

# INTRAVENOUS REGIONAL ANAESTHESIA (BIER'S BLOCK)

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**History.** This simple method of providing anaesthesia of the distal arm or leg was first described by August Bier in 1808. After a period of wide popularity, it fell into disuse until repopularised by Holmes in 1963.

**Clinical application.** Intravenous regional anaesthesia (IVRA) is indicated for any procedure on the arm below the elbow or leg below the knee that will be completed within 40-60 minutes. Onset of anaesthesia is rapid and reasonable muscle relaxation can be obtained. Its use is limited to procedures lasting less than an hour because of increasing discomfort from the tourniquet.

**Contra-indications.** The technique should not be employed if a tourniquet cannot safely be used, for example, in patients with severe Reynaud's or homozygous sickle cell disease. IVRA is not contraindicated in patients who are heterozygous for sickle cell disease. Caution should be employed in patients who have sustained crush injuries of the relevant limb as potentially viable tissue will be subjected to a further period of hypoxia.

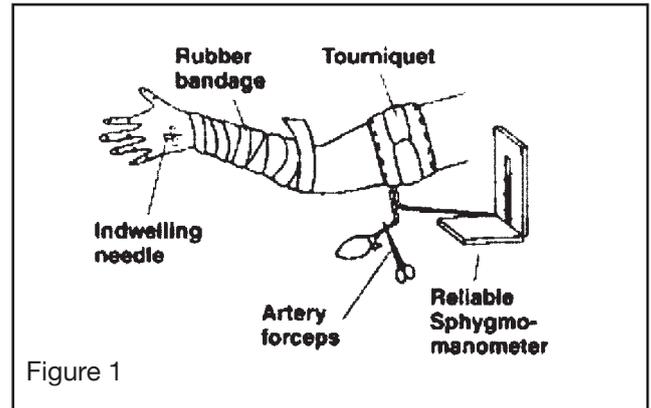
**Equipment.** The only equipment necessary to perform this procedure successfully is a tourniquet which does not leak and that can be inflated to a pressure at least 50mmHg above the patient's systolic blood pressure, and a cannula inserted in a distal vein. As with all other local anaesthetic blocks, resuscitation equipment should be immediately available.

**Drugs.** The drug of choice for IVRA is prilocaine as it is the least toxic local anaesthetic and has the largest therapeutic index. If prilocaine is not available, lignocaine is an acceptable alternative. It is essential that plain and not adrenaline-containing solutions are used. Bupivacaine (Marcain) is not suitable and should never be employed as it is too toxic, particularly to the myocardium. A suitable dose to use in an arm is 40ml of 0.5% prilocaine (or 0.5% lignocaine). This can be increased to 50ml in muscular individuals or decreased to 30ml in small or frail patients. Larger volumes are necessary in the leg eg. 50-60ml. Maximum recommended volumes for a 60-70 kg patient are 400mg prilocaine (80ml 0.5% solution) or 250mg lignocaine (50ml 0.5% solution).

**Technique.** Before beginning to perform the block, the patient's blood pressure should be measured.

An intravenous cannula or butterfly needle is then inserted in a distal vein in the limb scheduled for surgery (eg. in the dorsum of the hand or foot). It is good practice to place a cannula in another limb as

well in case any complications (see below) occur, which may require intravenous drug administration. The tourniquet is then applied to the upper arm or thigh. It should never be placed on the forearm or lower leg as adequate arterial compression cannot then be obtained.



A more effective block is obtained if the limb is exsanguinated (blood removed) before the tourniquet is inflated. Traditionally, this is done by tightly wrapping the distal part of the limb with an Esmarch rubber bandage, before inflating the tourniquet. However, if this is likely to cause pain to the patient eg. if the limb is fractured, it is acceptable to simply elevate the arm or leg for 20-30 seconds whilst applying firm digital pressure on the brachial (or femoral) artery. This will allow venous blood to drain from the limb whilst preventing further arterial blood entering. The tourniquet is then inflated to a pressure of 50mm Hg or more above the patient's systolic blood pressure.

The local anaesthetic solution is then slowly injected into the indwelling cannula and the patient warned that the limb may start to feel hot and that the skin will take on a mottled appearance. Analgesia will occur within 3-4 minutes and surgery can then commence. Even if the surgery is completed within a few minutes, on no account should the tourniquet be deflated until at least 15 minutes has passed since the injection of the local anaesthetic or serious toxic side-effects may occur. The pressure in the tourniquet must be constantly observed and maintained at least 50mm Hg above the patient's systolic blood pressure.

If the operation is prolonged, the patient may complain of pain due to pressure from the tourniquet. This may be reduced either by the subcutaneous infiltration of a few mls of local anaesthetic above the tourniquet or by the use of a "double tourniquet technique." If this method is used, two tourniquets are placed on

the patient's arm or leg. Initially, the more proximal (upper) one is inflated and the local anaesthetic agent injected. If the patient becomes uncomfortable, the distal (lower) tourniquet is inflated and then the proximal one is deflated.

At the end of the procedure, the tourniquet is deflated and normal sensation quickly returns. It has been suggested that if the tourniquet is reinflated again 20-30 seconds, the rate of washout of local anaesthetic from the limb and hence the incidence of side-effects is decreased. In any event, the patient should be warned that they may experience tinnitus, dizziness or transient drowsiness following deflation of the tourniquet.

**Complications.** Intravenous Regional Anaesthesia is extremely safe and problems are few. The most important complications are due to the toxicity of local anaesthetics and will occur if the tourniquet suddenly deflates soon after the local anaesthetic has

been injected. These will range from dizziness and tinnitus to muscle twitching, loss of consciousness and convulsions. Serious cardiac side-effects are rare and occur if convulsions are inadequately treated or if bupivacaine is used.

Convulsions due to local anaesthetic toxicity are treated in the standard way: oxygen is administered, the airway is protected, by endotracheal intubation if necessary, and the convulsions terminated with intravenous diazepam or thiopentone. Deaths have been reported when convulsions have been inadequately or incorrectly managed.

**Conclusion.** IVRA is a simple and valuable technique that is easy to learn and perform. It is very safe provided excessive doses of local anaesthetic are avoided, if the tourniquet pressure is carefully monitored and if resuscitation equipment is always immediately available.