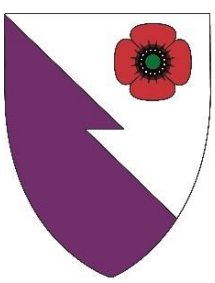
The Royal College of Emergency Medicine

Best Practice Guideline

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



Revised:
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Summary of recommendations

1. Patients should receive a full explanation about the procedure and consent is obtained before the procedure.
2. Departmental certification and verification of competence is recommended. Only those credentialed by the Emergency Department should perform the procedure.
3. The procedure should be performed in an appropriately sited, well lit, and equipped area with resuscitative equipment available in the department.
4. Two practitioners, one of whom is credentialed by the department to perform Bier's block, should be present for the entire procedure.
5. Immediately prior to the procedure an invasive procedures checklist should be completed.
6. A double pneumatic Tourniquet cuff should be used in case rotation of cuff is needed. If rotation of cuff is considered then the machine should have a fail-safe selected preventing decompression of proximal cuff prior to inflation of distal cuff. The cuff should be checked for leaks (a common leak is split rubber o ring on clip for cuff).
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.
8. Effectiveness of this guideline should be continuously monitored by means of audit, clinical incident review, clinician feedback, and patient complaints.
9. Clinical staff using local anaesthetics should have ready access to intra-lipid.

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, Bupivacaine and more rarely lignocaine, Prilocaine is the recommended agent for use in intravenous regional anaesthesia.

Indication:
Reduction of wrist fractures, most commonly Colles' fracture.

Contraindications:

- Allergy to local anaesthetic
- Children – consider whether appropriate on individual basis
- 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
- Pagets Disease
- Uncooperative or confused patient

Drug and Dose

- 0.5% or 1% prilocaine without preservative
- No preparation with adrenaline
- Prilocaine 3mg/Kg. There are **no** reported problems at this dose.
- 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)
- During a period of prilocaine shortage in the UK, the following regime was found to be an acceptable alternative; 0.5% plain lidocaine at a dose of 3 mg/kg up to a maximum of 200 mg (40 ml)

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

Technique:

Immediately prior to the procedure an invasive procedures checklist should be completed.

Check for the following

- Consent
- Patient weight in kilograms
- Fasting not required
- Patient transferred to resus or appropriately sited, well lit, and equipped with resuscitative equipment available in department
- ECG, BP and pulse oximeter to monitor patient throughout the procedure
- Check air cylinder at least 1/4th full if electronic machine not used. Electronic machines must be kept on charge when being stored between procedures.
- Cuff checked for leaks (a common leak is split rubber o ring on clip for cuff )
- Drug to be used (prilocaine)
- Drug dosage and preparation
- Awareness of the location of stocked emergency drugs
- IV access on normal side 22G – 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. Proximal vein can be used but injection should be slow and wait 13 mins for effect
- Radiographer informed about the requirement of post reduction film
- There is some evidence to support use of ultrasound guidance to aid reduction

Procedure:

- Place double cuff tourniquet on upper arm and not on forearm as adequate arterial compression cannot be obtained. Padding must always be applied prior to cuff placement and applying a well fitted double cuff will be a 2 person procedure
- If a plaster has already been applied then apply tourniquet before removing the plaster
- Elevate the injured arm to exsanguinate the limb
- Inflate the proximal cuff to 100mmHg above the systolic BP or up to a maximum of 300mmHg. If rotation of cuff is considered then the machine should have a fail-safe selected preventing decompression of proximal cuff prior to inflation of distal cuff.
- 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.
- Remove the cannula and apply pressure as the venupuncture site is prone to bleed (thus use of 22G)
- Warn the patient about the cold/hot sensation and mottled appearance of the arm
- Check for anaesthesia, may sense movement but not pain after 10 minutes which is when the manipulation should be done and plaster applied by 2nd member of staff
- Lower arm on to a pillow and obtain check x-ray
- Tourniquet dials 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 rotation of cuff required because of pain at cuff site or prolonged procedure (2nd manipulation) this should done after the manipulation and plaster is applied. The distal cuff will then be inflated over an anesthetised area and be more comfortable for the patient.
- If satisfied with the post reduction position of fracture, deflate the cuff observing the patient and monitor
- If fail safe selection applied the distal cuff will need to be inflated first prior to deflations
- Record the time of deflation
- Check limb circulation prior to discharge and arrange patient follow up and analgesia as appropriate

Systemic Toxicity for local anaesthetics

Note: none have been recorded using Prilocaine at 3mg/kg dose for IVRA.

Intralipid is helpful in local anaesthetic toxicity.

Intralipid should be easily available in all departments using local anaesthetics.

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.

Methaemoglobinaemia

- A problem specific to prilocaine, usually in doses >16mg/kg but can occur with other drugs (lidocaine, GTN, phenytoin, metoclopramide, poppers, cocaine)
- Symptoms related to MetHb level

3-20%	Discoloured skin (pale, grey, blue) and cyanosis
25-50%	headache, SOB, dizzy, confusion, chest pain
>50%	cardiac arrhythmias, delirium, seizures, coma, death

- Diagnosis MetHb level eg. arterial blood gas sample
- Treatment IV methylene blue 1-2mg/kg over 5mins if MetHb >20% and symptomatic (avoid in G6PD deficiency)

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
- Intralipid is helpful in local anaesthetic toxicity.

Enlist senior and anaesthetic help

Appendices 2 and 3 give example advice sheet and checklist.

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Review

Usually within three years or sooner if important information becomes available.

Conflicts of Interest

None.

Disclaimers

RCEM 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.

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.

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.

Appendix 2

Example Patient Information Leaflet

Bier's Block

Patient Information Leaflet
Emergency Department

Having a Bier's Block

What is a Bier's block?
It is a local anaesthetic procedure normally done for patients needing manipulations of wrist fractures.

Is it safe?
This procedure has an extremely good safety record. The risk of serious complications is rare.

Where will the procedure be done?
It will normally be done in the resuscitation room where there is an x-ray machine.

What will happen?
You will be awake during the procedure and be able to talk to the doctor and nurse.
A small cannula is inserted into the back of both of your hands. A cuff similar to one used for measuring blood pressure is placed around the upper arm of the injured limb, and is inflated. You will feel the cuff tighten around your arm.
Local anaesthetic is then injected into the cannula of your injured arm, you will feel tingling in the arm, and it may become discoloured. After about 10 minutes the anaesthetic will have worked, and the doctor will be able to move the fracture into a better position. You may feel some movement during this stage. It is uncommon to feel any pain, but if you do the doctor will be able to provide some additional medicine to help with the pain.
After the plaster has been put on, we will x-ray your arm again, if the position of the bones is acceptable, we will deflate the cuff.

What happens afterwards?
Over 20 minutes the feeling in the arm will return to normal. The needle in your uninjured arm will be removed.

You may need us to provide you with some medication for the pain. However once the arm is in plaster, simple over the counter medication like paracetamol and ibuprofen are often adequate.

It is important you keep your injured arm in the sling to reduce swelling, and to follow the advice in the plaster information sheet.
We will arrange for you to be seen in the fracture clinic within one week, where your injury will be reviewed by an orthopaedic specialist.
When the swelling has reduced, your arm will be put in a full plaster.
The plaster will normally be kept on for around 6 weeks.
Sometimes despite the wrist being immobilised in plaster, the position of the fracture can move, and this can mean that you will require a further manipulation. If this is required your orthopaedic specialist will discuss the options with you.

Appendix 3

Example Bier's block checklist

Emergency Department
BIERS BLOCK CHECKLIST

AGH	
WRH	

Worcestershire NHS
Acute Hospitals NHS Trust

<Name> <Age> <DoB> <Hosp number> <NHS Number> <ED episode number>

BEFORE THE PROCEDURE **Indication:** □ Distal Forearm Fractures □ Other

	Yes	No		Yes	No
Patient Identity checked as correct?			Bier's machine checked ?		
Appropriate Consent completed?			Cuff(s) checked for leaks?		
Confirm SITE / SIDE of clinical abnormality by **two** clinicians – sign below			Are there any concerns about this procedure for the patient or its timing ?		
Small bore IV cannula (22G) for each limb ?			Drug dosage calculation and preparation		
Radiographer aware of procedure			Cuff bandage; plaster equipment ready		
Patient has been given advice leaflet			Baseline Observations		

TIME OUT

	Yes	No		Yes	No
Patient adequately analgesed ?			Patient is adequately Monitored (Sats, ECG, BP)		
Patient position is optimal			Team members identified & roles assigned		
Plan for management LA toxicity discussed			Cuff Technique agreed before commencing		
			All team members able to read pressure dials		

STOP BEFORE YOU BLOCK
Have you got the Correct Side ?

Clinician 1	□Right □Left	Clinician 2	□Right □Left

DURING PROCEDURE

- WEIGHT □ Actual □ Estimate
- Local Anaesthetic:
  - □ Prilocaine 0.5%
  - □ Prolocaine 1%
  - □ Lidocaine 1%

Volume:

- Technique:
  - □ Cuff Rotation
  - □ Double cuff no rotation
  - □ Single cuff no rotation
- UltraSound ? □ Yes □ No
- Adverse Events □ No □ Yes (record in notes)

	Prilocaine 3mg/Kg	
Kg	0.5%	1.0%
80	48ml	24ml
70	42ml	21ml
60	36ml	18ml
50	30ml	15ml
40	24ml	12ml

Systolic BP (mmHg)	
Cuff Inflation time (24hrs) (min 20mins, max 45mins in total)	
Cuff Pressure (mmHg) (100mmHg above systolic or max 300mmHg)	
Injection Time (24hrs)	
Cuff Rotation time (24hrs)(if applicable)	
Cuff Deflation time (24hrs)	

SIGN OUT

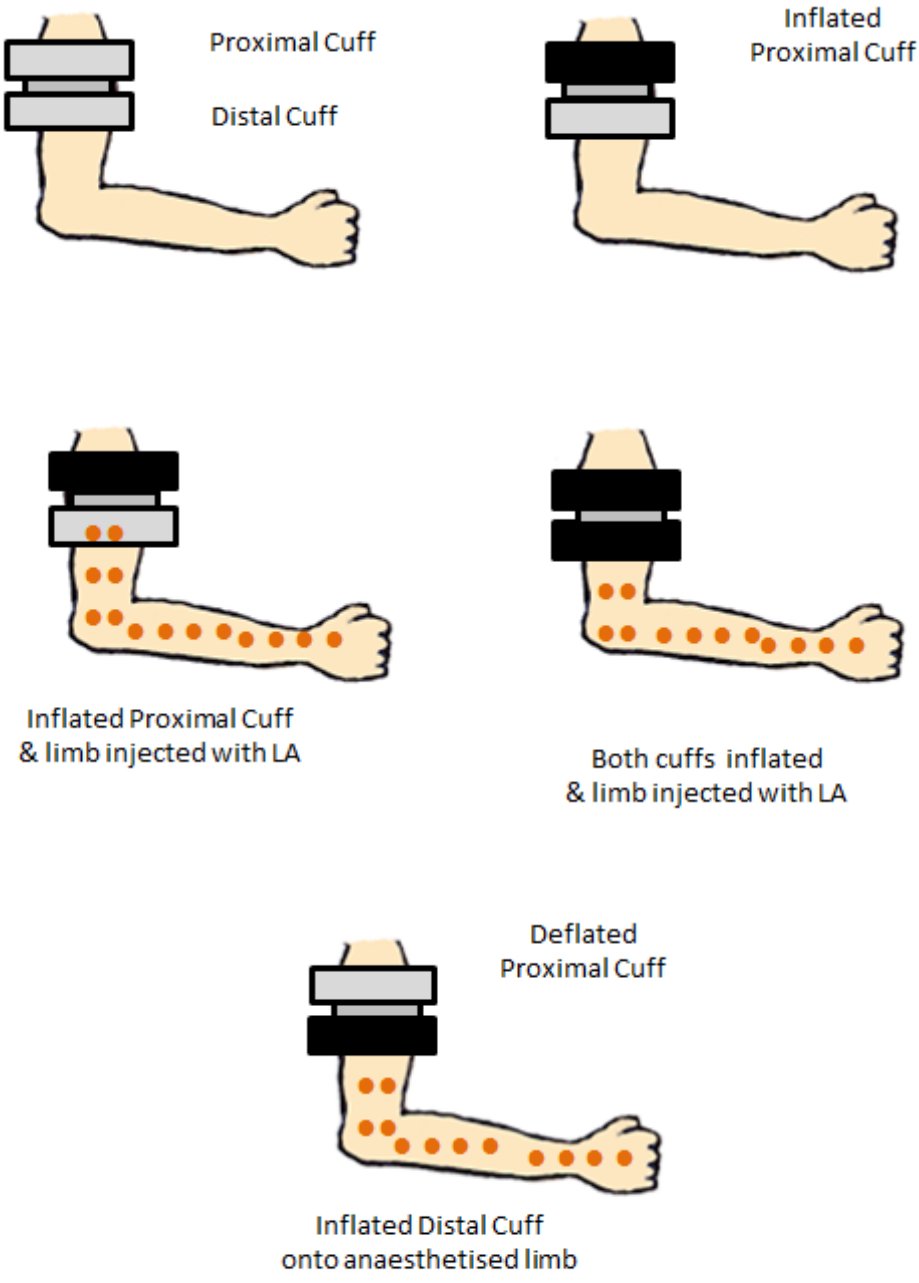
	Yes	No		Yes	No
Repeat Baseline Observations			Cannula removed; Manip limb circulation check		
Ensure adequate analgesia now and TTO			Written advice (PoP) and follow-up arranged		

PROCEDURE
Date
Time (24hr)

STAFF (print & sign)
Operator
Assistant(s)

Appendix 4

Bier's block – Rotatory Cuff Technique



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