

## SCGH ED Guidelines

### Bier's Block Charlie's ED Guideline

#### **Purpose:**

This is a peripheral intravenous local anaesthetic block of the upper limb using a pneumatic cuff technique. It provides analgesia, muscle relaxation and a bloodless field. This technique is commonly used for the manipulation of distal radius fractures in the ED or for surgery to peripheral soft tissues without the need for conscious sedation or general anaesthesia, facilitating management of these injuries in ED.

#### **Indications:**

- Manipulation of wrist and forearm fractures
- Clean and repair of multiple forearm lacerations
- Foreign body removal from wounds on forearm.

#### **Contraindications:**

- **ABSOLUTE:**
  - Amide local anaesthetic hypersensitivity/allergy
  - Congenital/Idiopathic Methaemoglobinaemia
  - Severe hypertension (SBP>220mmHg)
  - Compartment syndrome
  - Uncooperative patient
  - No IV access on affected hand and other limb
- **RELATIVE:**
  - Coagulopathy
  - Cardiac conduction abnormalities
  - Peripheral vascular disease/neuropathy
  - Sickle cell anaemia
  - Epilepsy
  - Local inflammation/infection
  - Children (<10yrs)
  - Pregnancy
  - Lactation
  - Anticoagulants

#### **Location:**

- **ONLY** where full resus facilities are available- Resus bays
- **Post-reduction** films portable
- **A responsible medical officer or nurse** remains with the patient until **completion** of procedure

**Requirements:**

● **PATIENT:**

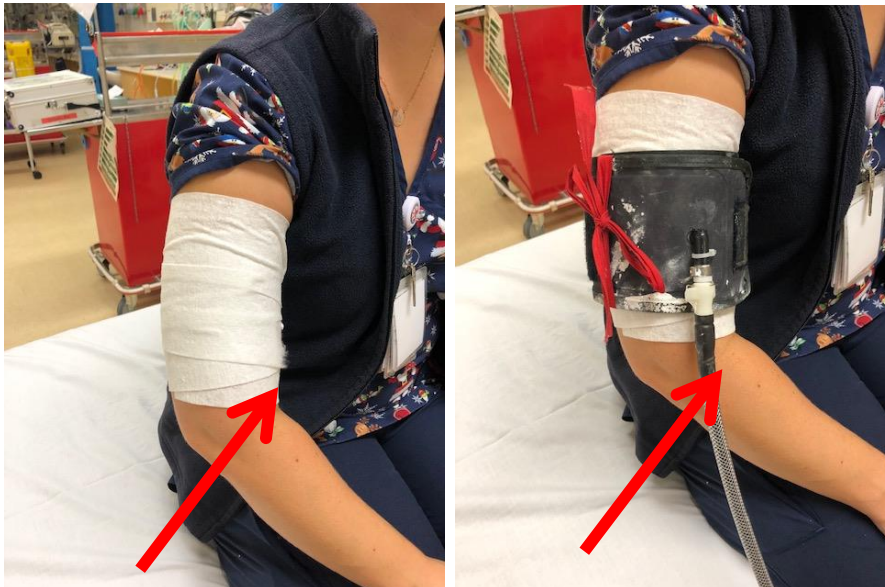
- Check indications & contraindications
- Explanation & reassurance
- Check weight & SBP
- **Informed consent (verbal and / or written)**
- Risks of procedures
- **Patient competency**
- **Patient comprehension**
- **Patient decision**

● **STAFF:**

- **Minimum 2 doctors or 1 doctor & 1 nurse practitioner.**
- Doctor 1 administers the drugs, monitors the patient for side-effects, cuff integrity & cuff tolerance by patient
- Doctor 2/NP performs the manipulation or procedure
- **Minimum 1 nurse**
- For fracture reductions inform radiology staff that a portable post-reduction x-ray will be required immediately after reduction

● **PROCEDURE:**

Remove jewellery, undress and utilize hospital gown. Educate and reassure patient accordingly. Weigh your patient. Apply Velband to the upper affected arm and position the Bier's BP cuff in place as shown in photographs.



To protect the skin of the patient wrap the upper arm in Velband. Place the cuff of the biers block over the Velband. Secure with the Velcro and red ties

**Equipment:**

- Single Cuff pneumatic tourniquet - document time on/time off. Automatic tourniquet controller.

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- IV cannula x 2 (22g recommended in affected limb).
- Plaster trolley.
- Prilocaine 0.5% IV 50mls.
- Diazepam 10mg IV
- Methylene Blue IV.
- Sodium Bicarbonate 8.4% 100mls IV.
- Intralipid 20% 500mls IV.
- Adrenaline 1:10000 10mls IV
- Airway equipment including requirements for intubation.
- 1 litre of Sodium Chloride 0.9% with primed line.
- Hudson mask and oxygen/suction equipment.
- Velband.

### Pharmacological information:

#### 1. Prilocaine 0.5% 250mg/50mls

**Action:** Local anaesthetic agent.

**Dosage:** 3mg/kg (5mg/ml) Maximum total dosage: 400mg (80mls).

**Side effects:** Central Nervous System, Cardiovascular and Respiratory System effects. These may include nervousness, dizziness, blurred vision, tremor, drowsiness, tinnitus, numbness, disorientation, nausea and vomiting. Uncommonly METHAEMOGLOBINAEMIA results in a decrease of the oxygen carrying capacity of haemoglobin leading to subsequent hypoxia. If the hypoxia does not resolve with high flow oxygen methylene blue administration is considered.



2. **Methylene Blue 1% 50mg/5mls**

**Action:** Reverses METHAEMOGLOBINAEMIA by reducing the methaemoglobin to haemoglobin.

**Dosage:** 1mg/kg slow IV push over 10 minutes. This can be repeated in 1 hour if the cyanosis has not improved.

**Side effects:** Methylene Blue may paradoxically cause methaemoglobinaemia, when given in high doses (>7mg/kg) secondary to a direct oxidative effect on haemoglobin.

Acute haemolytic anaemia may occur in G6PD-deficient individuals and with very large doses of Methylene Blue (>15mg/kg)



3. **Sodium Bicarbonate 8.4% 8.4g/100mls**

**Action:** Sodium bicarbonate is a systemic alkalinizing agent. It is an antidote to drugs that impair fast sodium channel function. Used for local anaesthetic toxicity for ventricular dysrhythmias, hypotension and/or seizures.

**Dosage:** Initial 1-2 mmol/kg IV repeated every 1-2 minutes to restore a perfusing rhythm, multiple doses maybe required.

**Side effects:** Tetany, hyperventilation, shortness of breath, hyperirritability, hypercapnia, electrolyte imbalance (hypernatraemia, hypokalaemia) & hyperosmolarity. Accidental extravasation may cause chemical cellulitis, tissue necrosis, tissue ulceration and sloughing

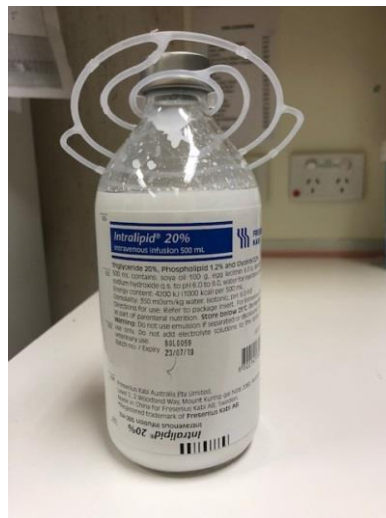


4. **Intralipid 20% 500mls**

**Action:** The exact mechanism of action of lipid emulsion is not known. It may serve as a 'lipid sink', providing a large lipid phase in the plasma, enabling capture of the local anaesthetic molecules and preventing binding to tissues.

**Dosage:** Initial IV bolus of 1.5ml/kg over 1 minute (it can be repeated) and IV infusion of 15ml/kg/hr. For 70kg patient IV bolus of 100mls over 1 minute (it can be repeated) and IV infusion of remaining 300-400mls over 15 minutes.

**Side effects:** Fever, chills, nausea, vomiting, hypersensitivity, thrombosis, haemolysis, neurological disturbance, fat overload syndrome and tissue pigmentation.



5. **Diazepam 10mg/2mls**

**Action:** Sustained benzodiazepine that enhances the effect of the neurotransmitter gamma-aminobutyric acid (GABA-A), resulting in sedative, hypnotic (sleep-inducing), anxiolytic (anti-anxiety), anticonvulsant and muscle relaxant properties.

**Dosage:** 5-10mg IV push at a rate of not more than 5mg/min repeated if necessary after 10 minutes.

**Side effects:** Drowsiness, confusion and ataxia, amnesia, weakness, hypotension, salivation changes, apnea and thrombophlebitis.



**6. Adrenaline 1:10000 10mls**

**Action:** Direct sympathomimetic agent exerting its effect on  $\alpha$  and  $\beta$ -adrenoreceptors. Major effects are increased systolic blood pressure, reduced diastolic pressure, tachycardia, hyperglycaemia and hypokalaemia. It is a powerful cardiac stimulant. It has vasopressor properties, an antihistaminic action and is a bronchodilator. Its action is rapid in onset and of short duration.

**Dosage:** In cardiopulmonary resuscitation (CPR) the initial dose is 1 mg (10 mL of 1:10,000) delivered intravenously, preferably through a central line, and repeated every 3-5 minutes during CPR. Further bolus doses or continuous infusion may be required to maintain an adequate blood pressure after the patient generated pulse has returned.

**Side effects:** Anxiety, restlessness, tachycardia, tremor, weakness, dizziness, headache, dyspnoea, cold extremities, pallor, sweating, nausea, vomiting, sleeplessness, hallucinations and flushing or redness of face and skin. Psychomotor agitation, disorientation, impaired memory and psychosis. Ventricular fibrillation may occur and severe hypertension may lead to cerebral haemorrhage and pulmonary oedema.



## Prilocaine Toxicity signs/symptoms and management

### Signs and symptoms of Prilocaine Toxicity:

<u>Signs suggestive of toxicity</u>	<u>Action or Treatment</u>
<ul style="list-style-type: none"><li>• Peri-oral paraesthesia (lips, tongue, nose), metallic taste, slurred speech</li><li>• Hypotension</li><li>• Arrhythmia, dizziness, tinnitus</li><li>• Twitching, fasciculation, seizure</li><li>• Transient desaturation, cyanosis, dyspnoea</li><li>• Methaemoglobinaemia*</li><li>• Ventricular dysrhythmias</li><li>• Cardiac arrest</li></ul>	<ul style="list-style-type: none"><li>• Registrar/Consultant review</li><li>• Re-inflate cuff if deflated &amp; IVF crystalloid bolus</li><li>• Oxygen, ECG and observe</li><li>• Diazepam IV if ongoing</li><li>• Oxygen and observe</li><li>• Oxygen, Methylene Blue 1%</li><li>• Sodium bicarbonate 4.8% &amp; Intralipid 20%</li><li>• CPR, Adrenaline 1:10000 1mg, Sodium bicarbonate 4.8% &amp; Intralipid 20%</li></ul>

**\*Signs and symptoms of Methaemoglobinaemia include: hypoxia, cyanosis, dyspnoea, chest pain, tachycardia, headache and confusion. **ALWAYS recheck cuff pressure and ensure it is still inflated.****

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Connect the hose of the biers block device to the black air outlet on the wall

1. Turn the device ON by turning the switch to the right
2. Slowly increase pressure/inflate the cuff by turning the knob to the right.

Updated by NP N O'Mahony 18<sup>th</sup> June 2019  
Reviewed by Dr. J Armstrong 18<sup>th</sup> June 2019  
Due for further review: 18<sup>th</sup> June 2022



**Nurse/Doctor Responsibilities:**

1. Inform the nursing shift coordinator of procedure being conducted.
2. Nurse to provide 1:1 nursing care to the patient during the procedure including 15 minutes post deflation of cuff.
3. Attach patient to monitor, do a set of baseline observations (BP, P, Sats) and then every 5 minutes during procedure.
4. Check the presence and function of:
  - a. Airway equipment including intubation equipment, operational suction and air viva.
  - b. Single biers cuff.
  - c. Methylene blue/Diazepam/Sodium Bicarbonate/Intralipid/Adrenaline
  - d. Equipment required for procedure (as above).
5. Inform radiology of the intended Biers block procedure as well as location and time they will be required to attend.
6. Prepare patient (as above).
7. Assist with establishing bilateral distal IV access. Anaesthesia is usually achieved no matter where the local anaesthetic is injected, but some evidence indicates that the procedure is more successful when the anaesthetic is injected distally. Ensure a 1 litre bag of 0.9% saline with primed line is hanging on the bed IV pole in case of hypotensive event.



8. Connect the patient to cardiac monitor and record HR, BP, RR, pain score and oxygen saturation throughout the procedure every 10 minutes.
9. Administer supplemental oxygen by a Hudson Mask at 6 litres, if required as prescribed by doctor/nurse practitioner, unless contraindicated.
10. Complete neurovascular observations in affected limb pre and post Bier's block.
11. Exsanguinate limb by elevating the limb for 2 minutes. The process of exsanguination is believed to allow better vascular diffusion of the anaesthetic.



**Remember:**

- A bloodless field is essential for many surgical procedures
- The better the exsanguination the better the block
- Handle the injured limb gently

12. When instructed by doctor/nurse practitioner, inflate the cuff to 100mmHg above the patient's systolic blood pressure, or to a maximum of 300mmHg. **It is the responsibility of the appointed person to the Bier's block cuff role to check that cuff remains inflated to the appropriate reading throughout the procedure.**
  - a. Document time of cuff inflation and reading of pressure prescribed.
  - b. Ensure continuous cuff monitoring-check for inflation/pressure (look and feel).
  - c. Check brachial pulse to ensure tourniquet has occluded blood flow
13. Record injection time of Prilocaine and amount given IV.
14. Wait 5-10 minutes for onset of action.
15. Remove IV line of affected limb.
16. Assist the doctor/nurse practitioner manipulate the fracture and apply a plaster back slab as instructed.
17. Ring radiology and ask for an urgent post manipulation portable xray while cuff is still inflated in case of need for further manipulation.
18. Do not deflate the cuff until at least **25 minutes** has elapsed since the prilocaine was injected (to ensure that the prilocaine is fully tissue bound) and do not have cuff inflated for longer than **60-90 minutes**.
19. The tourniquet may be deflated with approval of the clinical staff. The cuff should be deflated over a 10 second period and then immediately reinflated for 1 minute while observing for signs of local anaesthesia toxicity (as above). If no signs of toxicity then fully deflate the tourniquet once again for 10 seconds, if no complications are noted, you can repeat this once more and then you can release cuff permanently. Document the time of deflation. Warn the patient that they may experience tinnitus, dizziness or transient drowsiness following deflation of the tourniquet.
20. Repeat baseline observations and neurovascular observations at the end. Monitor for side effects for 15 minutes.

**Note:** Persistent paraesthesia in limb **may** last **12-24** hours after tourniquet release.

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### **Summary:**

Be sure to adopt a risk minimization approach, whereby all eventualities are catered for. The nurses and doctors need to familiarize themselves with all relevant equipment and potential adverse effects, so that they are in a better position to effectively troubleshoot and rectify any problem that arises.

### **After care:**

- Observe minimum of 1hr post procedure. 15-30 minutes neurovascular obs should be performed during this time
- From a procedural point of view, patients are safe for discharge once sedation begins to return to the limb
- Do not remove IV from normal limb until observation period is complete

### **Disposition:**

- Consider ability to cope at home. May need OBS admit with CCT review
- Arrange orthopaedic follow up

### **Documentation:**

- Document the details of the procedure

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### References:

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