

**The College of Emergency Medicine**

**Best Practice Guideline**

**Intravenous Regional  
Anaesthesia for Distal  
Forearm Fractures  
(Bier's Block)**



**MARCH 2014**

## Summary of recommendations

1. Patients should receive a full explanation about the procedure and consent is obtained before the procedure. Level 5 evidence
2. A pre-procedure assessment, appropriate for a general anaesthetic, should be performed. Level 5 evidence
3. Departmental certification and verification of competence is recommended. Level 5 evidence
4. The procedure should be performed in an appropriately sited, well lit, and equipped area with resuscitative equipment. Level 5 evidence
5. Two practitioners, one of whom should be a doctor competent in airway and resuscitation should be present for the entire procedure. Level 5 evidence
6. A double pneumatic Tourniquet cuff should be used. The cuff should be checked for leaks before the procedure by inflating and leaving it for 5 minutes. Level 5 evidence
7. Cuff should be kept inflated for a minimum of 20 minutes and for a maximum of 45 minutes. Timing of cuff times and inflation pressure reading should be clearly documented. Level 5 evidence
8. Effectiveness of this guideline should be continuously monitored by means of audit, clinical incident review, clinician feedback, and patient complaints. Level 5 evidence
9. Clinical staff performing intravenous regional anaesthesia should have ready access to intra-lipid. Level 5 evidence

## Scope

To assist emergency physician using intravenous regional anaesthesia (Bier's Block) for adults in the Emergency Department requiring manipulation for distal forearm fractures.

## Reason for development

To help the clinician in performing an intravenous regional anaesthesia (IVRA), standardise and improve patient care.

## Introduction

Fracture of the distal forearm fractures is a frequent presentation to every Emergency Department with a prevalence of 9/10,000 in men and 37/10,000 in women aged more than 35 years and above. A proportion of these fractures require manipulation within the Emergency Department using the two commonest methods either Haematoma block or Bier's block (IVRA). There is evidence to state that haematoma block provides less analgesia and can compromise reduction.

Due to reported toxicity of different local anaesthetic agents, prilocaine or lignocaine are the recommended agents for use in intravenous regional anaesthesia.

0.5% lignocaine at 3mg/kg with a maximum dose of 200mg (40ml) may be used as an alternative to prilocaine. However, the clinician is encouraged to use one agent regularly, as this minimises risk.

**Indication:**

Reduction of wrist fractures, most commonly Colles' fracture.

**Contraindications:**

- Allergy to local anaesthetic
- Children – consider whether appropriate on individual basis
- Epilepsy
- Hypertension >200mm Hg
- Infection in the limb
- Lymphoedema
- Methaemoglobinaemia
- Morbid obesity (as the cuff is unreliable on obese arms)
- Peripheral vascular disease
- Procedures needed in both arms
- Raynaud's phenomenon
- Scleroderma
- Severe hypertension
- Sickle cell disease or trait
- Uncooperative or confused patient

**Drug and Dose**

- 0.5% or 1% prilocaine without preservative
- No preparation with adrenaline
- Prilocaine 3mg/Kg
- If 0.5% prilocaine unavailable, use half volume of 1% plain prilocaine and the same volume of normal saline (eg instead of 40ml 0.5% plain prilocaine, use 20 ml 1% plain prilocaine and dilute with 20ml normal saline)

<b>Weight (Kg)</b>	<b>Dose (at 3mg/kg)</b>	<b>Total volume of 0.5% prilocaine (ml)</b>
80	240	48
70	210	42
60	180	36
50	150	30
40	120	24

**Technique:**

Check for the following

- Consent
- Patient weight in kilograms
- Ideal but not mandatory for the last oral intake (solids) 4 hours before procedure
- Patient transferred to resus or appropriately sited, well lit, and equipped with resuscitative equipment
- ECG, BP and pulse oximeter in situ
- Check air cylinder at least 1/4<sup>th</sup> full
- Cuff checked for leaks by inflating it for 5 minutes
- Drug to be used (lignocaine or prilocaine)
- Drug dosage and preparation – checked by minimum of two persons
- Awareness of the location of stocked emergency drugs eg: intralipid
- IV access on normal side – in case of complications which require systemic drug administration
- IV access, distal to the cuff, with small bore cannulae (22G) on the side to be anaesthetised
- Radiographer informed about the requirement of post reduction film

**Procedure:**

- Place double cuff tourniquet on upper arm and not on forearm as adequate arterial compression cannot be obtained
- Elevate the injured arm for three minutes to exsanguinate the limb
- Inflate the cuff to 100mmHg above the systolic BP or to 300mmHg (whichever is greater)
- Record the time of inflation
- Check for the absence of radial pulse
- Inject 0.5% plain prilocaine, prepared according to patient weight, slowly and record the time of injection
- Warn the patient about the cold/hot sensation and mottled appearance of the arm
- Check for anaesthesia, may have touch but not pain, after five minutes
- If anaesthesia inadequate, flush cannulae with 10-15ml normal saline
- Remove the cannula
- Lower arm on to a pillow and check tourniquet not leaking.
- Perform the procedure and obtain check x-ray
- Tourniquet must be under observation at all times
- Watch for signs of toxicity
- The cuff must be inflated for a minimum of 20 minutes and a maximum of 45 minutes
- If satisfied with the post reduction position of fracture, deflate the cuff observing the patient and monitor
- Record the time of deflation and observe the patient and limb closely for signs of delayed toxicity until fully recovered
- Check limb circulation prior to discharge and arrange patient follow up and analgesia as appropriate

## **Systemic Toxicity of Prilocaine**

### **C.N.S**

- Signs of excitation
  - Subjective circumoral paraesthesia
  - Yawning, restlessness, anxiety, tremor
  - Nausea and vomiting
  - Muscle twitching, convulsions
- Subsequently followed by depression
  - Apnoea
  - Coma
- Treatment
  - Basic / advanced airway management
  - IV diazepam/ lorazepam– for convulsions

### **C.V.S**

- Sweating, pallor, hypotension, circulatory collapse
- Arrhythmias, especially bradycardia and asystolic cardiac arrest
- Treatment
  - IV fluids – crystalloid
  - Anti-arrhythmics as indicated
  - ALS – should not be abandoned until at least 3-4 hours after collapse.
  - Intralipid is helpful in local anaesthetic toxicity

### **Methaemoglobinaemia**

- A problem specific to prilocaine, usually in doses >16mg/kg
- Treatment
  - IV methylene blue 1-2mg/kg

## **If any features of minor prilocaine toxicity during the procedure or after tourniquet release**

- Note cuff pressure and inflate the cuff to 100mmHg above the pre operatively recorded blood pressure
- Measure patient current Systolic BP and ensure cuff pressure is maintained 50mmHg above this
- Commence oxygen and IV fluids
- Prepare to treat serious features mentioned above
- Enlist senior and anaesthetic help

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### **Acknowledgements**

Ray McGlone, Gavin Lloyd and Victoria Stacey

### **Review**

Usually within three years or sooner if important information becomes available

### **Conflicts of Interest**

None

### **Disclaimers**

The College recognises that patients, their situations, Emergency Departments and staff all vary. This guideline cannot cover all possible scenarios. The ultimate responsibility for the interpretation and application of this guideline, the use of current information and a patient's overall care and wellbeing resides with the treating clinician.

### **Research Recommendations**

None identified

### **Audit standards**

There should be a documentation and audit system in place within a system of clinical governance.

### **Key words for search**

Distal radius fracture, Bier's block, intravenous regional anaesthesia

First published May 2010, revised March 2014



# Appendix 1

## Methodology

Where possible, appropriate evidence has been sought and appraised using standard appraisal methods. High quality evidence is not always available to inform recommendations. Best Practice Guidelines rely heavily on the consensus of senior emergency physicians and invited experts.

## Evidence Levels

1. Evidence from at least one systematic review of multiple well designed randomised control trials
2. Evidence from at least one published properly designed randomised control trials of appropriate size and setting
3. Evidence from well designed trials without randomisation, single group pre/post, cohort, time series or matched case control studies
4. Evidence from well designed non experimental studies from more than one centre or research group
5. Opinions, respected authority, clinical evidence, descriptive studies or consensus reports.

## References

1. O'Neill T, Cooper C, Finn JD et al. *Incidence of distal forearm fracture in British men and women.* Osteoporos Int 2001; 12(7): 555-8.
2. Wadsworth TG. *Colles' fracture.* Br Med J 1990; 301(6745): 192-4.
3. O'Sullivan I, Brooks S, Maryosh J. *Is fasting necessary before prilocaine Bier's block?* Br Med J 1996; 13: 105 – 7.
4. Kendall JM, Allen PE, McCabe SE. *A tide of change in the management of an old fracture?* J Accid Emerg Med 1995; 12(3): 187-8.
5. Bier A (1908) *Uperinenveven Weglocalanaesthesian den Gliedmassenzuerzeugen Arch. Klinische Chirurgie* 86 1007.
6. Stark RA. *A review of intravenous regional anesthesia.* Anesthesiol Rev 1982; 9: 15 – 24.
7. Heath ML. *Deaths after intravenous regional anaesthesia.* Br Med J 1982; 285: 913 – 4.
8. *Medical Defence Union Hazardous Regional Anaesthesia Annual Report* 1984; 35.
9. *Department of Health and Social Security Automatic Tourniquets Hazard Warning (NH (82)7).*
10. Kendall JM, Allen P, Younge P et al. *Haematoma block or Bier's block for Colles' fracture reduction in the accident and emergency department - which is best?* J Accid Emerg Med 1997; 14(6): 352-6.
11. Quinton DN, Hughes J, Mace PF et al. *Prilocaine leakage during tourniquet inflation in intravenous regional anaesthesia: the influence of fracture manipulation injury.* 1988; 19(5): 333-5.
12. Crawford OB. *Methemoglobin in man following use of prilocaine.* Acta Anaesthesiol Scand Suppl 16: 183 – 187.
13. Harris WH, Cole DW, Mital M et al. *Methemoglobin formation and oxygen transport following intravenous regional anesthesia using prilocaine.* Anesthesiology 1968; 29: 65 – 69.
14. El-Hassan KM, Hutton P, Black AMS. *Venous pressure and arm volume changes during simulated Bier's block.* Anaesthesia 1984; 39: 229 – 235.
15. Duggan J, McKeown DW, Scott DB. *Venous pressures in intravenous regional anaesthesia.* Regional Anaesthesia 1984; 9(2): 70 – 72.
16. Carley S. *Towards evidence based emergency medicine: best BETs from the Manchester Royal Infirmary. Haematoma block versus intravenous regional anaesthesia in Colles' fractures.* J Accid Emerg Med 1998; 15(4): 229-30.
17. Handoll HH, Madhok R, Dodds C. *Anaesthesia for treating distal radial fracture in adults.* Cochrane Database Syst Rev 2000(3): CD003320.
18. Jakeman N, Kaye P, Hayward J et al. *Is lidocaine Bier's block safe?* Emergency Med Journal, 2013; 30:3 214-217.



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