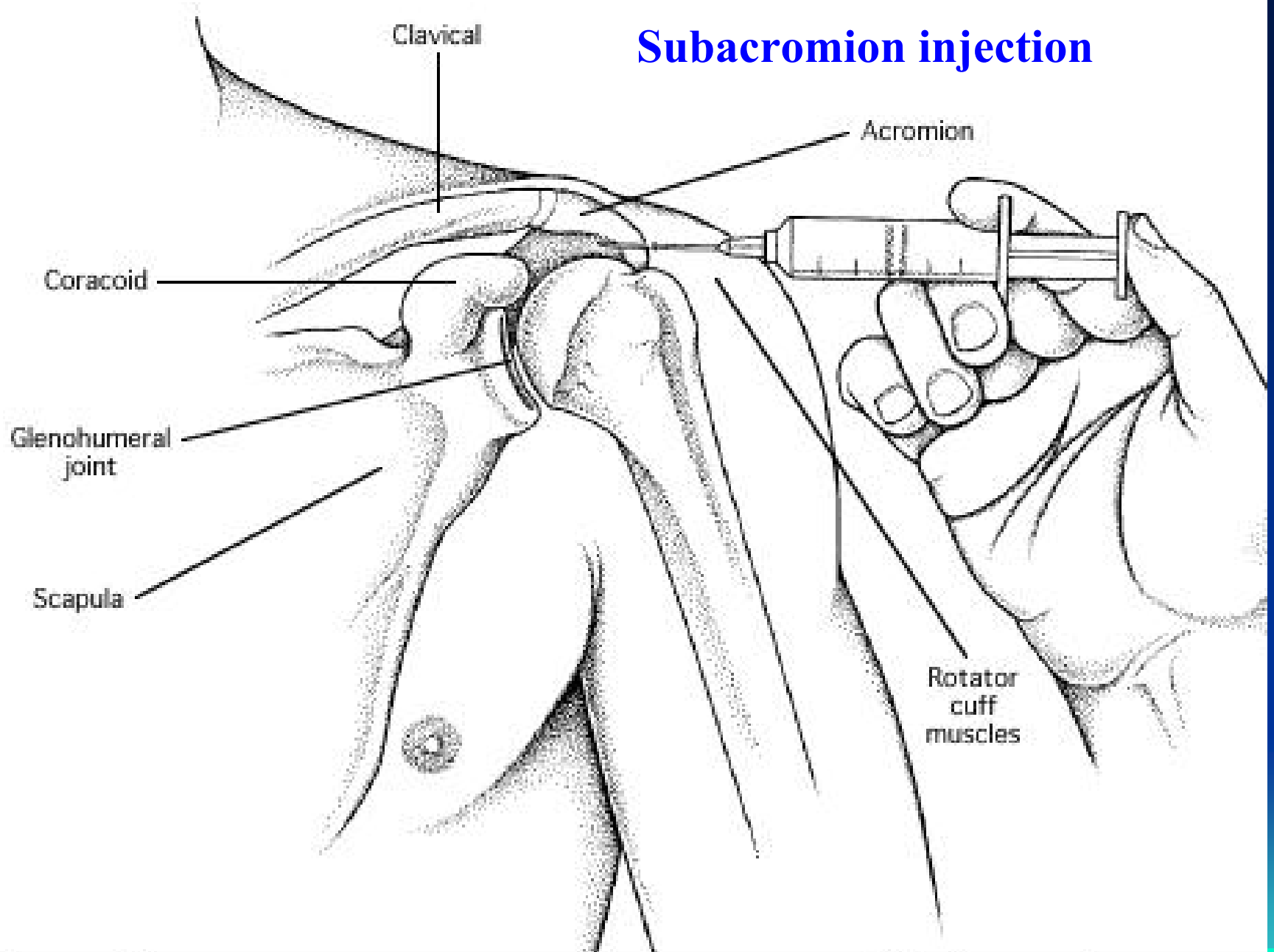
## Shoulder aspiration/injection



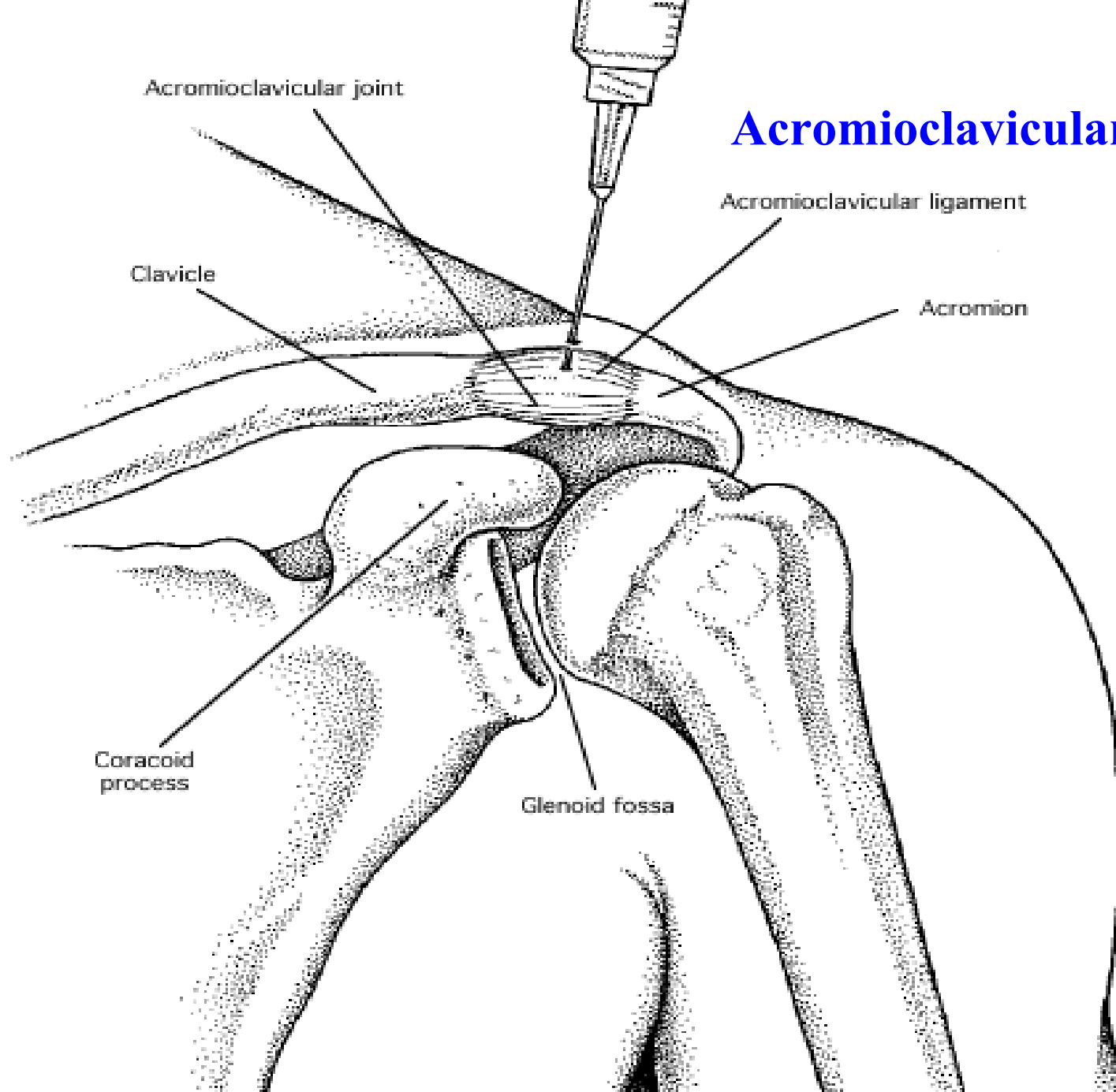


## Shoulder aspiration/injection

# Subacromion injection



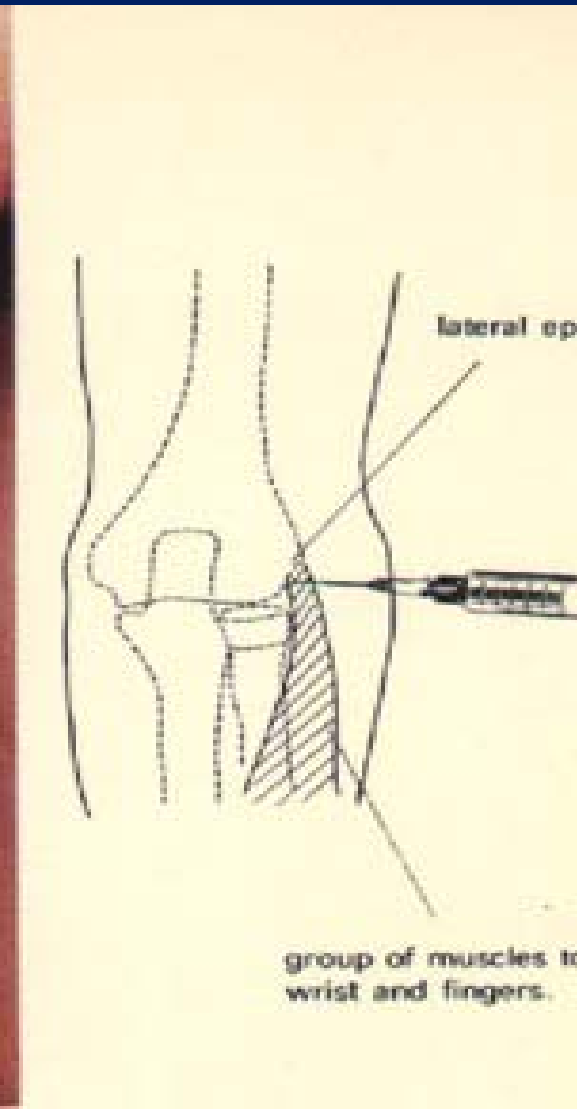
# Acromioclavicular injection



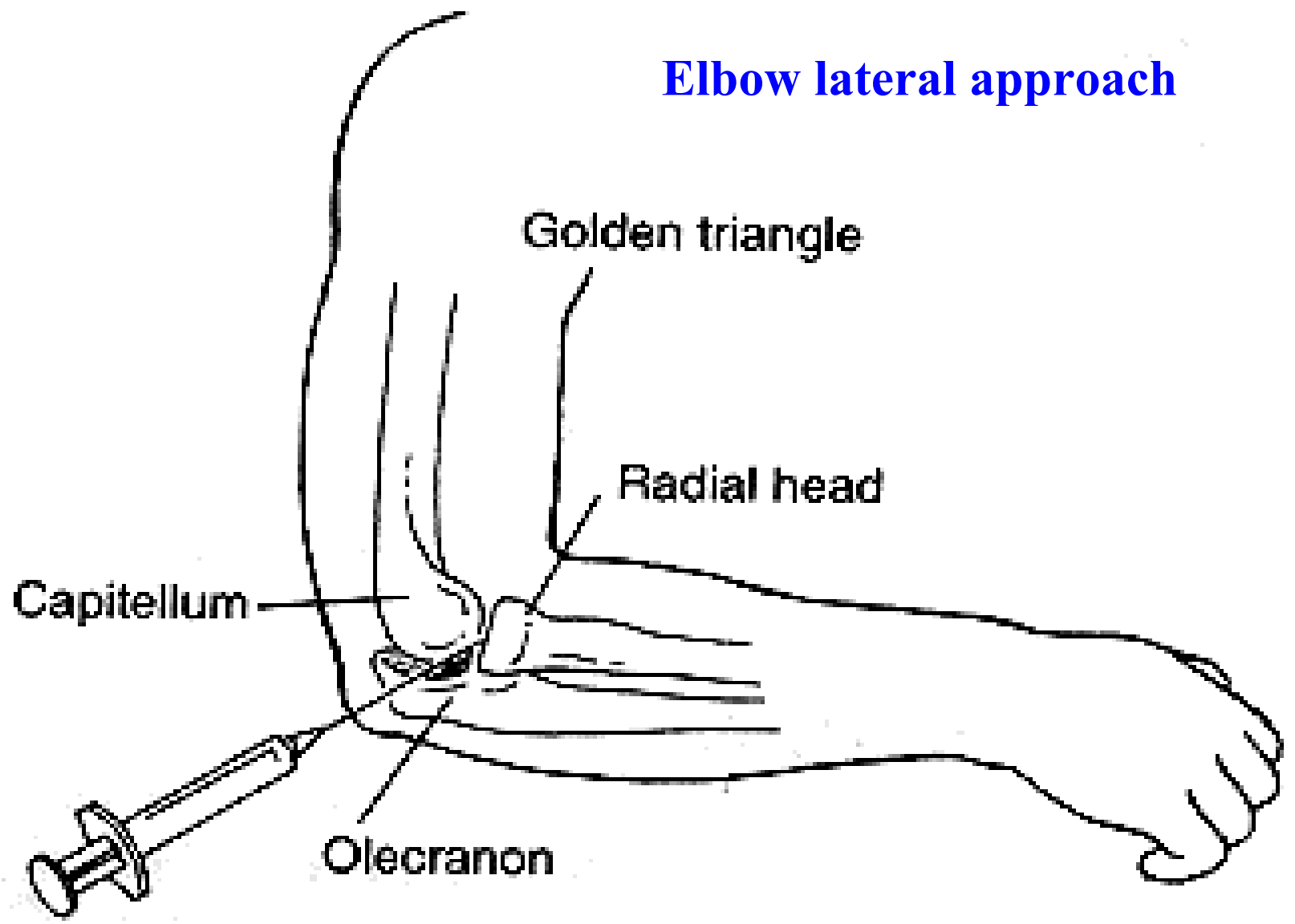


# Lateral Epicondyle

Extend the elbow at a right angle; insert the needle at the most tender spot and direct the needle toward the external epicondyle of the humerus and infiltrate the area.

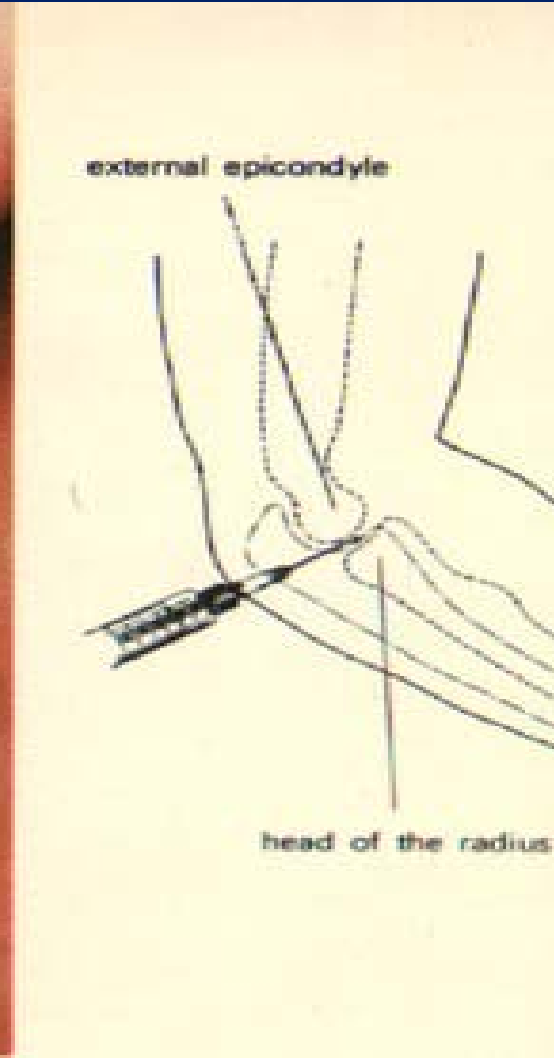


## Elbow lateral approach

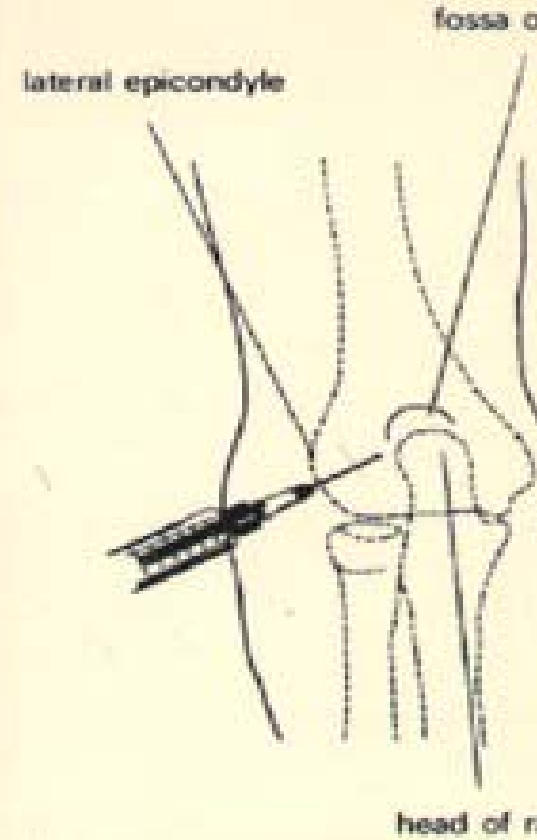


## Elbow aspiration/injection lateral approach

Bend the elbow at a right angle; rotate the forearm inwards and outwards and palpate the head of the radius. Insert the needle into the space between the proximal end of the radius and the external epicondyle of the humerus

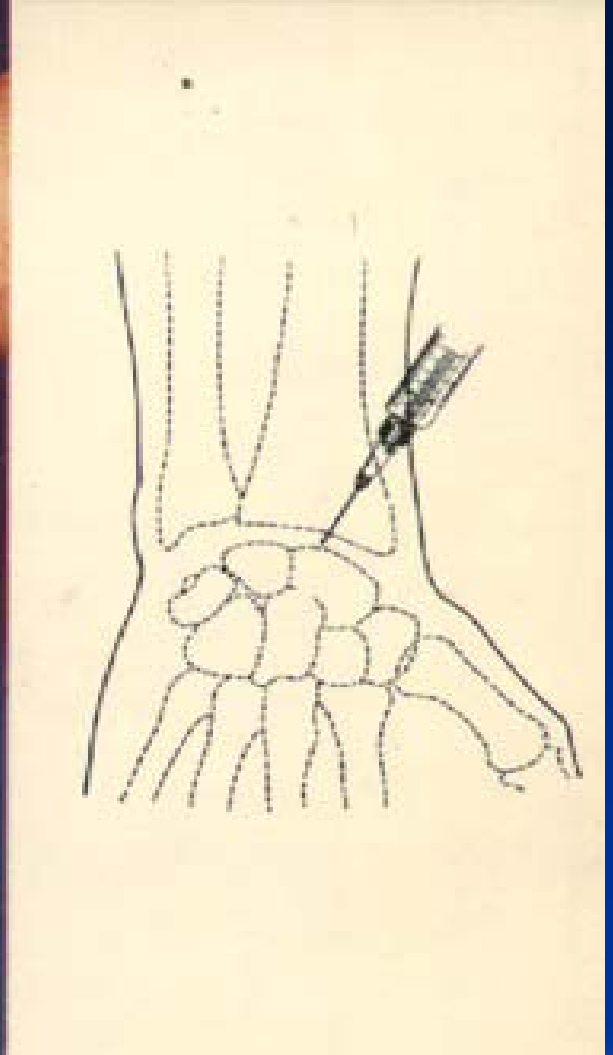


## Elbow aspiration/injection anterior approach

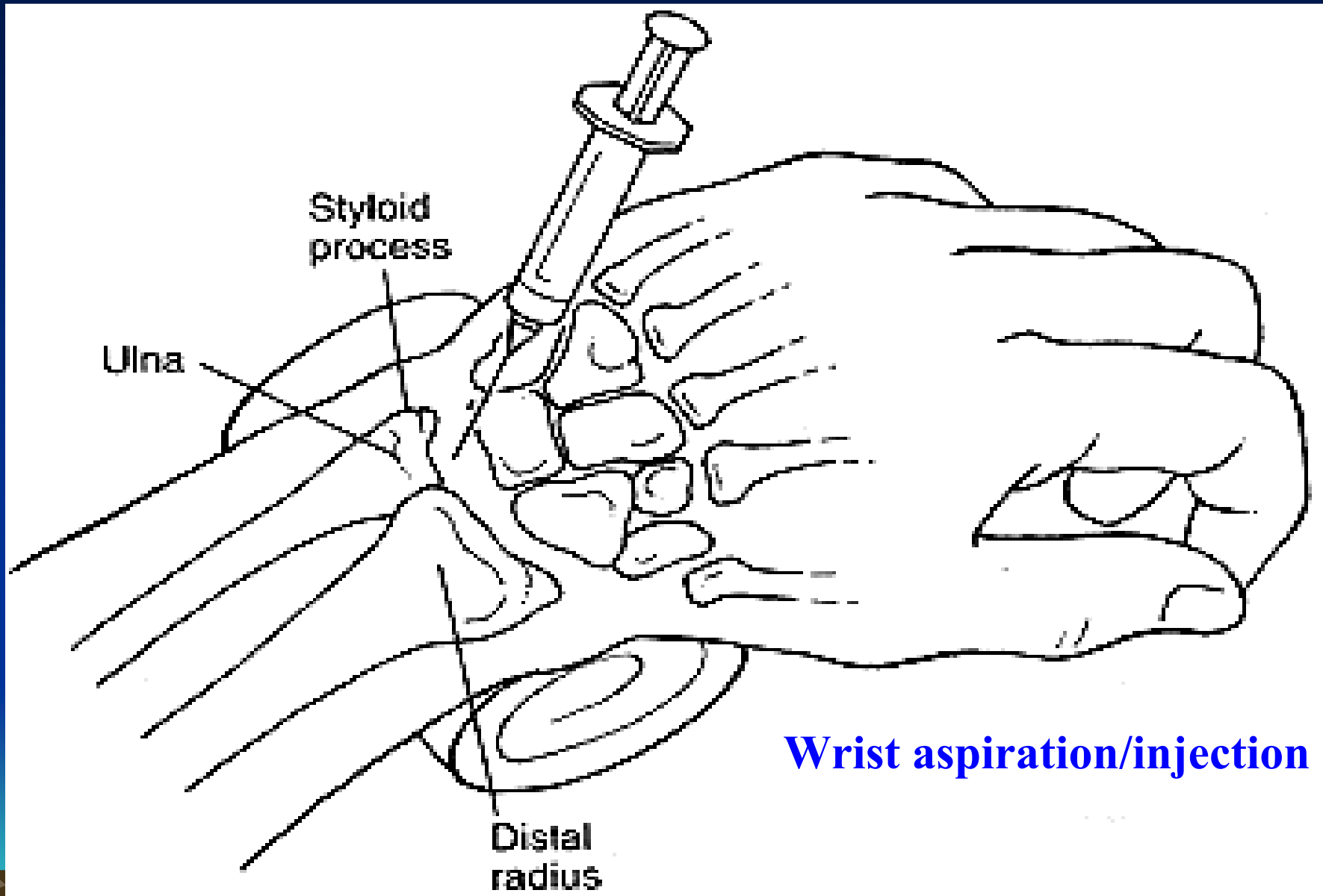


Bend the elbow at a right angle and insert the needle between the head of the radius and the lateral epicondyle.

## Wrist aspiration /injection



Move the wrist joint and palpate the space between the radius and the carpal bones. Slightly flex the wrist joint and introduce the needle at the radial margin of the tendon of the extensor carpi muscle of the index finger, avoiding the superficial veins.



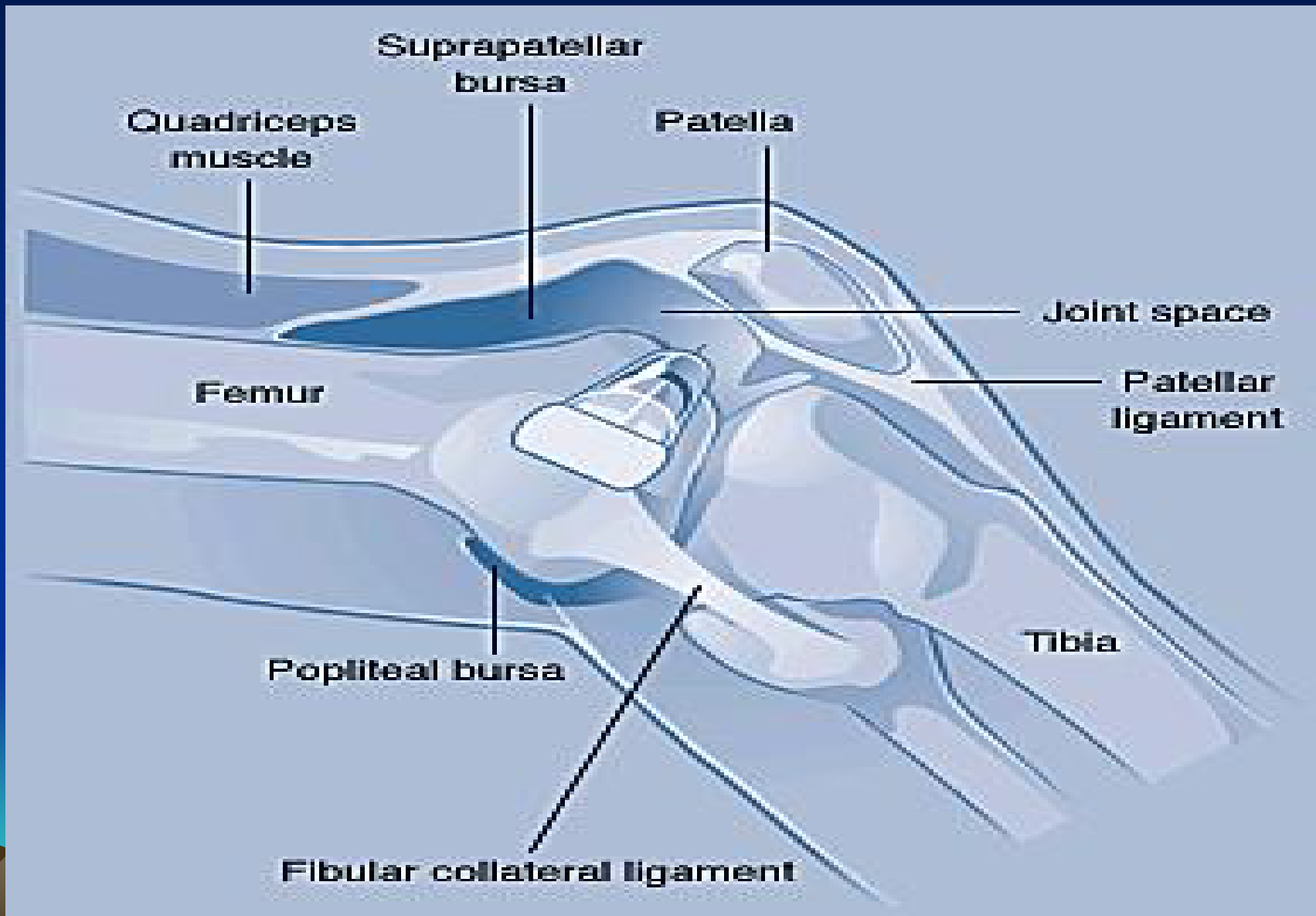
**Wrist aspiration/injection**

# De Quervain's Tenosynovitis



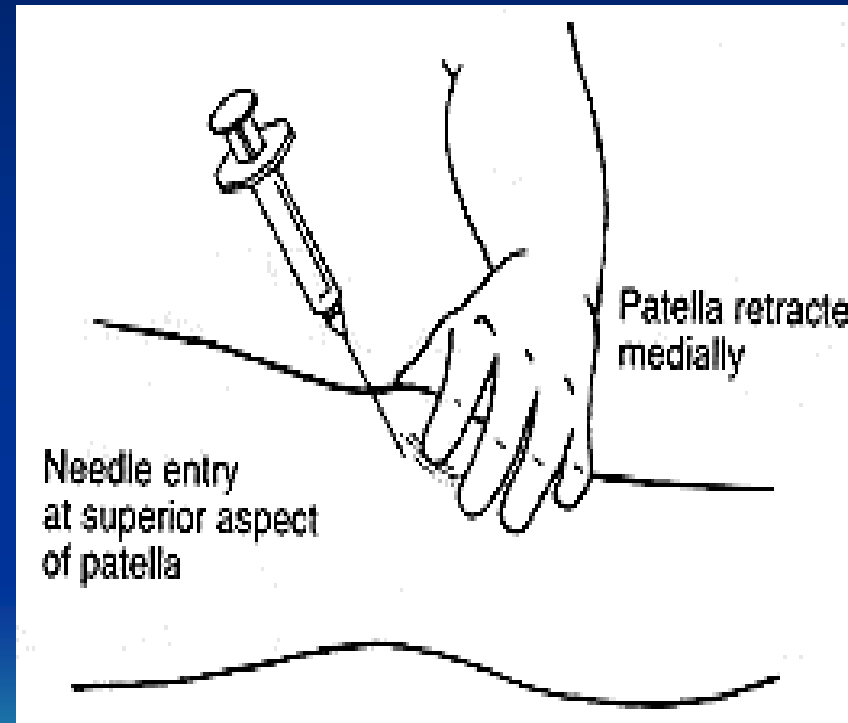
This method is used in De Quervain's tenosynovitis. Slightly flex the wrist joint toward the ulnar and also flex the thumb. Introduce the needle parallel to the direction of the muscle concerned and direct the needle almost horizontal to the skin.

# Knee aspiration /injection

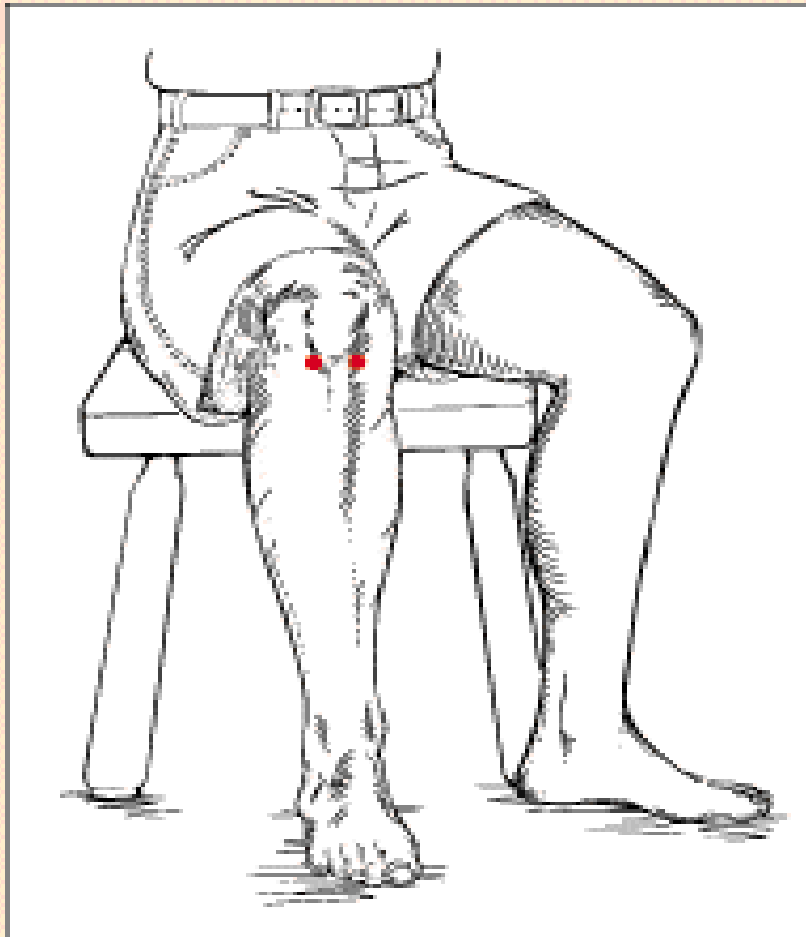




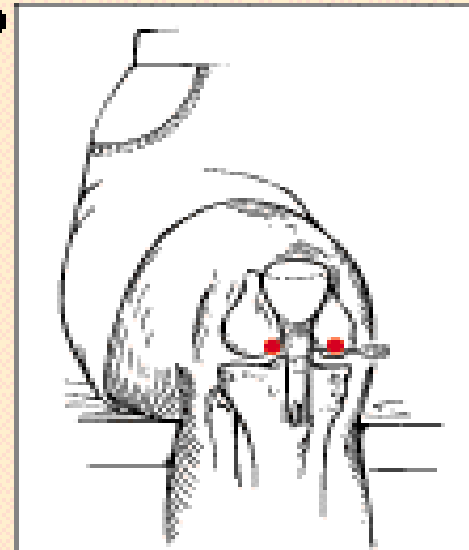
# Approaches to Knee Injection



a



b

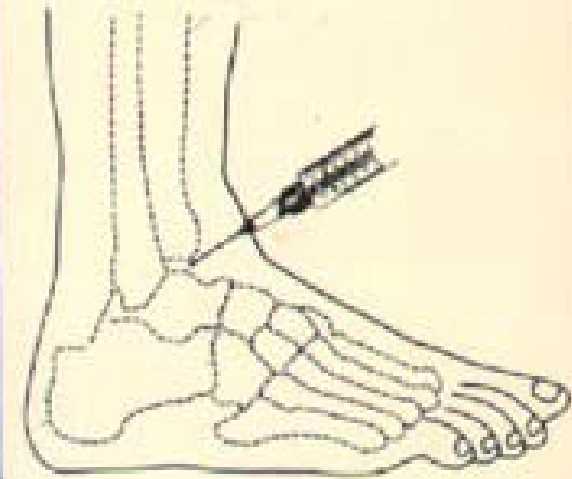
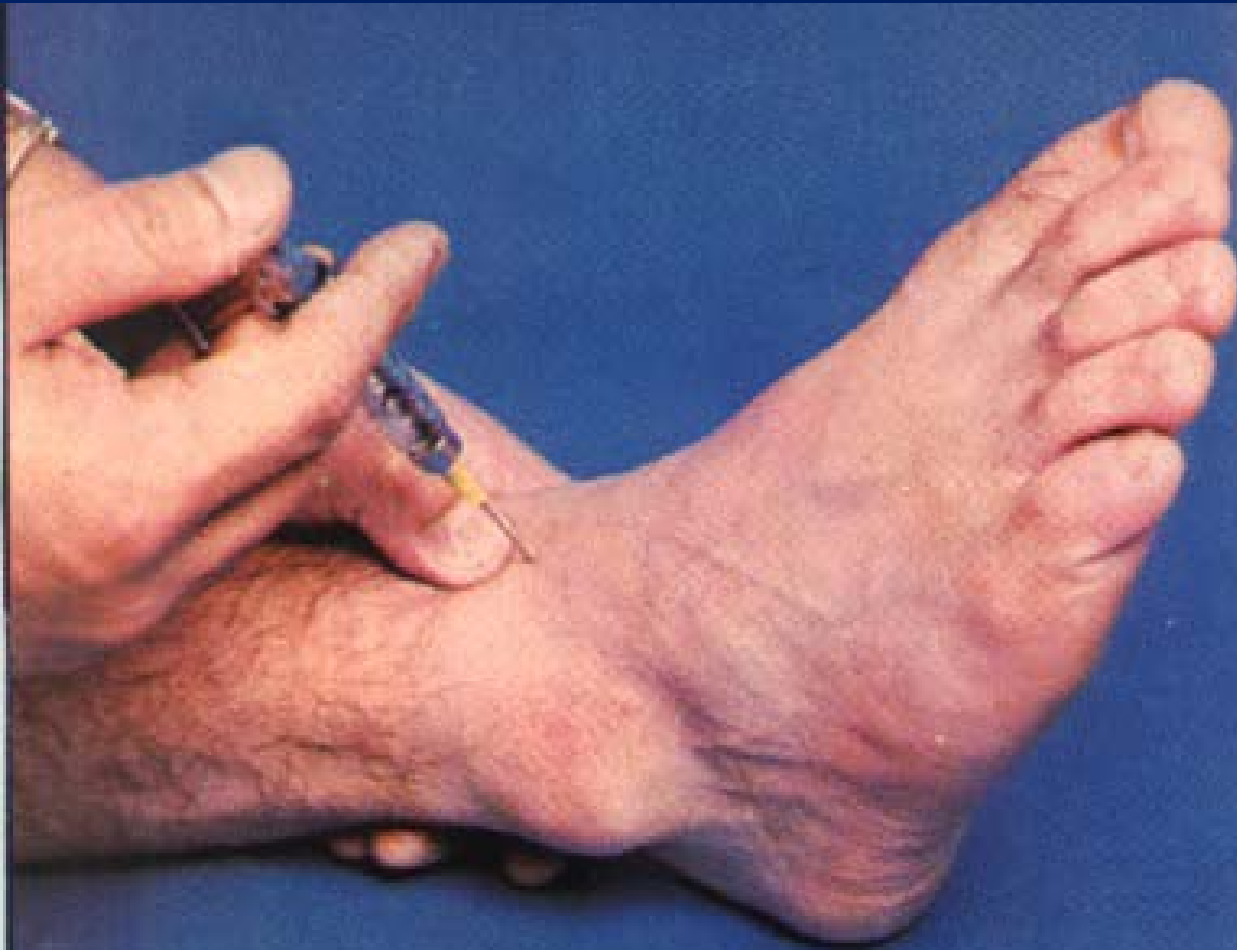


## Knee- anterior approach

Figure 1. For an anterior approach to knee joint injection or aspiration, the patient usually should be seated, and the injection site should be slightly lateral or medial to the patellar tendon (a). The needle should be angled in a posterolateral (b) or posteromedial direction, depending on the injection site.

## Ankle aspiration/injection

Move the ankle and ascertain the height of the tarso-calcaneus joint. Slightly extend the foot and introduce the needle internal to the tendon of the extensor hallucis longus muscle.



## Toe Aspiration/injection

Injection is given from the internal or external dorsal surface of the toe. Usually it is difficult to introduce the needle into the joint cavity.



# Greater Trochanteric Bursa Injection

- 40 mg Kenalog with 4.0 mL 1% lidocaine without epi
- Inject 1 mL at point of maximal tenderness
- Inject 1 mL at 12 o'clock, 3 o'clock, 6 o'clock and 9 o'clock around bursa



# Pes Anserine Bursa Injection

Patient lies supine with knee slightly flexed

Mark position of pes anserine bursa - Distal to medial joint line

Sandwiched between ligament and tendon on medial knee

Identify point of maximal tenderness

Insert needle perpendicular to tibia

