Bier (IV Regional Anesthetic) Block in the ED Management of Wrist Fractures

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Objectives

- Short history of Bier Block
- Demonstrate equipment and technique
- Show examples
Bier (Intravenous Regional) Block

- August Gustav Bier 1908
- Re-popularized by Holmes 1963
- Extensive OR use for surgical procedures arms and legs procedures <60 minutes
- Safe
- Predictable
- Reliable
- Well suited to ED use
- Alternative to GA & PSA in full stomach and more complex medical patients
- Fractures, lacerations, FBs, I&D, burn debridement
Mechanism of Action

- diffusion of anesthetic from small veins directly to tissue peripheral nerve endings causing transient sensory and motor paralysis

- it is possible there is also some block at the nerve trunk level if higher concentrations (1-2%) of lidocaine are used

- Lidocaine 0.5% is most commonly used, limb volumes result in good diffusion throughout tissues, lower initial boluses to central circulation upon cuff release
Typical Calculations

- 70 kg patient
  - $70 \times 3 \text{ mg/kg} = 210 \text{ mg xylocaine}$
  - BB dose $= 21 \text{ cc } 1\% \text{ xylocaine} + 21 \text{ cc NS}$

\{1\% \text{ xylocaine} = 10 \text{ mg/cc, } 21\text{cc }1\% \text{ xylocaine} = 210 \text{ mg}\}

- 30 kg child (10yo) $= 30 \times 3 \text{ mg/kg} = 90 \text{ mg xylocaine}$
  - BB dose $= 9\text{cc }1\% + 9\text{cc NS}$
Contraindications

- Lidocaine allergy
- Uncontrolled hypertension
- Morbid obesity
- Uncooperative patient or non-verbal patient
- Raynaud’s Disease, severe peripheral vascular disease
- Blood dyscrasia (Hemophilia or sickle cell disease)
- Methemoglobinemia
- Severe crush injuries, vascular compromise, open fracture
- Infection of the limb
Bier Block: Step by Step

- Draw up 0.5% lidocaine (1.5-3.0 mg/kg)
- Start IV(s) (22-24 gauge IV catheter or 23-25 gauge butterfly) in affected limb
- Generously apply soft wrap to upper arm (web roll)
- Carefully apply tourniquet
- Elevate limb 2 minutes (no need to exsanguinate)
- Inflate proximal cuff (use LOP and RTP with ATS 3000)
- Infuse slowly (60-90 seconds)
- Remove infusion needle, apply 2 min pressure
- Perform reduction 15 – 20 minutes and cast
- Deflate cuff at 30 minutes using “cycling” technique
ED Flow:) (Team Approach)

1. see patient, order BB, analgesia po or IV (1 or 2 IVs)…
2. Pt goes for Xray
3. review X-ray, BB procedure…
4. staff notify you when 2 min to cuff inflation
5. Inject Anesthetic…
6. go do another PSA or see patients
7. return in 15 min (…or 30 min), do reduction and casting…
8. see patient after post-reduction films for review and discharge
Side Effects/Complications

- Dizziness, headache, blurred vision, ringing in the ears, tongue numbness
- Vasovagal reaction
- Thrombophlebitis
- Bradycardia, hypotension, dysrhythmias
- Seizures
- Cardiac Arrest

All cardiac deaths have been with Bupivicaine use
Mitigating Complications

- Proper Procedure and Equipment - ATS 3000
- Lidocaine dose checks
- Choose distal injection site
- Check cuff inflation
- Monitor cuff pressure and time
- “Deflation/Re-inflation” cycling technique
- 30 minute minimum cuff time, 90 min max
- Lidocaine Toxicity Treatment Protocol Posted
WHCC Bier Block Study*

- Sep 2000 - Mar 2005
- 1816 BBs in 1804 Pts
- Youngest 4
- Oldest 79
- Mean age 24
- Most in a day: 13 Pts
- Cuff time 27-110min average 42 min
- Cuff leak <1%--antecubital IV
- (after study “10 cm rule”) & 250 mmHg minimum (SBP + 100)*
- <1% incomplete anesthesia

*now we use ATS 3000 = RTP*

Pearls

- Don’t put ice on their wrist when they present
- if desired, give analgesia through the BB IV before the block
- start an accessory IV if you anticipate you might need it (e.g. combo BB/PSA)
- for high wrist/forearm fractures reduce and splint/cast the lower arm, remove the cuff, and finish
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Thank you!