

Anaesthetic Guidelines for Rural Hospitals

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On behalf of the Rural Health Task Group of the Academy of Family Practice/Primary Care.

This series is also being produced as a booklet for the use of doctors in Rural Hospitals and is obtainable from SA Family Practice.

SUB-ARACHNOID or 'SPINAL' 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 regional anaesthesia
11. Ventilation and breathing systems
12. Blood transfusion

INTRODUCTION

A spinal anaesthetic is essentially a lumbar puncture followed by the injection of local anaesthetic into the cerebro-spinal fluid (CSF).

Spinal anaesthetics are simple to perform, inexpensive, effective and safe. It is difficult to understand why they are not used more commonly in developing countries.

A major advantage of spinal anaesthetics is that they allow the patient to remain conscious during the operation. An awake patient is a good safety monitor – for example, with diabetics, there is little chance of unrecognised hypoglycaemia in an awake patient. As the airway is not compromised, there is a reduced risk of airway obstruction, gastric aspiration and other problems related to intubation.

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For patients with diabetes, respiratory disease, congestive cardiac failure and obvious intubation difficulties, a spinal anaesthetic may be the technique of choice, if the operation allows for it. Consider its use for any operation below the umbilicus.

EFFECTS

Nervous system

Blockade of all types of nerve fibres: autonomic, sensory and motor. The extent of the effects of a spinal are governed by the degree to which the spinal cord and its nerve roots are anaesthetised. The higher up the spinal cord, the more the body is affected. (See Figure 1).

Respiratory system

There is virtually no effect on respiratory capacity providing the block does not reach the cervical nerve roots that supply the phrenic nerve (C3, 4, 5). Although there may be some loss of intercostal muscle activity, this is not usually important unless there is severe respiratory disease. However, unless the oxygen saturation can be monitored, it may be wise to give the patient some oxygen to breathe.

Cardiovascular system

Hypotension is the major effect of spinal anaesthetics, and is due to

the denervation of the sympathetic outflow tracts (T1 to L2). The effects are proportional to the height of the block and result from mainly from vasodilation causing venous pooling. In awake and fit patients, compensatory vasoconstriction above the block often maintains arterial pressure. However, if the patient loses consciousness (eg due to being sedated), the compensation may be abolished and result in hypotension.

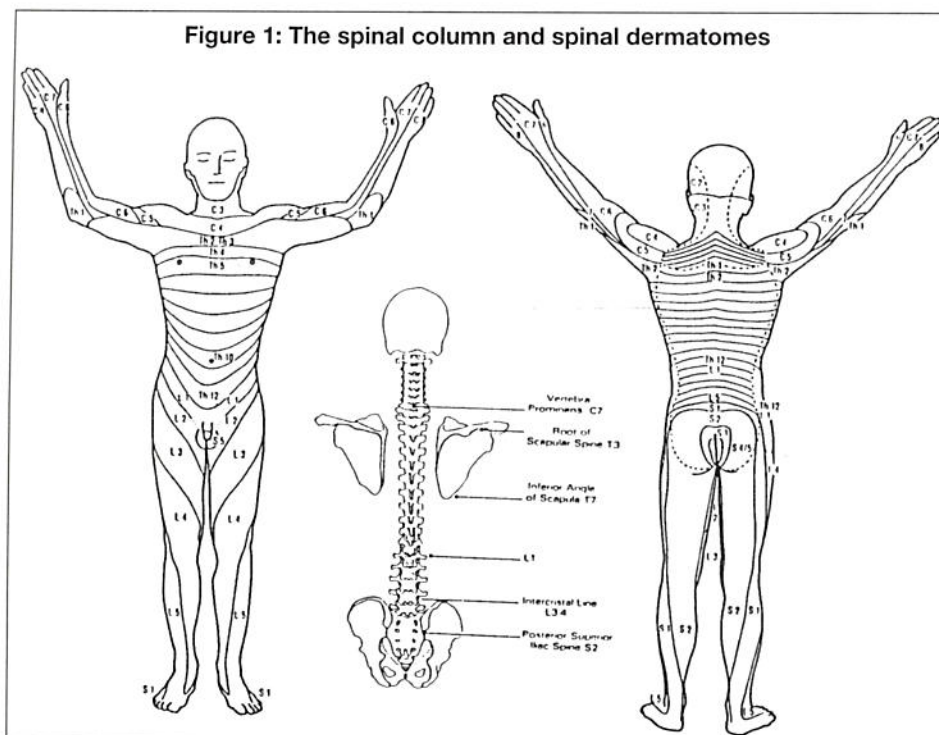
Patients who are already compensating for hypovolaemia will develop catastrophic hypotension when given a spinal.

The sympathetic nerve supply to the heart is supplied by T1-T4. Therefore a dangerously high thoracic block will also cause a bradycardia, reduce the heart's inotropic capacity and possibly result in a cardiac arrest.

Preventing a hypotensive disaster

- First of all, anticipate hypotension in all spinal anaesthetics. Remember that nausea and vomiting are often symptoms of established or impending hypotension in the awake patient – check the BP immediately!
- Always insert a large bore IV cannula and preload patients with 500ml of normal saline before the anaesthetic.

Figure 1: The spinal column and spinal dermatomes



- Never give a spinal in any patient who is hypovolaemic, or who may have little compensatory reserve.
- Monitor the patient's BP and pulse carefully.
- Left lateral tilt in obstetric patients.
- Place patient in a slight head down position 10 minutes after injecting the local anaesthetic – this has little effect on distribution of the block, but has a significant effect on venous return by raising the level of the legs above the heart.
- Limit the height of the block, and never give more than 4ml of local anaesthetic.
- Replace all operative blood and fluid loss promptly.

Responding to severe hypotension

- Lift the legs up and place the patient in a head down position.
- Increase the rate of IV fluid infusion.
- Give 100% oxygen.
- If hypotension remains, use **Ephedrine**: Give IV boluses of 3mg and titrate according to response.

- If there is associated bradycardia give atropine.

Gastro-intestinal system

Unopposed parasympathetic action on segments of the gut will lead to increased peristaltic activity. It should also be remembered that unpleasant sensations from visceral manipulation are not abolished by a spinal.

SIDE-EFFECTS AND DISADVANTAGES

- **Post-spinal headaches**
This is due to CSF leaking out of the hole made in the dura by the needle, and can be very severe and disabling. It is more common in young adults and obstetric patients, and may occur up to three days after the lumbar puncture and persist for as long as two weeks.

Characteristically it is worse on sitting and is occipital in distribution. Management is with analgesia and maintaining good hydration in the patient. If it is persistent or severe, an extra dural blood patch nearly always works – aseptically inject 15-

20ml of the patient's own blood into the epidural space. This then clots and seals the hole, preventing further CSF leakage. Technique that increase intra-abdominal pressure, such as tight binding across a band of about eight inches of the upper abdomen, also help.

This complication may be minimised by using the smallest gauged spinal needle that is available and by placing the bevel of the needle parallel to the sagittal plane of the patient.

- **Meningitis and meningism.**
- **Haematoma or abscess compression of spinal canal.**

CONTRA-INDICATIONS

- **Bleeding diathesis**
This may cause a haematoma and spinal cord compression to occur.
- **Hypovolaemia and hypotension**
This may cause disastrous hypotension.
- **Sepsis close to site of lumbar puncture**
This may cause meningitis or a spinal cord abscess.
- **Patients with a fixed cardiac output**
For example severe stenotic valvular heart disease.
- **Patients with uncontrolled hypertension**
- **Raised intra-cranial pressure**
- **GI perforation**
Increased peristaltic action may cause increased peritoneal contamination.
- **Operations lasting more than two hours**
For such operations, patients should really receive a general

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anaesthetic to minimise discomfort for the patient.

- **Uncooperative patients and unpleasant surgery**

Patients who are uncooperative may disrupt the surgeon or the surgical field, and should be sedated or completely anaesthetised. This includes children, for whom it may be kinder to use a general anaesthetic. Also operations such as amputations may be too traumatic to allow the patient to remain conscious or even semi-conscious.

- **Uncontrolled hypertension.**

TECHNIQUE FOR GIVING A SPINAL ANAESTHETIC

- Explain the procedure to the patient.
- Use the strictest aseptic technique.
- Place patient in a sitting or lateral decubitus position (see Figure 2). Lumbar puncture is most easily performed when there is maximum flexion of the spine.
- Level of puncture: Dural puncture must occur below the point at which the spinal cord ends – in adults this is usually at the level of L2, and in children this is usually at L3. An important landmark to remember is that the line joining the top of the iliac crests together is at L4/5 and the L4/5 or L3/4 are equally good interspaces to use.
- Needle: The smaller the better. Avoid using anything bigger than a 22G needle. This reduces the incidence of post-spinal headache. The bevel of needle should face laterally so that the fibres of the arachnoid are split vertically rather than cut horizontally. Never use a needle that has been contaminated in any way, including contamination with surgical spirits or antiseptic solution.
- Injection: Inject slowly (1ml over

five seconds), and never inject during a contraction in an obstetric patient.

- Monitor BP and pulse continually.

NB: The practice of barbotage is no longer recommended and should not be done.

CHOICE OF LOCAL ANAESTHETIC

There are a number of local anaesthetic agents that can be used for spinal anaesthetics. In keeping with the principle of becoming expert with one drug rather than knowing lots of different drugs less well, the rest of this chapter will refer only to the use of 0,5% Bupivacaine.

Bupivacaine, however, can come in two different forms of baricity. Baricity refers to the density of the local anaesthetic solution, and they can be hyperbaric (more dense than CSF), or isobaric (the same density as CSF). It is recommended that if you are not a trained anaesthetist, that you limit yourself to the use of hyperbaric or 'heavy' solutions. Hyperbaric agents tend to have a more consistent and reliable effect. Because of its heaviness it will tend to fall like syrup through the CSF so that its spread can, to a certain extent, be determined by the posture of the patient.

DETERMINING THE LEVEL OF THE BLOCK

Volume: The volume range should always be limited to between 1,5 and 4ml. A higher volume will increase the risk of a high spinal block. In obstetric patients, the elderly and in small people, a smaller volume is required. For Caesarian Sections, a volume of 1,5ml will make the risk of a 'high spinal' extremely unlikely. A 'saddle block' which anaesthetises only the perineal region, can be achieved by using a volume as little as 1ml in a sitting patient.

The following is a general guideline for fit, normal sized adults:

Position: A sitting position will produce a lower block with a hyperbaric solution. In the supine patient, volumes of 2-4ml will usually spread up to a level of T4. If the volumes are lower than 2ml the spread rarely goes above T10.

Patient: Obesity, pregnancy and old age are associated with a low subarachnoid volume. Therefore, lower volumes are desirable in these situations. A big man on the other hand, is likely to need 3-4ml to achieve a low thoracic block.

DURATION OF BLOCK

With hyperbaric Bupivacaine a duration of two to three hours is usually assured.

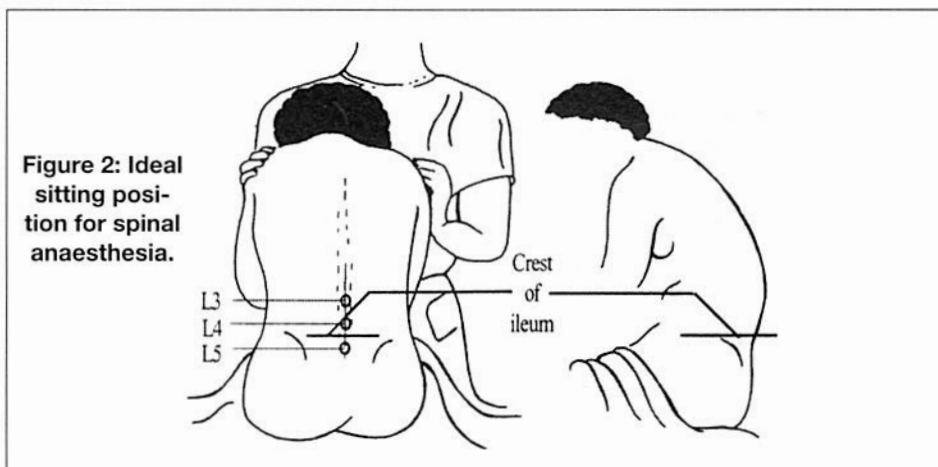


Figure 2: Ideal sitting position for spinal anaesthesia.