

# Anaesthetic Guidelines for Rural Hospitals

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This series is also being produced as a booklet for the use of doctors in rural hospitals and will be obtainable from SA Family Practice in 1997.

## LOCAL AND PERIPHERAL ANAESTHESIA

### The series will have the following sections:

1. Introduction to anaesthetics and anaesthetic safety checklist
2. Anaesthesia, intubation and extubation
3. The pre-operative assessment
4. Anaesthetic drugs I
5. Anaesthetic drugs II
6. Spinal anaesthesia
7. Caesarean Sections
8. Paediatric anaesthesia
9. Complications during anaesthesia
10. Local and peripheral anaesthesia
11. Ventilation and breathing systems
12. Blood transfusion

### INTRODUCTION

Local and peripheral anaesthesia is the establishment of anaesthetic conditions in a localised part of the body, achieved by blocking the conduction of peripheral nerves. It can be performed by blocking specific and discrete nerves, by general infiltration around the surgical site, or by a combination of both.

This chapter discusses the principles of local and peripheral forms of anaesthesia, and does not repeat the previous chapter on spinal anaesthesia. Due to space limitations, there are no detailed descriptions of the technical aspects of performing specific nerve blocks, which are explained in most standard anaesthetic textbooks.

Local and peripheral anaesthesia should be the anaesthetic tech-

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nique of choice for many procedures in rural and under-resourced settings where staff and equipment shortages mitigate against the use of general anaesthesia.

### ADVANTAGES

**Safety and preservation of consciousness** – Generally speaking, it is safer to anaesthetise a part of the body than to anaesthetise the whole person. Because the patient is awake, she/he is able to protect her/his airway from gastric aspiration, which is particularly useful when the patient has a full stomach. For this reason, always ask before every operation: *Can this operation be done more safely under local anaesthesia?*

**Practicality** – The equipment required to perform local anaesthesia is far less expensive, bulky and complex than it is for general anaesthesia.

**Quicker post-operative recovery** – This is usually because the patient remains awake.

**Affordability** – Local anaesthesia is generally cheap compared to most forms of general anaesthesia.

### DISADVANTAGES

**Limited range of surgical indications** – Because the patient remains awake, it is unsuitable for several types of surgery where it would be kinder to render the patient asleep. As well as this, local anaesthesia cannot be used very effectively for abdominal surgery, or close to areas of cellulitis or infection. Finally, for certain nerve blocks, bleeding diathesis is a contra-indication.

**Limited degree of anaesthesia** – Although pain and light touch sensation is usually abolished, the sensation of heavier forms of pressure, ie pulling and tugging, often remains.

**Side-effects** – If the wrong technique or dosage is used, local anaesthetics can produce serious and potentially fatal systemic toxicity (see page 471).

**Less reliable** – Local anaesthesia is a technique that does not always work, and for this reason, patient acceptance may be low.

**Delay of onset** – Some local blocks can take as long as 15 to 20 minutes to work before the patient is ready for surgery.

**Increased vascularity** – Most local anaesthetics cause vasodilation as a side-effect, which can be troublesome for the surgeon.



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This is less so with bupivacaine than for Lidocaine (also known as Lignocaine). The addition of adrenaline also helps to minimise this effect.

## LOCAL ANAESTHETIC SOLUTIONS

In keeping with the principles of using a core selection of drugs, only Lidocaine and bupivacaine are discussed here. The dangers of local anaesthesia relate to the systemic absorption of the drug beyond the maximum dose, or to the local anaesthetic being injected directly into a vein or artery. The maximum dose is calculated on the basis of the lean body mass of the patient (see Table 1).

**Adrenaline:** Adrenaline is often used because it causes local vasoconstriction, with the effect of reducing the speed of systemic absorption and the incidence of side-effects. This allows for the maximum dosage of local anaesthesia to be increased, as well as prolonging the duration of action.

However, it is totally contra-indicated for use on the extremities (digits, penis etc) where the vasoconstriction of end arteries can cause ischaemia and necrosis. The maximum safe dose for adrenaline in adults is 0,5mg.

**Lidocaine:** This common local anaesthetic usually comes in concentrations of 1% or 2%. If diluted with sterile saline or water, less concentrated solutions can be used. It comes in both isobaric and hyperbaric solutions.

**Bupivacaine:** This is a common and popular local anaesthetic especially because it is much longer lasting than Lidocaine. It is also more potent, and therefore comes in solutions of 0,25% to 0,5% and can be both isobaric and hyperbaric.

The main disadvantage of bupivacaine is that it is one of the most potentially toxic of all local anaesthetic solutions.

## SIDE-EFFECTS AND OVERDOSAGE

The toxicity of local anaesthesia relates to an excessively high plasma concentration, and may be due to accidental intra-vascular injection, use of too large a dose, or to faulty technique. Signs and symptoms of toxicity include drowsiness, anxiety, tremors, twitching, circumoral tingling, convulsions, hypotension, arrhythmias and loss of consciousness. Coma may be accompanied by apnoea and general cardiovascular collapse.

The management of toxicity is to cease administration of the local anaesthetic, resuscitate as necessary, oxygenate, control convulsions with thiopentone and infuse fluids intravenously. For this reason, all but the most minor procedures should be carried out with ready intravenous access in the patient, and with the availability of resuscitation equipment.

## PERFORMING LOCAL ANAESTHESIA

Success comes with practice. Therefore, if you are a beginner, select patients who are thin and co-operative. If a nerve stimulator is available, it is ethically acceptable to

practise nerve blocks (as a form of post-operative analgesia) in patients under general anaesthesia.

Always explain the procedure pre-operatively, and reassure your patient. Remember to explain that he/she will probably retain some sensation of touch and pressure. It is often helpful to give the patient pre-medication (an anxiolytic and an opioid).

With some procedures, being conscious during the operation will mean discomfort due to prolonged immobility (this is best relieved by an opioid and not a benzodiazepine).

As a rule of thumb, except for the most straightforward of procedures, patients should be starved in case the local anaesthetic does not work, and a general anaesthetic will have to be given.

To minimise toxic side-effects, the main safety measure is to inject slowly (helps to prevent a high plasma concentration even if the injection is intravascular) while withdrawing or moving the needle, and aspirating occasionally. Remember also that the higher the concentration of the local anaesthetic solution, the higher the chance of toxicity.

The speed with which local anaesthesia becomes effective may vary from seconds to 20 minutes, de-

Table 1

	Lignocaine		Bupivacaine	
	Plain	With adrenaline	Plain	With adrenaline
Maximum dose	4mg/kg (up to 200mg)	7mg/kg (up to 400mg)	2mg/kg	2mg/kg
Duration of action	1½ hours	Up to 3 hours	4 to 6 hours	Up to 6 hours



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pending on the type of local anaesthetic used, the technique, the patient, and the nerve/s being blocked. Finally, always check to see if the anaesthesia is working before proceeding.

## GENERAL TECHNIQUES

**Infiltration anaesthesia:** This is performed by generally infiltrating the soft tissue or the site of surgery with local anaesthetic. It can be combined with an actual nerve block and is particularly useful for minor operations such as the excising of cysts and lipomas, and lymph node biopsies. As long as you keep the needle moving as you inject, it is not necessary to continually aspirate.

Some fractures can be manipulated and reduced following infiltration anaesthesia into the haematoma between the fragments of bone at the fracture site. This technique has been said to be particularly useful at the scene of mass trauma casualties, and especially for extension fractures of the wrist. It is very important that this is conducted under strictly sterile conditions, that the fracture is less than 24 hours old, and that the anaesthetic is injected slowly.

**Surface anaesthesia:** The mucous membranes of the body readily absorb local anaesthetic agents to cause a surface anaesthesia which may be useful for procedures involving the conjunctiva (insert two drops of 2% Lidocaine 20 times in 10 minutes), the ear drum, the nasal mucosa, and the urethra. A 40% or 10% topical spray of Lidocaine is also available for pharyngeal and laryngeal anaesthesia.

**Intravenous regional anaesthesia (IVRA):** IVRA was first introduced in 1908 by Bier, and is sometimes referred to as the Bier's block. It can provide anaesthesia of

the distal part of both limbs and involves injecting local anaesthetic solution directly into the vein of a limb which has been rendered ischaemic by the use of an arterial tourniquet.

According to some authors, IVRA should be the first local anaesthetic technique learned by a trainee because its technical simplicity allows him/her to concentrate on acquiring the skills of patient management.

The procedure is first of all to exsanguinate the limb as much as possible by using an Esmarch bandage, or by lifting the limb above the level of the heart for at least five minutes. The limb is then rendered ischaemic by pumping up a sphygmomanometer to a pressure of at least 100mmHg above the patient's systolic blood pressure.

Ensure that the limb is well padded, that all connections are able to lock, that the equipment has been tested for leaks and that the pressure gauge is working. A cannula should be inserted into the contralateral arm in case emergency drugs need to be administered.

The ideal agent to use is Prilocaine (40ml of 0,5% solution). However, a solution of 0,5% Lidocaine is also sometimes used: 30 to 40ml for the arm and 50 to 80ml for the leg. *Never use bupivacaine.* Inject through a vein on the dorsum of the hand or foot.

The cuff must not be deflated for at least 20 minutes, and when it is released, do so slowly. If there is discomfort caused by the cuff, you can use a second cuff which is blown up over a part of the limb that has already been anaesthetised.

The Bier's block has suffered from a bad reputation due to the wide pub-

licity of a number of accidental deaths. These deaths have resulted from the incorrect choice of drug, the wrong dosage, faulty equipment, a lack of vigilance and personnel who have been inadequately trained to manage toxic reactions.

## SPECIFIC BLOCKS

Below is a selection of nerve blocks that should be within the capacity of the generalist doctor because of their usefulness *and* because of their relative technical ease. It is not possible here to describe these various blocks in detail, which are in any case best learnt by practice under supervision. If you have a chance to arrange an attachment with a specialised anaesthetist, try and learn the skills to administer the following:

- brachial plexus block via the axillary approach;
- digital nerve blocks;
- ulnar, median and radial nerve blocks at the elbow level;
- inter-costal nerve blocks;
- infiltration anaesthesia for caesarian section; and
- penile ring block.

As well as this, it would be well worth the investment of time to learn how to perform infiltration anaesthesia and nerve blocks for dental excisions, and to learn how to administer a transvaginal pudendal block.