



## EM CASES SUMMARY

Prepared by Dr. Keerat Grewal, Mar 2015

### Episode 61 – Highlights from Update in Emergency Medicine Whistler Conference (Part 1)

*Drs. Paul Hannam, Anil Chopra & Joel Yaphe*

### Intraosseus (IO) Line Pearls – Dr. Paul Hannam

#### Choosing and Landmarking a Site for an Intraosseus Line

Proximal Tibia: Find the tibial tubercle, move 2cm inferiorly and 1 cm medially and insert the IO line 90 degrees to the bony plane

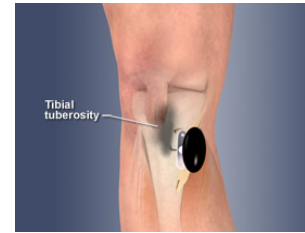


Fig 1: Landmark for Proximal Tibial IO Site

Proximal Humerus: Place your thumb on anterior humerus, feel for bicipital groove, the lateral “bump” is the greater tubricle – which is the site of a humeral IO.

**Advantages of Humerus site:** *faster infusion rates* and is easily landmarked.

**Disadvantage of Humerus site:** The arm must be immobilized in adduction, across the abdomen to prevent dislodging the needle. Requiring the arm to be immobilized may interfere with other resuscitative measures.

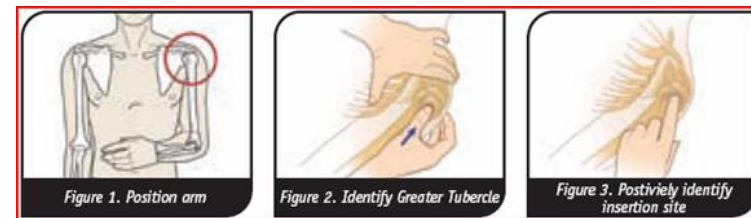


Fig 2: Landmark and Position for Humeral IO Site

Avoid all bone sites where there is: a fracture, previous attempt, trauma or circulatory compromise proximal to the site

## Choosing a Needle Length

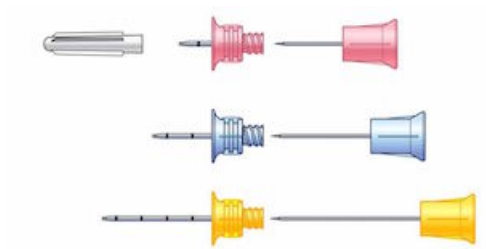


Figure 3. IO Needle sizes

EZ-IO kits have three needle lengths (15mm, 25mm and 45mm) and comes with weight-based recommendations for which needle to use for a given patient. Rather than using weight-based recommendations, our experts find it more useful to select the needle length according to the soft tissue thickness between the skin and bone of the patient at the given site. Estimate the soft tissue thickness and choose the needle that would accommodate that thickness. It is better to overestimate than underestimate the length of the needle required.

## Stabilizing and Securing the Needle

Ensuring that the needle does not move once it is placed is vital to avoiding leaking from the site. Even small movements of the needle can increase the diameter of the hole in the bone resulting in a leak from the IO site. Dislodgement or leak of the IO site increases the risk of compartment syndrome.

Two methods to securing the IO needle:

1. Use the stabilizer supplied with the EZ-IO kit.
2. Stack gauze on both sides of the IO needle and tape down.



Fig 4. EZ-IO Stabilizer in proximal humerus

## Flushing the IO Line

After stabilizing the IO needle, you need to flush the IO with 10cc of normal saline to clear away bone fragments and allow good flow through the line.

It is important to flush the IO SLOWLY (over 8-10 seconds) to avoid causing a potentially lethal fat embolism.

Cadaver literature has shown that generating > 2000 mmHg of pressure through bone results in an increased risk of fat emboli. Rapidly flushing an IO line with 10cc over 1 second can generate

pressures of approximately 3000 mmHg and therefore, increases the risk of a fat embolus.

### Infusing fluids through an IO Line

For patients who require resuscitation, infuse fluids using a pressure bag with pressure pumped up to 300mmHg.

Infusing fluids without a pressure bag by gravity alone, will not generate enough pressure to adequately resuscitate your patient.

### Reducing Pain Associated with IO infusion Using Lidocaine

Needle placement is not a very painful aspect of IO insertion. The infusion of fluids is more painful. Consider using lidocaine prior to the infusion

Use ***The 2-2-2 rule***:

- 2% lidocaine without preservative (from the crash cart) and without epinephrine
- 2 cc of lidocaine
- Wait 2 minutes for analgesic effect

### Removing an IO Needle

Use any syringe with a luer lock and screw it onto the top of the IO needle. Then pull out the IO needle using the syringe.

## Contrast-Induced Nephropathy – Dr. Anil Chopra

### Defining Contrast-Induced Nephropathy (CIN)

- Occurs within 1-3 days of receiving CT contrast
- Rise in creatinine of 25% or more; or
- Absolute rise in creatinine of 44

### Risk Factors for Contrast-Induced Nephropathy

Patients with no risk factors for CIN have negligible risk for CIN

The most important Risk factors for CIN include:

- History of Diabetes
- History of CHF
- History of Nephropathy
- Creatinine clearance <45
- Recent CT contrast study

### Risk of Contrast-Induced Nephropathy

In the largest ED study from 2013 of 5006 patients, the risk of CIN at 48-96h after a contrast enhanced CT study in the emergency department was approximately 7% (1).

Risk factors for developing nephropathy were largely associated with comorbidities (as listed above), and not age.

## Consequences of Contrast-Induced Nephropathy

The majority of patients with CIN improve within 72 hours, almost always within 1 week.

Less than 1% patients of patients with CIN require dialysis. However, when patients require dialysis as a result of CIN, they have a high mortality rate; >50% die within that hospital admission, 80% die within two years.

## Preventative Measures for Contrast Induced Nephropathy by Creatinine Clearance

- Creatinine clearance > 45: no issue with contrast
- Creatinine clearance 30-45: give 300-1000mL bolus of crystalloid fluid before AND after study, discuss contrast options with your radiologist (non-ionic contrast, low-osmolality contrast or lower amount of contrast)
- Creatinine clearance < 30: consider alternative study (i.e. ultrasound), consider consultant opinion (e.g. surgery), consider non-contrast scan. If contrast deemed imperative, give 300-1000mL bolus of crystalloid fluid before AND after study. Discuss with your radiologist.

## NAC and Bicarbonate to Prevent Contrast-Induced Nephropathy

The use of NAC and Bicarb for prevention of CIN is controversial. There are no good ED-based studies that have definitely shown either of these measures to significantly decrease the risk of CIN beyond giving a fluid bolus before and after the study, however

some hospital protocols have NAC and/or Bicarb as options for the highest risk patients.

## Metformin and Contrast CT

Patient who are taking metformin, do not require an alteration in the study you are ordering or the contrast. After they receive the contrast, some radiology departments advise patients to hold their metformin for a certain number of days.

Metformin does not increase the risk of CIN.  
Metformin increases the risk metabolic acidosis.

## Review of the 2014 Emergency Medicine Literature – Dr. Joel Yaphe

### TRISS Study: Lower versus Higher Hemoglobin Threshold for Transfusion in Septic Shock (2)

**Background:** Previous recommendations for early goal directed therapy in sepsis, aimed for a hematocrit of > 30%, and Hb >90.

This was a multi-center study of ICU patients in septic shock. Patients were randomized into two groups 1) Hb > 90, 2) Hb > 70. The primary outcome was death at 90 days.

No difference in the primary endpoint was found between two groups.

Take home message: Patients in septic shock with Hb of 70 or above generally do not require RBC transfusion.

### **Topical Tetracaine Used for 24 Hours is Safe and Rated Highly Effective by Patients for the Treatment of Pain Caused by Corneal Abrasions (3)**

This was a double blinded RCT of 116 patients with uncomplicated corneal abrasions as a result of either mechanical trauma, UV exposure, or FB removal.

#### **Exclusion criteria:**

1. >36 hrs post injury,
2. previous eye surgery or cataracts,
3. contact lens wearers,
4. injured both eyes,
5. ocular infection,
6. grossly contaminated FB in eye,
7. injury requiring urgent ophthalmological evaluation (i.e. penetrating eye injury, large or complicated abrasions, significant disruption of vision).

Patients were randomized into two groups

- 1) topical tetracaine (1%) or
- 2) placebo - topical saline

Patients were instructed to use the eye drops every 30 minutes for up to 24 hours as needed. Patients also received acetaminophen 1g Q6H and chloramphenicol drops.

**Primary safety outcome:** Repeat ED exam at 48h, telephone follow up at 7d and 1 month monitoring for complications.

**Secondary outcomes:** pain score and patient's perceived effectiveness.

Results showed that topical tetracaine was safe with no reported complications. Note that the study was not powered appropriately, allowing for up to 6% chance of complications. There was no significant difference in pain scores between the groups. Tetracaine was rated significantly higher for effectiveness by the patients. Interestingly, whether the patients were randomized to the treatment arm or the placebo arm, the time to resolution of pain symptoms was similarly short (within 12 hours).

**Take home message:** consider topical tetracaine eye drops for patients with small abrasions (be selective), use for a short duration of time 6-12 hours.

#### **Dr. Yaphe's editorial:**

There is no good evidence for any benefit for the use of anti-inflammatory or antibiotic topical eye drops in the management uncomplicated corneal abrasions. So presently, looking at the body of evidence, consider only giving a short course of tetracaine in these patients.

### **PEITHO Study: Fibrinolysis for Patients with Intermediate Risk Pulmonary Embolism (4)**

This was an RCT that included 1006 patients > 18 years of age with a confirmed PE, with symptoms 15 days or less prior to randomization. Patients also had evidence of myocardial injury (elevated troponin) and RV dysfunction (on ECHO or CT).

Exclusion criteria included patients with BP > 180/110.

Randomization of patients into two groups

1) full dose tenecteplase, or

2) placebo

Both groups received unfractionated heparin.

**Primary outcome:** death or hemodynamic decompensation within 7 days.

**Secondary outcomes:** major bleeding

There was a lower death/hemodynamic decompensation rate in the lysed patients (2.6% vs 5.6%), with most of the difference in hemodynamic decompensation, not death.

However, the Number needed to harm (NNH) was 14 for hemorrhagic stroke/major extracranial bleed!

**Take home message:** Save thrombolysis for unstable patients (i.e. patients in shock). Patients with elevated Troponin and signs of RV dysfunction on imaging who are not in shock should be monitored carefully and providers should be prepared to give rescue treatment (IV thrombolysis or interventional methods) if the patient decompensates.

### **Co-trimoxazole and Sudden Death in Patients Receiving Inhibitors of Renin-Angiotensin System (5)**

This was a retrospective database review of 1.6 million patients in Canada. Co-trimoxazole (Septra) had an increased risk of death in patients on ACEI or ARBS compared to other antibiotics. The postulated mechanism was secondary to hyperkalemia.

**Take home message:** Avoid use of Septra in patients on ACEI or ARBs. If Septra is required, check the patient's serum potassium before administering the drug.

### **The "Syringe" Technique: A Hands-free Approach for the Reduction of Acute Nontraumatic Temporomandibular Dislocations in the Emergency Department (6)**

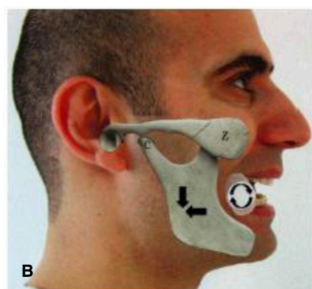
This was a prospective convenience sample of 31 patients aged 18-65 over 3 years in two hospital EDs.

The technique involved:

1. The patient bites down with their posterior molar teeth on a 5-10 cc syringe on the side of the dislocation.
2. The syringe is rotated so that it pushes the posterior molars posteriorly. The direction of rotation is clockwise for a right dislocation, or counterclockwise for the left (see Fig 5).

**Results:** 30 of 31 patients successfully reduced with this method, the majority within 2 minutes.

**Take home message:** The syringe technique is a non-invasive, safe option for reduction of TMJ dislocation that avoids the need for procedural sedation.



*Fig 5: Syringe Technique to Reduce TMJ Dislocation*

### **Chronic Effects of Shift Work on Cognition: Findings from the VISAT Longitudinal Study (7)**

This was a prospective cohort study of 3232 employed and retired workers. Various measures of cognition were taken at 0, 5, and 10 years. Workers were classified into two groups 1) shift work either current or past, or 2) never participated in any shift work.

Exposure to shift work was associated with a chronic impairment of cognition. This was highly significant if shift work was performed for more than 10 years.

Recovery of cognitive functioning back to baseline after having stopped any form of shift work took approximately 5 years.

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