How to perform Bier's blocks

This is a more detailed guide including handy tips and tricks which we have found helpful. It is intended for anaesthetic trainees at the Royal Infirmary of Edinburgh delivering the Bier's block service for Emergency Department manipulation of distal forearm fractures.

Part 1: Preparation

The patient list (maximum 4 per day) is located at the desk in A&E 'Exam' (Minor Injuries). They are also booked onto Trakcare. Patients wait in the Surgical Observation Ward and Bier's blocks are performed in the anaesthetic room in A&E. A&E nursing staff will usually bring the patient through to the anaesthetic room.

Perform a full anaesthetic assessment, exclude contraindications and check patient weight and fasting status

Explain procedure to patient and obtain verbal consent

- The cuffs are uncomfortable and can be sore. If there is significant discomfort or pain and the operator is experienced, cuff rotation is an option.
- It is normal for skin to appear mottled and for patients to report cold sensation on injection followed by hot burning sensations in the affected arm.
- With adequate block, manipulation should not be painful, but touch and movement sensation are normal.
- There is a small risk the procedure will fail, in which case an operation under general anaesthetic is usually required.
- Ideally 6 hours to solids and 2 hours to clear liquids. It is safe to proceed if patient is not fasted but be wary if procedural sedation is required.

CONTRAINDICATIONS

Absolute:

- Open fracture or neurovascular compromise
- Bilateral manipulation required
- Infection in the limb
- Uncooperative patient – including children and adults with incapacity
- Methaemoglobinaemia
- Genuine local anaesthetic allergy
- Severe hypertension (systolic BP >200 mmHg)
- Upper limb peripheral vascular disease
- Sickle cell disease
- Raynaud's phenomenon
- Lymphoedema
- Paget's disease
- Scleroderma
- Morbid obesity – unreliable cuff

Relative (consider discussing with senior):

- Poorly controlled epilepsy – not a contraindication but exercise caution
- Any additional concerns

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Ensure equipment checked and prepared:

PRE-PROCEDURAL CHECKLIST

- ☐ A&E nursing staff +/- competent supervisor
- ☐ Anaesthetic machine checked – Oxygen supply; Facemask; Suction
- ☐ Intralipid in cupboard, Bier's block protocol and LA toxicity guideline available
- ☐ Check location of emergency drugs and defibrillator
- ☐ Cuffs x2 – checked at 300 mmHg for 5 minutes without leaks.
- ☐ Cuffs should be the appropriate size for the arm – see below.
- ☐ Softban wraps applied to upper arm
- ☐ Monitoring – continuous ECG, SpO2, NIBP on non-injured arm
- ☐ IV access: 22G (Blue) cannula x2 – one in each arm; as distal as possible in fractured arm
- ☐ Prepare local anaesthetic: prilocaine 0.5% at 3mg/kg (see Bier's block protocol for tables)
- ☐ If prilocaine is unavailable then 0.5% lidocaine at 3mg/kg to a maximum of 200mg (40ml) can be used instead.

Part 2: Advice on tourniquet use

Two tourniquet cuffs are required. Usually the double-cuffed tourniquet can be used, but if necessary there are a range of single cuffs in various sizes available in the upper left cupboard (number 7) – two of these can be applied instead.

The tourniquet width should ensure that it covers the upper arm, without overlapping onto the shoulder or the elbow.

The tourniquet length should be sufficient that the inflatable bladder overlaps by a minimum of 5 inches when wrapped round the arm. Try to find the shortest tourniquet that does this – if it is too long there is a risk of it slipping during use.

The tourniquet should be placed in the mid-point of the upper arm to minimize risk of nerve injury. Tie the stabilizing ribbons to ensure a snug fit and to reduce the risk of cuff movement during use.

Check appropriate tightness before inflation. You should be able to fit two fingers under both proximal and distal sides of the cuff before it is inflated.

Part 3: Performing the block

- Apply both cuffs over Softban dressing and elevate the arm, compressing the brachial artery. Hold for at least 30 seconds.
- Inflate both cuffs to 100mmHg above patient's systolic blood pressure (max. 300 mmHg)**.**
- Release pressure on the brachial artery after both cuffs have inflated. Lower the arm and check for an **absent radial pulse**.
- Slowly inject pre-calculated dose of local anaesthetic through the cannula, while applying circumferential proximal pressure on the proximal forearm with the other hand. If cannula is in the antecubital fossa, be extra careful not to apply too much pressure on the syringe.
- It is often easier to inject through the distal end with the cap removed as opposed to the top port. Do not use 'Smart Sites' as these impede flow.
- Note the time from end of local anaesthetic injection. The tourniquet must remain inflated for a minimum of 20 minutes from this time and a maximum of 45 minutes.
- Remove cannula in fractured arm once injection complete. Apply firm pressure over cannula site as bleeding is common.
- Warn patient again of mottled skin and cold/hot/tingling sensations.
- Check for adequate anaesthesia at 5 minutes with pressure over fracture site. A good block can take up to 10 minutes to develop.
- A&E Doctor will manipulate the wrist, apply a plaster cast and request a radiograph to check alignment.

CUFF ROTATION (ONLY IF EXPERIENCED OPERATOR)

This technique aims to reduce tourniquet discomfort, however there is a greater risk of error so only consider once experienced and confident in the use of both tourniquets.

Apply both tourniquets to the upper arm over softban, as usual. Proceed as above, except when inflating the tourniquets, only the proximal cuff is inflated. This means that after local anaesthetic injection, the skin under the distal cuff should also become anaesthetized. If the patient starts complaining of excessive tourniquet discomfort, then the distal tourniquet can be inflated over the anaesthetized skin. Once this is fully inflated, the proximal cuff can be deflated.

Remember there is less safety in just having one cuff and also the risk of error if both cuffs are erroneously deflated. Therefore, this is just for experienced operators.

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Part 4: Recovery

Ensure at least 20 minutes has elapsed since injection of local anaesthetic. This is not the tourniquet time!

Deflate the cuffs and observe patient for 5 minutes in anaesthetic room for signs of local anaesthetic toxicity.

It is common for patients to have mild peripheral excitatory signs such as tinnitus or perioral paresthesia. Provided there is no systemic compromise, observation +/- oxygen and IV fluids until these have settled is all that is usually required. Also consider re-inflating the tourniquets for a period of time to stop further local anaesthetic entering the circulation.

In the event of an emergency or severe systemic reaction, call for help early, resuscitate patient and follow AAGBI protocol for local anaesthetic toxicity.

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