

# Joint Injection Workshop

*Annual Clinical Day in Family Medicine*

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*Dr. Vikram Dalal MD CCFP(EM) FCFP*

*Dr. Bryan Lemenchick MD CCFP DipSportMed*



# Faculty / Presenter Disclosure

*Faculty: Dr. Vikram Dalal*

Relationship with Commercial Interstes:

**NONE**



# Faculty / Presenter Disclosure

*Faculty: Dr. Bryan Lemenchick*

Relationship with Commercial Interests:

**NONE**



# Disclosure of Commercial Support

*This program has received **NO** financial support*

*This program has received **IN-KIND** support from Tribute Pharmaceuticals in the form of **injection models***

*Potential Conflict(s) of interest:  
**NONE***





# Mitigating Potential Bias

*NOT APPLICABLE*



# Objectives

To Educate Family Physicians on...

- Evidence base for injection therapy
- The drugs used
- The bony landmarks for common joint/bursa/soft tissue injections
- Correct techniques to do joint injections

# What Providers Need to Know About Joint Injection and Aspiration

- Relatively simple procedure
- Complications are rare
- Injection/arthrocentesis can provide diagnosis, pain relief, reduce joint damage
  - “Liquid biopsy of joint”
  - Useful information can be provided by relatively inexpensive tests
  - Can help differentiate inflammatory from non-inflammatory arthritis
- Judicious use of anesthetics and steroids may be safer than systemic medications
- **Summary: There are often more reasons for doing than not**

# Indications for Joint Injection /Aspiration

- **Diagnostic:**
  - Acute inflammatory arthritis (24-48hrs) in a patient who has never had these symptoms before
  - Acute effusion in the setting of fever, chills, or presence of infection at another site
  - Acute effusion in the setting of trauma
  - Prior to committing patients to long-term, expensive or toxic therapy
- **Therapeutic:**
  - To facilitate a more tolerable musculoskeletal exam (ie pain control)
  - To suppress inflammation in one or two isolated joints
  - Adjuvant therapy to a few joints resistant to systemic therapy
  - To facilitate a rehabilitative physical therapy program
  - To support a patient with active joint inflammation pending the effects of systemic therapy
  - To remove exudative fluid from a septic joint
  - To relieve pain in a swollen joint



# Conditions Likely to be Improved by Joint or Periarticular Injections

- Rheumatoid arthritis
  - Seronegative spondyloarthropathies
  - Crystal induced arthritis
  - Carpal tunnel
  - Bursitis
  - Tenosynovitis / tendinosis
  - Adhesive capsulitis
  - Osteoarthritis
- 

# Contraindications to Joint Injection/Aspiration

## Absolute:

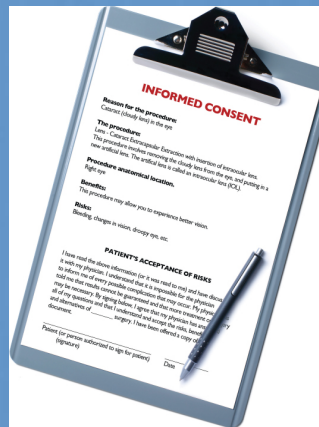
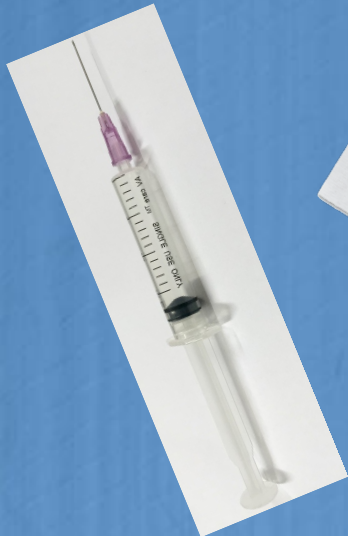
- Sepsis / Cellulitis
- Hypersensitivity
- Fracture
- Arthroplasty
- Previous severe steroid flare
- Reluctant patient
- Uninformed patient
- Injection into critical wt bearing tendons

## Relative:

- Uncontrolled Diabetes
- Immunosuppression
- Bleeding disorder
- Anticoagulants\*
- > 3 prev. steroid injection in a major wt bearing joint within the preceding year
- Excessive anxiety
- Prosthetic Joint

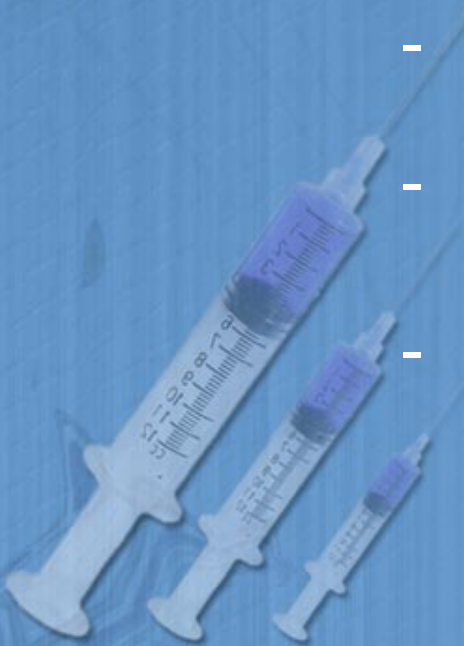
\*Therapeutic INR – okay, NOACs variable but okay (Ahmed 2012)

# Technique: Equipment



# Technique: Preparation

- Discuss with patient option of injection and alternative treatments applicable to condition
- Obtain informed consent
- Check names on consent and expiration dates
- Place in comfortable position
- Define / mark anatomy





# Technique: Site Prep

- Skin Preparation
  - Infection is rare
    - Reported incidence unknown, but varies from 1:3,000 to 1:50,000 (Baima, J, 2008)
    - Isopropyl alcohol similar to chlorhexidine in killing skin flora (Cawley et al., 1992)
- Inject using Aseptic Technique
- Confident Approach
- Stretch skin
- Needle insertion depending on site and type of injection





## Technique: Aftercare

- Avoid excessive activities for 24-48 hours
- Gradual return
- Apply ice for 10-15 min, 2-3 times/day
- NSAIDS / Acetaminophen for first 12-24 hours (PRN)
- Watch for “steroid flare”
- +/- Follow-up



# Steroid Use

Commonly used in ambulatory care settings by family doctors, orthopedic surgeons, and rheumatologists

Conditions warranting injection (Hill JJ (1989); McNabb J (2010))

- Epicondylitis (93%)
- Shoulder Pathologies (91%)
- Greater trochanteric bursitis (91%)
- De Quervain's tendinopathy (87%)
- Bicipital tendonitis (81%)
- Osteoarthritis (knee) (92%)



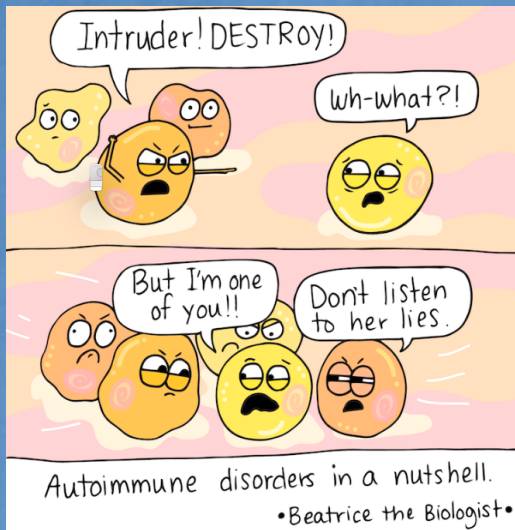
# Corticosteroid Function

- Corticosteroids have anti-inflammatory and immunosuppressive effect (Pekarek et al, 2011)

- Alter movement and function of leukocytes
- Reduce vascular permeability in inflamed areas
- Reduce prostaglandin synthesis

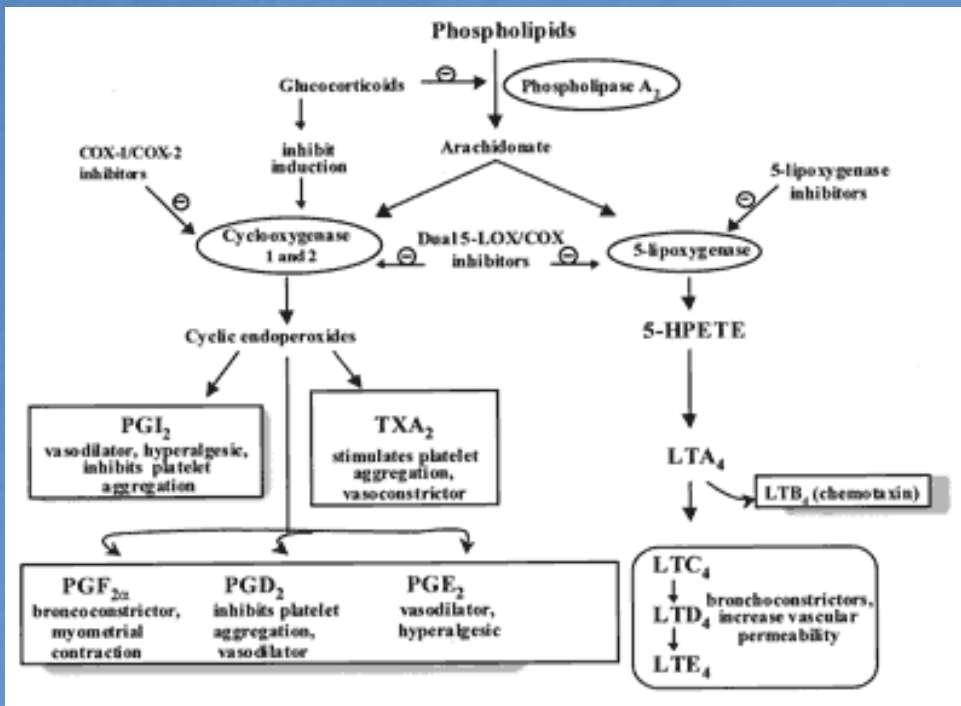
• Serve to reduce erythema, swelling, heat, and tenderness of inflamed joints

• Also increase the viscosity and hyaluronate concentration in synovial fluid



# Steroids - Physiology

- Stabilizes lysosomal membranes of inflammatory cells
- Decreases local vascular permeability
- Alters neutrophil chemotaxis and function
- Passes through cell membranes and binds to nuclear steroid receptors
  - Where they influence RNA transcription and subsequent protein production



# Guide to Glucocorticoids for Intra-articular and Soft tissue Injections

**Table 2: Common injectable corticosteroids. Common Injectable Corticosteroids ("Cortisones")**

Solubility/Generic Name	Common Trade Name	Strength <sup>a</sup> (mg/cc)	Relative Potency <sup>b</sup>	Recommended Dose Range <sup>c</sup>	
				Intermediate Joint [A-C Joint] (mg)	Large 'Joint' [S-A Bursa and G-H Joint] (mg)
<b>Most Soluble</b>					
* Betamethasone sodium phosphate	Celestone Phosphate <sup>f</sup>	3	25	1.5–3	6–12
<b>Soluble</b>					
* Dexamethasone sodium phosphate	Decadron <sup>f</sup>	4	25	2–4	7.5–15
Prednisone sodium phosphate	Hydeltrasol	20	4	12.5–25	50–100
<b>Slightly Soluble</b>					
* Methylprednisolone acetate	Depo-Medrol	20/40/80	5	10–20	40–80
Triamcinolone diacetate	Aristospan Forte <sup>f</sup>	25/40	5	10–20	40–80
Prednisolone tebutate	Hydeltra-TBA	20	4	12.5–25	40–80
<b>Relatively insoluble</b>					
* Triamcinolone acetonide	Kenalog <sup>f</sup>	10/40	5	10–20	40–80
* Triamcinolone hexacetonide	Aristospan <sup>f</sup>	20	5	10–20	40–80
Hydrocortisone acetate	Hydrocortone	25	1	25–50 <sup>d</sup>	100–200 <sup>d</sup>
Dexamethasone acetate	Decadron-LA <sup>f</sup>	8	25	2–4	7.5–15
<b>Combination</b>					
* Betamethasone sodium phosphate-Betamethasone acetate	Celestone Soluspan <sup>f</sup>	6	25	1.5–3	6–12



# The Drugs

- Few studies have assessed the comparative efficacy of different corticosteroid injections for various articular and peri-articular disorders
- Physician's choice of specific corticosteroid for injection is linked to the region where the physician was trained, as opposed to specific evidence based practice (Wittich et al., 2009)
- What we know:
  - Triamcinolone hexacetonide had faster pain relief than methylprednisolone for knee RA at day 7 and knee OA at 3 weeks; both had similar long term efficacy (Garg et al., 2014)
  - Triamcinolone acetate and methylprednisolone seem to have similar efficacy for knee and shoulder injections (Garg et al., 2014)



# Local Anesthetics



## Lidocaine:

- Rapid onset (minutes)
- Short duration (60-90 min)

## Bupivacaine

- Slower onset (30 min)
- Longer duration 96-8 hours)

## Buffering:

- Sodium bicarbonate

Typically a local anesthetic agent is combined with steroid agents

## 1. Analgesia:

- Decrease nerve conduction through the blockade of sodium channels, which disrupts axonal nerve conduction

## 2. Diagnostic:

- pain relief confirms pathology and correct administration

## 3. Volume Distribution / Dilutional:

- dilutes the steroid (reduced chance skin atrophy)
- increases the distribution of the agent to the treated area

# What Patients (and Providers) Need to Know About Joint Injection and Aspiration

- Relief will typically last weeks or longer
- No ligamentous or tendon structure should be injected directly
- Activity modification following injections of steroid is uncertain
- Maximal number of injections and the required period between injections have not been determined (Nichols, A (2005); Pfenninger, JL (2010))



# What Patients (and Providers) Need to Know about Joint Injections

- In a meta-analysis summarizing 25+ studies, a 5.5% complication rate noted

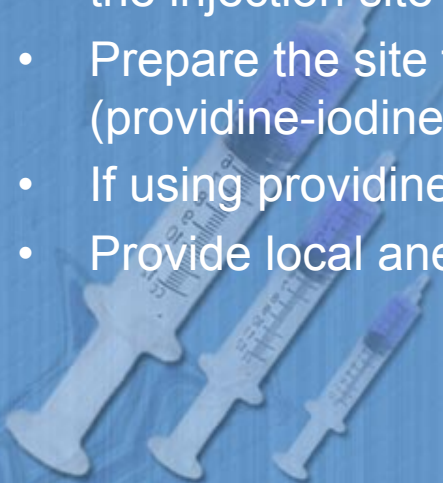
Tendon weakening and/or rupture  
Postinjection neuritis  
Hyperglycemia  
Skin atrophy  
Infection  
Adrenal cortical suppression  
Decreased ligament strength and possible rupture  
Synovitis  
Sickle cell crisis  
Cartilage damage  
Anaphylaxis  
Vascular injury  
Sterile abscess  
Corticosteroid arthropathy

- *Most common side effects included skin atrophy (2.4%), depigmentation (0.8%), localized erythema and warmth (0.7%), and facial flushing (0.6%)*
- *Post-injection pain was noted in up to 9% of patients*
- *Prolonged and repeated usage may increase the risk of complications and systemic side effects (hence at times limited to 3 injections within 12 months)*
- *Post injection flare (2-5%)*

- Infection 18/250,000 injections (0.072%)
- In diabetic patients, hyperglycemia has been shown to persist up to 5 days after single soft tissue injection

# Typical Injection/Aspiration Procedure

- Determine the medical diagnosis and consider relevant differential diagnosis
- Discuss the proposed procedure and alternatives with the patient
- Obtain written informed consent from the patient
- Collect and prepare the required materials
- Correctly position the patient for the procedure
- Identify and mark the anatomic landmarks and injection site with ink
  - Do not allow the patient to move the affected area from the time that the marks are placed until after the procedure is completed
- Press firmly on the skin with the retracted tip of a ballpoint pen to further identify the injection site
- Prepare the site for injection by cleansing with a topical antimicrobial agent (providine-iodine and/or alcohol swab)
- If using providine, allow to dry for full antibacterial effect
- Provide local anesthesia as indicated\*\*\*

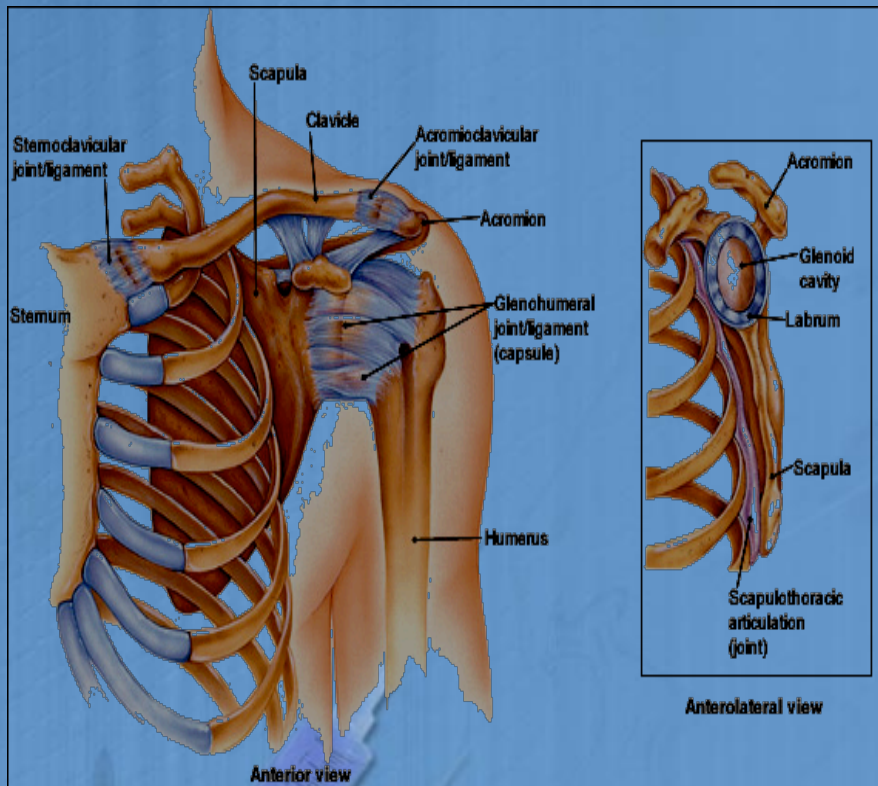




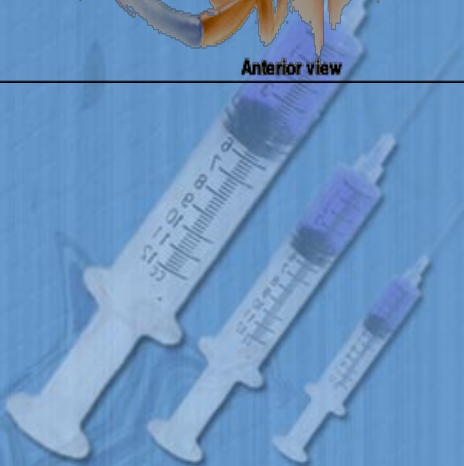
# Typical Injection/Aspiration Procedure

- Using the no-touch technique, introduce the needle at the injection site and advance into the treatment area
- Aspirate fluid (optional) using a 18 or 20-g needle and send it for laboratory examination if indicated
- If injecting corticosteroid immediately following aspiration, do not remove the needle from the joint or bursa; In this case, grasp the needle hub firmly (with hemostat clamp if necessary), twist off the original syringe, and then immediately attach the second syringe that contains the corticosteroid
- Always aspirate before injection to avoid intravascular administration
- Inject corticosteroid solution into the treatment area
  - If not aspirating then use 25-g needle
  - Do not inject the medication against resistance
- Withdraw the needle
- Apply direct pressure over the injection site with a gauze pad
- Apply an adhesive dressing
- Provide the patient with specific post-injection instructions

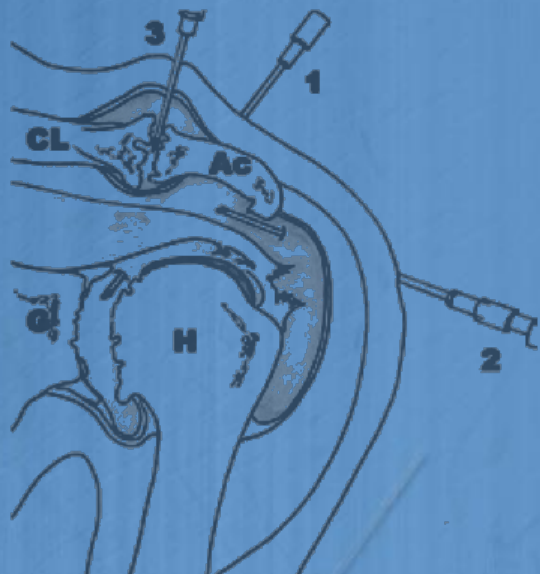
# Shoulder Complex



- A complicated anatomical and biomechanical joint
- Actually multiple joints
- Static and dynamic stabilizers
- Bursitis, tendinosis, adhesive capsulitis, impingement syndrome, calcific tendinopathy



# Shoulder Complex



**Fig 1: Injections in different spaces**

1. Injection in shoulder joint (ground floor)

2. Injection in subacromial space (first floor)

3. Injection in AC joint (attic)

H: humeral head

G: Glenoid

CL: Clavicle

AC: Acromium

Anatomy: No major arteries or nerves in the technique

Examples:

**GH Joint (Ground Floor):**

- 1-2 cc (40-80mg) depomedrol + 3-4cc xylocaine

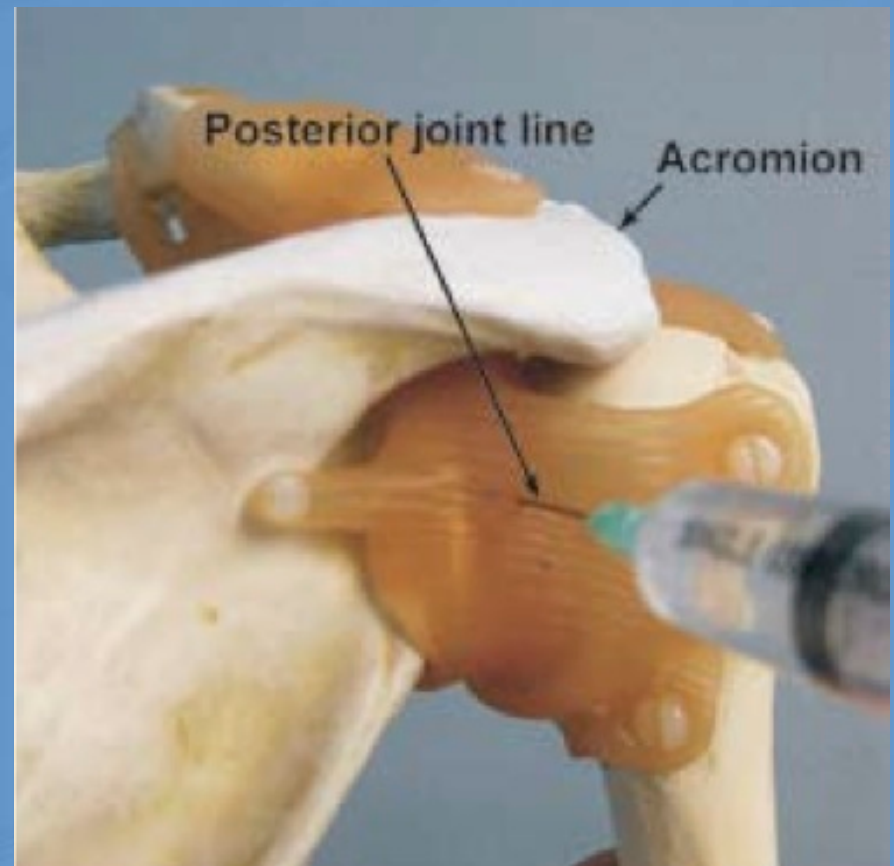
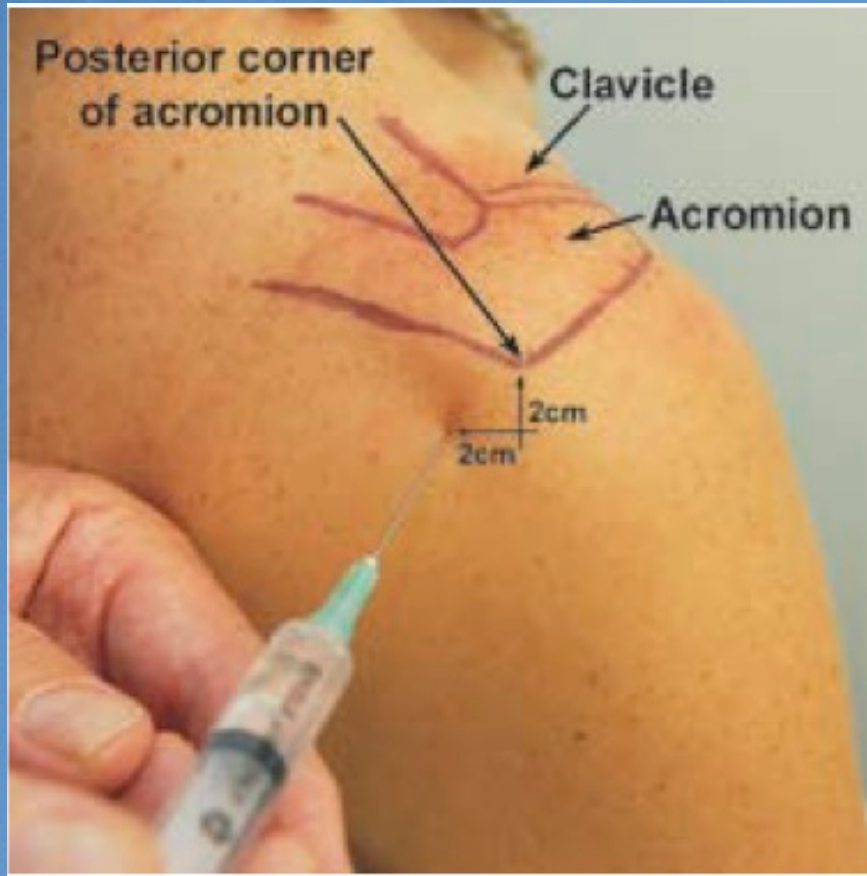
**Subacromial bursa (First Floor):**

- 1cc (40mg) depomedrol + 2cc xylocaine

**AC Joint (Attic):**

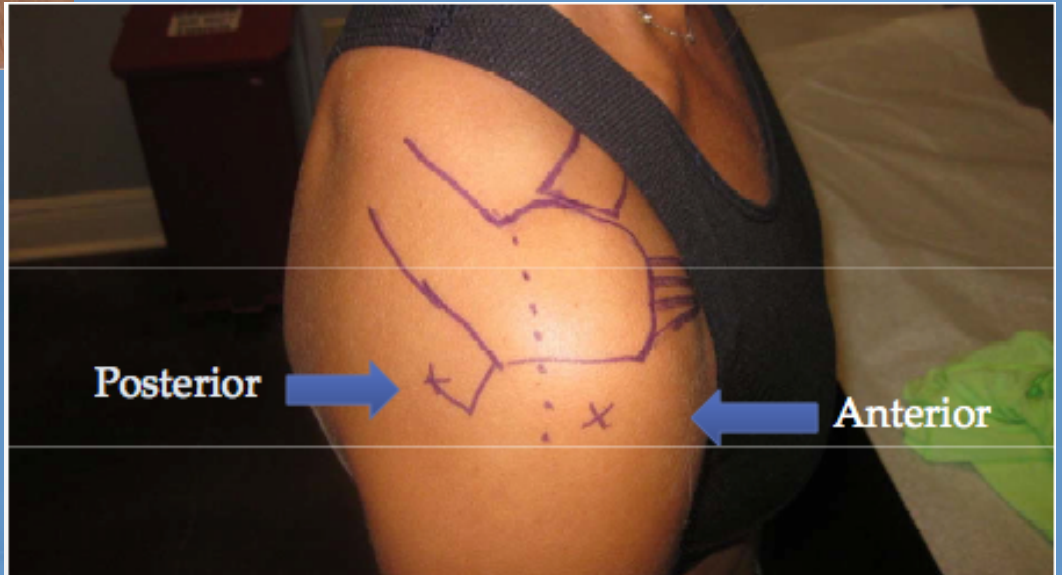
- 1cc (40mg) depomedrol + 1cc xylocaine

# Shoulder – Glenohumeral joint – *The Ground Floor*



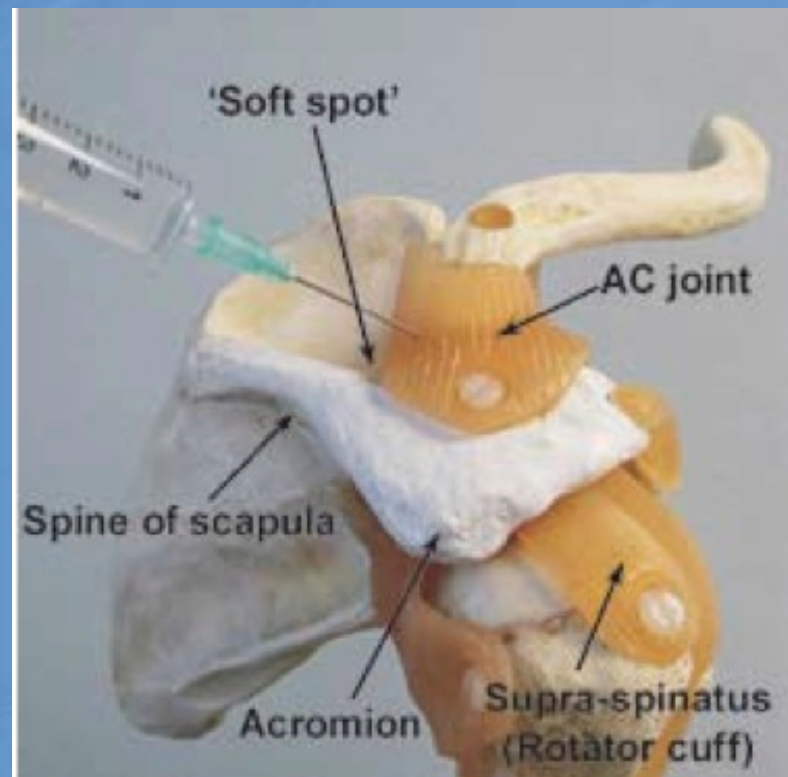
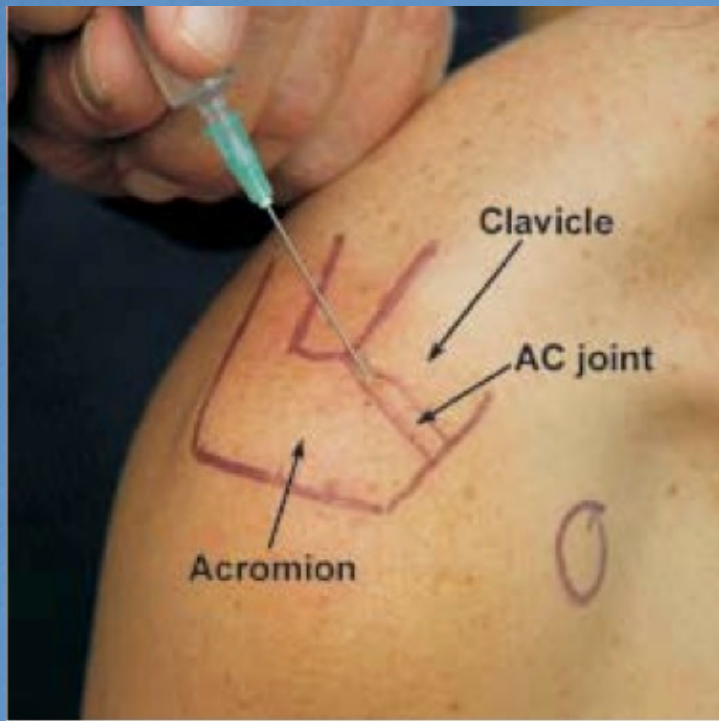


# Shoulder – Subacromial Bursa (1<sup>st</sup> Floor)





# Shoulder - The AC joint (The Attic)

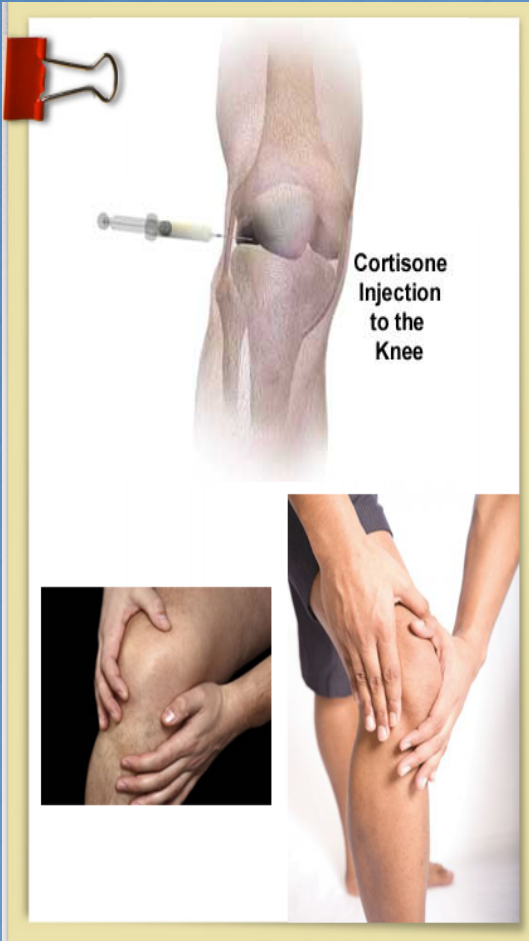


# Knee Injections

- OA, RA, Gout, Synovitis, Meniscal Tear, Effusion, Pain
- Anatomy: Large Joint / No major arteries or nerves
- Can improve patient's symptoms for up to 3 weeks with NNT of 3 or 4 (Roskos, 2005)
- Approaches:
  - Anterior
  - Medial Retropatellar
  - Lateral Retropatellar
  - Suprapatellar (done for suprapatellar effusions)

## Example:

- 1cc (40mg) Depomedrol + 4 cc lidocaine



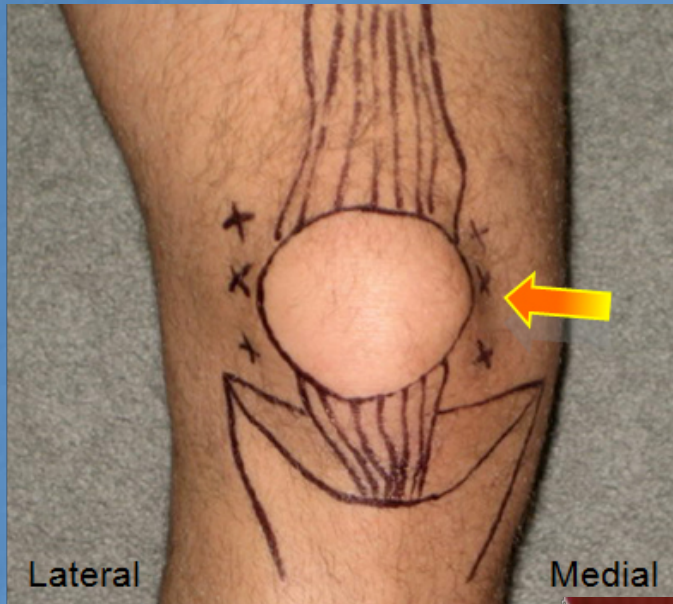
## Knee –Lateral Retropatellar



- Keep knee straight
- Palpate the upper and lower pole of the patella
- Lateral access point: within the lateral retropatellar space in line with the junction of the upper and middle thirds of the patella
- Apply pressure on the patella medially and with knee extended advance the needle medially and a bit inferiorly while holding the needle horizontally



## Knee – Medial Retropatellar

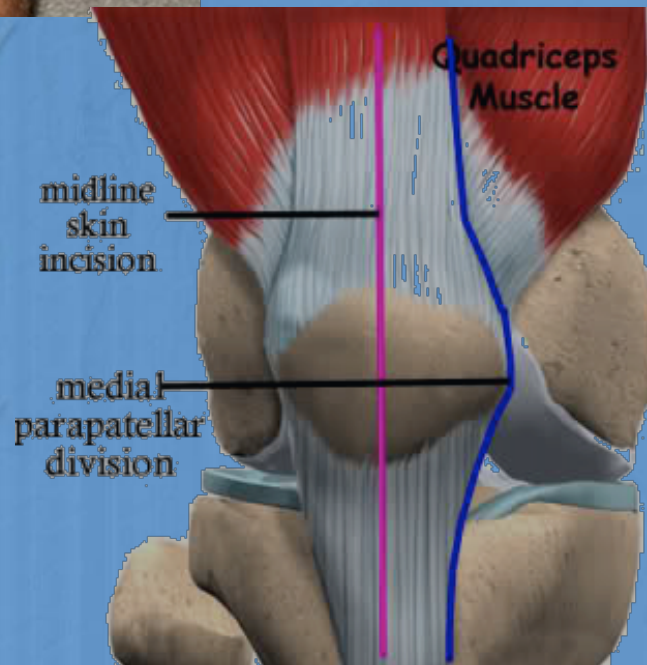


- Keep knee straight / extended

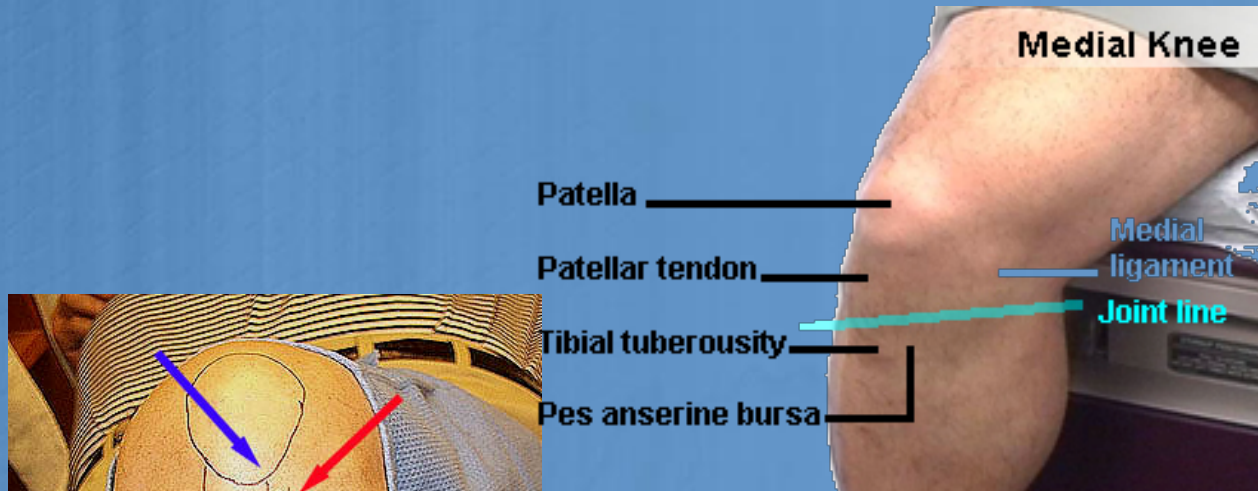
- Palpate the upper and lower pole of the patella

- Medial access point: At medial parapatellar groove underneath the patella, in line with the half-way point between the superior and inferior poles of the patella

- Apply pressure on the patella laterally and with knee extended (to open the patella medially) advance the needle laterally while holding the needle horizontally



# Knee - Anterior or Infrapatellar Approach (Lateral side)

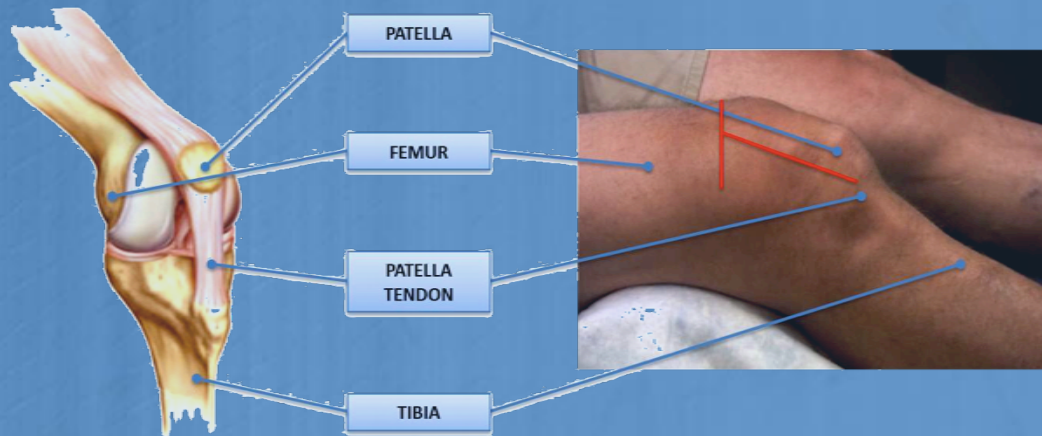


- Flex at 30 or 90 degrees
- Locate the patellar tendon, move about 1cm laterally (or medially); locate tibial plateau and move 1cm superiorly and palpate slight depression
- Mark the site
- Direct needle perpendicular to knee towards the center of the knee





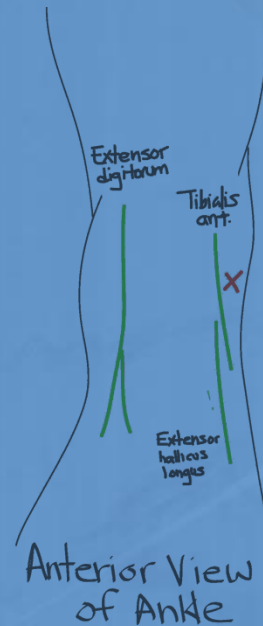
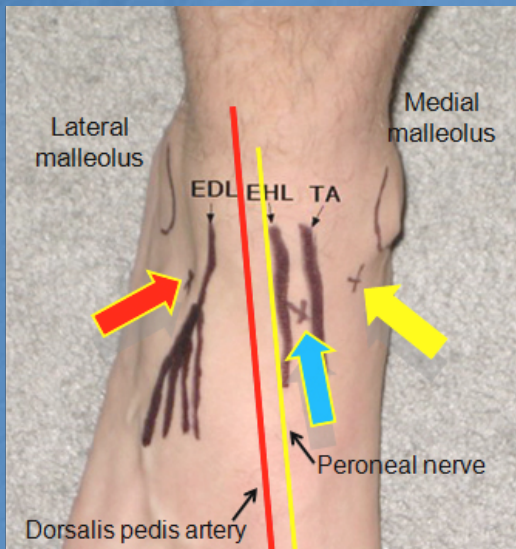
# Knee - Superolateral Approach



- Palpate superolateral and lateral edges of patella with patient supine and leg straight
- Mark the lines (red)
- Aspirate for effusion (compression of the opposite side of the joint may aid in arthrocentesis)
- Can use same needle if using aspiration and injection (steroid or viscosupplementation)



# Ankle Joint



Anterior View of Ankle

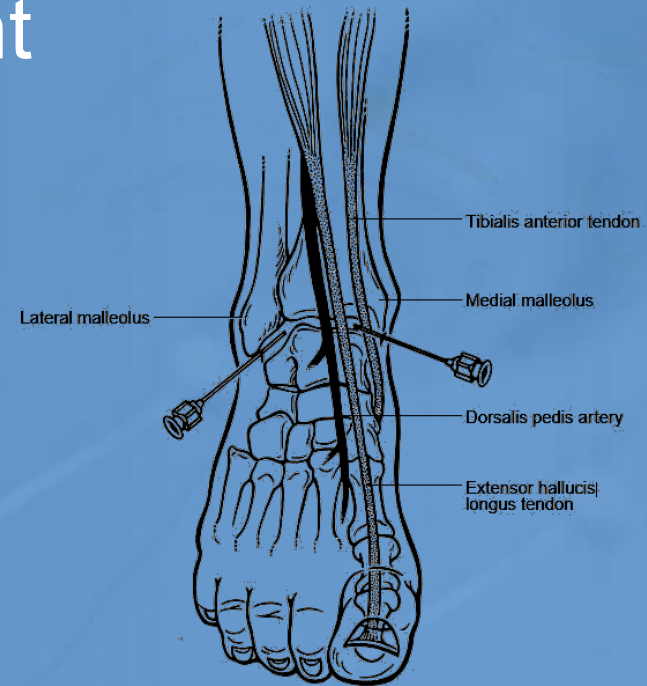


Figure 4. Ankle arthrocentesis:

## Positioning:

-Sitting or supine

-Knee flexed at 90° with leg either hanging or bent with heel resting against the stretcher

-Plantar flexion of the ankle against minimal ankle dorsiflexion by the patient helps define the anatomy

## Indications:

- Evaluation of arthritis (monoarticular or septic)
- Evaluation of joint effusion
- Evaluation of crystal arthropathy
- Identification of intra articular fracture

## Diagnostic:

- Relief of pain by aspirating effusions or blood
- Injection of medications (corticosteroids, antibiotics, anesthetics)
- Drainage of septic effusion

## Therapeutic:

# References

- Sims SE, Miller K, Elfar JC, Hammert WC. Non-surgical treatment of lateral epicondylitis: a systematic review of randomized controlled trials. *Hand* (2014); 9:419-446.
- Krogh TP, Bartels EM, Ellingsen T, Stengaard-Pedersen K, Buchbinder R, Fredberg U, Bliddal H, Christensen R. Comparative effectiveness of injection therapies in lateral epicondylitis: a systematic review and network meta-analysis of randomized controlled trials. *Am J Sports Med*. 2013 Jun;41(6):1435-46.
- Smidt N, van der Windt DA, Assendelft WJ, Devillé WL, Korthals-de Bos IB, Bouter LM. Corticosteroid injections, physiotherapy, or a wait-and-see policy for lateral epicondylitis: a randomised controlled trial. *Lancet*. 2002 Feb 23;359(9307):657-62.
- Wittich CM, Ficalora RD, Mason TG, Beckman TJ. Musculoskeletal injection. *Mayo Clin Proc*. 2009 Sep;84(9):831-6.
- Garg N1, Perry L, Deodhar A. Intra-articular and soft tissue injections, a systematic review of relative efficacy of various corticosteroids. *Clin Rheumatol*. 2014 Dec;33(12):1695-706.
- Brinks A, van Rijn RM, Willemsen SP, Bohnen AM, Verhaar JA, Koes BW, Bierma-Zeinstra SM. Corticosteroid injections for greater trochanteric pain syndrome: a randomized controlled trial in primary care. *Ann Fam Med*. 2011 May-Jun;9(3):226-34
- Cawley PJ, Morris IM. A study to compare the efficacy of two methods of skin preparation prior to joint injection. *Br J Rheumatol*. 1992;31:847-8.
- Pekarek B, Osher L, Buck S, Bowen M. Intra-articular corticosteroid injections: a critical literature review with up-to-date findings. *Foot (Edinb)*. 2011 Jun;21(2):66-70.
- Pensak MJ, Bayron J, Wolf JM. Current treatment of de Quervain tendinopathy. *J Hand Surg Am*. 2013 Nov;38(11):2247-9.
- Baima J., Zacharia, I. Clean versus sterile technique for common joint injections: A review from the psysiatry prerspective *Curr Rev Musculoskelet Med* 2008 Jun;1(2):88-91.
- Hill JJ Jr, Trapp RG, Colliver JA: Survey on the use of corticosteroid injections by orthopaedists. *Contemp Orthop* 1989;18:39-45.
- McNabb, James. *A Practical Guide to Joint & Soft Tissue Injection & Aspiration*. 2nd Ed.LWW; 2010.



# References

- Nichols, AW. Complications associated With the Use of Corticosteroids in the Treatment of Athletic Injuries. Clin J Sport Med (2005); 15:E370
- Pfenninger JL. Procedures for Primary Care Physicians. St. Louis: Mosby, 2010
- Dietzel DP, Hedlund EC Injections and return to play. Curr Sports Med Rep (2004) Dec; 3(6):310-315.
- Nepple JJ, Matava MJ. Soft Tissue Injections in the athlete Sports Health: A multidisciplinary Approach (2009) Sep;1(5):396-404.
- Wang AA, Hutchinson DT. The effect of corticosteroid in injection for trigger finger on blood glucose level in diabetic patient. J Hand Surg Am (2006) Jul-Aug; 31(6):979-981.
- Ahmed I, Gerner E Safety of arthrocentesis and joint injection in patients receiving anticoagulation at therapeutic levels. Am J Med (2012) Mar; 125(3):265-9.

