

# **SPORTS MEDICINE PROCEDURES**

**JONATHAN FINNOFF, DO, FACSM, FAMSSM**

**CHIEF MEDICAL OFFICER, US OLYMPIC AND PARALYMPIC COMMITTEE**

**PROFESSOR, MAYO CLINIC DEPARTMENT OF PM&R**

**TEAM  
USA**



## DISCLOSURES

- Demos Publishing – Royalties
- Up-to-Date - Royalties

# PERMISSIONS

All images used with permission

## OBJECTIVES

Upon completion of this lecture, participants will be able to:

- Discuss the indications for injections
- Recognize common signs and symptoms of local anesthetic toxicity
- Interpret the results of pre- and post-exercise compartment pressure testing

## OUTLINE

- Informed Consent
- Injections
- Compartment Pressure Testing

# INFORMED CONSENT

## Why obtain informed consent?

- Law protects nonconsensual invasion of patients bodily integrity

## INFORMED CONSENT

When should you obtain informed consent?

- Prior to any elective procedure or treatment with risk of temporary or permanent injury to the patient.

# INFORMED CONSENT

## What should it contain?

- All significant information required to make an intelligent decision regarding a procedure.
  - Diagnosis
  - Types and probability of risks
  - Potential benefits
  - Alternative treatment options
  - Likely outcome if treatment refused

# INFORMED CONSENT

## How much information is enough?

- Held to the standard of what the average physician would tell the patient regarding a given procedure.
- Be sure to cover common risks and those with severe consequences.

# INFORMED CONSENT

## Can you be sued?

- Yes. Physicians can be sued under tort law.
- Patient must demonstrate:
  - Physician didn't disclose a specific risk
  - This resulted in an injury
  - Patient wouldn't have done the procedure if they had known
  - Some states require the patient to demonstrate that no reasonable person in their situation would have consented to the procedure.

## INFORMED CONSENT

Does a patient's signature on a consent form prove consent was informed?

- No
- Be sure to document on the consent form risks specific to the procedure.
- Consider underlining specific risks in the form

## INFORMED CONSENT

Does informed consent allow for incompetent medical care?

- No
- Medical negligence claim can be brought against the physician if:
  - Physician had duty to treat
  - Breached the “standard of care” while rendering treatment
  - Resulted in demonstrable injury
  - Injury is compensable

# INJECTIONS

## Indications

- Identify pain generators
- Anesthesia/reduce pain
- Aspirations
- Treatment

# INJECTIONS

## Some injections require guidance

- Fluoroscopy
- Ultrasound
- Computed Tomography

## Injections that may require guidance

- Deep injections
- Injections into small structures/joints
- High risk injections (e.g. near neurovasc structures, anti-coagulation)
- Diagnostic injections
- Certain therapeutic agents
- Failed unguided injection

# INJECTIONS

Indications	Contraindications	
	Relative	Absolute
<ul style="list-style-type: none"><li>• Diagnose a pain generator</li><li>• Pain Control</li><li>• Aspiration for pain control and fluid analysis</li><li>• Therapeutic injection to relieve pain and improve function</li></ul>	<ul style="list-style-type: none"><li>• Chronic distal infection</li><li>• Allergy to injectate</li><li>• Latex allergy</li><li>• Diabetes mellitus</li><li>• Altered anatomy from surgery or congenital anomaly</li><li>• Coagulopathy</li><li>• Anticoagulated</li><li>• INR &gt; 1.2</li><li>• Platelets &lt; 100,000</li><li>• Pregnancy</li></ul>	<ul style="list-style-type: none"><li>• Local Infection</li><li>• Sepsis</li><li>• Bacteremia</li></ul>

# INJECTIONS

## Prior to injection

- No ASA x 7 days
- No NSAID x  $\geq 5$  half lives
- Obtain informed consent
- Use sterile technique
- Post-injection
  - Avoid submerging for 48 hours
  - Rest area

# INJECTIONS

## Local anesthetics

- Amides
  - Lidocaine and bupivacaine
  - Less allergenic
  - Metabolized in liver
- Esters
  - Procainamide
  - Converted to PABA in blood and excreted in urine
  - PABA may be allergenic

# INJECTIONS

## Local anesthetic mechanism of action

- Reversible sodium channel blockade

## More rapid onset and longer duration if

- Higher concentration
- Close to nerve
- Larger volume
- Vasoconstrictive additive
- Less surrounding vasculature
- Bicarbonate
- Increased local tissue temperature

# INJECTIONS

## Local anesthetic toxicity

- Systemic
  - CNS
  - Cardiac
  - Anaphylaxis
  - Malignant hyperthermia
- Local
  - Fibroblasts, tenocytes, chondrocytes, myocytes, neurons, etc (bupivacaine > lidocaine > ropivacaine)

# INJECTIONS

## Signs and symptoms

- Restlessness, incoherence, anxiety, numbness, light-headedness, peri-oral paresthesias, blurred vision, tremors, twitches, and drowsiness

Head and neck injections have higher potential for toxicity

# INJECTIONS

## Toxicity prevention

- Avoid excessive doses
  - Lidocaine 4.5 mg/kg, max dose 300 mg
    - 1% = 10 mg/ml
  - Bupivacaine 175 mg without epi, 225 with epi; may repeat up to once every 3 hours; 400 mg/24 hours
  - Ropivacaine 3 mg/kg, max dose 300 mg
- Aspirate prior to injecting
- Radio-opaque dye during high risk fluoroscopically guided injections

# INJECTIONS

## Severe reactions

- ABC's (now CAB) and ACLS

## Mild reactions

- Urticaria
  - Anti-histamines
- Bronchospasm (mild-moderate)
  - Beta-agonist
  - O<sub>2</sub>
- Bronchospasm (severe) or laryngotracheal edema
  - Epinephrine 1:1000, 0.1-1ml IM
- Vasovagal reaction
  - Trendelenburg, IV fluids, +/- atropine

## INJECTIONS

Patients at risk for serious adverse reactions should be pre-medicated:

- 32 mg methylprednisolone 12 and 2 hours prior to the procedure along with an anti-histamine

## INJECTIONS

Corticosteroids decrease inflammation by inhibiting:

- Release of cytokines
- Lymphocyte migration
- Immune complex passage across basement membranes
- Capillary permeability
- Superoxide radical production
- Prostaglandin and collagenase synthesis
- Production of granulation tissue

## INJECTIONS

- Betamethasone shouldn't be mixed with local anesthetics that contain preservatives due to possible precipitation
- Triamcinolone has higher incidence of fat atrophy and hypopigmentation

## INJECTIONS – ADVERSE REACTIONS

Post inj flare (~10%)

Hyperglycemia in DM

Adrenal suppression

Facial flushing

Increased appetite

Peripheral Edema

CHF

AVN

Dyspepsia

Insomnia

Malaise

Cushinoid changes

Osteoporosis

PUD

Psychosis

HTN

## INJECTIONS

All levels of allergic reactions can occur

Post-injection infection = 0.072-0.006%

Tx of post-injection flare

- RICE
- NSAIDS and mild analgesics

If no resolution in 72 hours, eval for septic joint

## COMPARTMENT PRESSURE TESTING

In Sports Medicine, usually performed for CECS

Symptoms of CECS include

- Cramping, burning, aching, tight pain, +/- numbness/weakness
- Occur with exercise, resolve with rest
- 5 P's more often with acute compartment syndrome (pulseless, pain, pallor, paralysis, paresthesias)

## PE

- Usually normal at rest
- After exercise, can have tense tissue, tender to palpation & passive stretching, fascial hernias, neurovascular dysfunction

# COMPARTMENT PRESSURE TESTING

## Theories regarding mechanism for increased compartment pressures

- Fascial restrictions
- Muscle hypertrophy
- Tissue edema
- Venous congestion

True tissue ischemia hasn't been demonstrated

Pain probably due to nerve irritation from increased compartment pressures and/or release of neuro-inflammatory mediators

## COMPARTMENT PRESSURE TESTING

Evaluation = Pre & post exercise compartment pressure testing

- Take compartment pressure at rest
- Place dressing over area
- Exercise until symptomatic
- Repeat pressures 1 and 5 minutes post-exercise

## COMPARTMENT PRESSURE TESTING

### Pedowitz criteria for a positive test:

- Resting  $>15$  mmHg
- 1 min. post-exercise  $>30$  mmHg
- 5 min. post-exercise  $>20$  mmHg

## KEY POINTS

- Informed consent is important and should be thorough, but it does not protect against negligent medical care
- Ester local anesthetics are more allergenic than amides due to conversion to PABA
- Know treatments for allergic reactions
- Pedowitz criteria for CECS (> 15 pre-ex, > 30 one min post-ex, > 20 five min post-ex)

# THANK YOU



# THANK YOU

