Bier’s Block

Introduction

August Karl Gustav Bier (1861 – 1949) a German surgeon first performed the intravenous regional anaesthetic now possessing his name in 1908.¹

Indications

- Manipulation of fractures and dislocations involving the forearm or hand (most commonly – Colles’ fractures)

- The technique can be applied to the lower limb for injuries distal to the knee, however larger doses of anaesthetic is required

Contraindications

- Patient refusal
- Uncooperative patient
- Allergy to amide local anaesthetics
- Uncontrolled hypertension (SBP >200mmHg)
- Compromised circulation to the affected limb
- Local infection – eg: cellulitis
- Sickle cell disease
- Psychologically unstable patients

Patient Consent

Information for the patient:

What does the procedure involve?

This technique involves restricting the circulation to the limb for a short time (via a special tourniquet cuff) whilst injecting local anaesthetic to make the limb go numb. The limb appears pale and blotchy as the local anaesthetic works and motor function is diminished.

Once numb the fracture can be manipulated into a normal position for healing, following which a plaster cast is applied.

The whole procedure takes about 30-45 minutes. The limb returns to normal sensation after about 60 minutes.
What can go wrong?

Complications are uncommon.

**Local anaesthetic complications:**
- LA toxicity due to cuff failure can cause arrhythmias or convulsions.
- Early signs of toxicity include numbness or tingling around the mouth

**Complications of manipulation of fracture:**
- Skin tears
- Occasionally adequate fracture reduction is not possible. If this occurs further operative treatment may be required.

**Documentation**

It is important to clearly document the consent discussion in the patient’s notes.

**Procedure**

**Preparation of equipment and set-up:**

- 2 doctor technique
  Clinician to perform reduction, clinician to perform block
- Nursing staff member for assistance.
- Resuscitation equipment available
- Non-invasive monitoring
  Baseline BP obtained
- Cuffed pneumatic tourniquet (ensure adequate pressure in cylinder before starting)
- Place two IV lines
  22 g IVC in affected limb to administer LA
  18 g IVC in unaffected limb (should resuscitation be required)
- Prepare Prilocaine (Citanest) 0.5% solution
  Dose calculation: \(0.6 \text{ml} / \text{kg} \) (ie: \(3 \text{mg/kg} \)) ~ 40mL for most upper limb blocks
  It is suggested to increase this dose for lower limb blocks to \(0.8 \text{ml/kg} \) (ie \(4 \text{mg/kg} \)) for lower limb blocks ~ 50-60mL¹
- Plaster material prepared
**Technique:**

- Apply Webril padding to the arm of the injured limb where cuff will be placed – allows for improved comfort during procedure.

- **Apply cuffed tourniquet** to arm

- Elevate limb to aid venous drainage

- **Inflate** proximal cuff to **100mmHg above patients systolic BP**

- Record the time of cuff inflation

- Ensure correct cuff inflation – feel the cuff; ensure radial pulse is absent

- Lower limb back down

- Slowly inject dose of **prilocaine 0.5% solution (0.6ml/kg over 2-3 minutes)** into injured limb

- Record the time of LA injection

- Once injection is complete, remove IVC in the affected limb and apply pressure until haemostasis achieved

- Allow 5-10 minutes for adequate anaesthesia

- **Perform manipulation**

- **Apply plaster slab** as per guidelines

- Perform **post-reduction x-ray** to assess adequacy of reduction, can re-manipulate if necessary while block still effective

**End of procedure:**

- Once alignment is satisfactory and at least **20 minutes** has passed since the injection of LA it is **safe to slowly deflate** the cuff

- Keep cuff on arm for 1-2 minutes after deflation to ensure signs of LA toxicity do not develop

- If reduction inadequate – discuss further treatment options with Orthopaedic team

- Patient may be discharged to a safe environment once sensation returns to the hand

- Ensure the limb is placed in a **high arm sling** and the patient has been given a **Plaster Care Instruction handout**

- Ensure a follow-up appointment is made to **Fracture Clinic**
Complications

Local anaesthetic toxicity:

- Initial symptoms are subjective and include perioral tingling or numbness, lightheadedness, tinnitus, metallic taste, slurred speech, auditory and visual disturbances. Minor symptoms usually do not require treatment. If any of these occur observe patient closely and identify any potential reasons for systemic toxicity eg: check for cuff failure - reinflate.

- Objective signs of significant neurotoxicity are usually excitatory: twitching, fasciculation and seizures:
  
  Check for cuff failure – reinflate immediately
  Administer Midazolam 2.5-5.0 mg prn
  Support the ABC’s as indicated

  *Most seizures are self-limiting but can be potentiated by hypoxia, acidosis and hypercarbia so these should be treated aggressively.*

- If significant cardiotoxicity occurs (eg: hypotension, bradycardia and arrhythmias) give oxygen and adopt an ACLS approach
  
  Check for cuff failure – reinflate immediately
  Bicarbonate may be indicated to address acidaemia

1 Additional Information

- The recommended maximum dose of prilocaine is 6mg/kg or twice the recommended doses we are using in a Bier's block.¹

2 References

1. Casey, W. ‘Intravenous Regional Anaesthesia (Bier's block)’ Update in Anaesthesia : Practical Procedures 1992; Issue 1, Article 2: available online http://www.nda.ox.ac.uk/wfsa/html/u01/u01_003.htm