

TWENTY REGIONAL ANAESTHESIA BLOCKS - CHAPTER 1

A MANUAL FOR MEDICAL AND ANAESTHETIC PRACTITIONERS

JOHN HYNDMAN

Primum non nocere ----- First, do no harm

Questions

- 1) What are the advantages of regional anaesthesia?**
- 2) What are the disadvantages of regional anaesthesia?**
- 3) What are the contraindications to regional anaesthesia?**
- 4) What are the signs and symptoms of lidocaine toxicity?**
- 5) How can you reduce the risk of nerve damage?**

INTRODUCTION

I have written this manual of regional anaesthesia as I believe there is a need for a simple, practical and clearly illustrated guidebook to assist non-specialist practitioners. This is not a book for the specialist anaesthetist.

During my career as a specialist anaesthetist I have taught practical regional anaesthesia to students, nurses and doctors. This teaching experience has taught me the importance of imparting knowledge in a clear, simple and unambiguous manner. I learnt that the fundamentals were all important. The student who is started along the straight path is more likely to stay on it long after the teacher has left his side.

This book has no academic pretensions. It is a simple, practical guide to assist medical and nurse practitioners in learning the art of regional anaesthesia. I have deliberately adopted a didactic and prescriptive style. I believe the student should be instructed in a particular technique and then follow the recommended method until competence has been achieved. At that point it is reasonable to experiment with different ideas and techniques.

Medical practitioners and nurse practitioners working alone in remote locations may of necessity be called upon to perform regional anaesthetic blocks. These practitioners may have had minimal formal instruction in regional anaesthesia and find the learning on the job approach a daunting experience. I have therefore selected 20 blocks that I consider to be simple,

safe and reliable. I believe the inexperienced anaesthetist can rapidly attain proficiency in performing these procedures. An overall success rate of 90% is realistic if the correct procedure is followed.

In an ideal world, all of these blocks would be taught under close supervision. However not all practitioners will have had the opportunity in their training to avail themselves of supervised instruction. A nurse or doctor in some faraway place may consult this manual and perform a block for the first time. This is the stark reality of working in developing countries and I have therefore endeavoured to teach a simple and safe method for each block.

THE TWENTY BLOCKS ARE IN THREE CATEGORIES:

A: Simple blocks. (May be learnt from this manual).

- Infiltration anaesthesia
- Digital block
- Wrist block
- Inguinal hernia field block
- Penile block
- Peri-anal block
- Knee arthroscopy (intra articular) block
- Ankle block
- Carpal tunnel anaesthesia

B: More demanding blocks. (Should be learnt under supervision).

- Intravenous regional anaesthesia (IVRA).
- Axillary brachial plexus block
- Intercostal block
- Inferior dental block
- Caudal block
- Pudendal block
- The 3 in 1, inguinal paravascular block
- Sciatic (lateral popliteal approach) block

C: Technically demanding blocks. (Strongly recommend formal instruction).

- Subarachnoid (spinal) block
- Interscalene brachial plexus block
- Infraclavicular brachial plexus block

I believe these 20 blocks are more than sufficient to fill the armoury of the enthusiastic novice anaesthetist.

It has been difficult to decide which blocks to include and which to omit. I have, for instance, left out thoracic and lumbar epidurals, as I believe the risks inherent in these procedures are significant. They should therefore be left to the specialist anaesthetist. Likewise I don't believe sciatic blocks (at hip level), paracervical blocks, paravertebral blocks and sympathetic blocks are suitable for the inexperienced anaesthetist.

I have not included ophthalmic blocks and facial blocks as these procedures are usually best managed by the surgeon. I seldom perform cervical plexus blocks or elbow blocks. I am sure there will be arguments over what has been included and what has been left out. If you have strong views about my twenty block selection please email me with your suggestions and recommendations. It will assist me when editing future editions of this manual.

My paramount concern at all times has been to teach safe practice. A fundamental principle of medicine, *Primum non nocere*, (*first, do no harm*) should be our guiding light. There is no place for casual or slovenly practice.

There are a few golden rules which should never be broken.

1. **Always insert an intravenous line before commencing a block.**
2. **Always monitor (pulse oximetry, EGG, BP as indicated).**
3. **Always practice proper aseptic technique.**
4. **Always have resuscitation equipment at hand.**
5. **Always obtain the patients informed consent.**
6. **Always have an adequate knowledge of the correct technique and know how to handle complications.**

These rules are sensible and obvious, but you ignore them at your peril. Shortcuts and casual practice are the highway to hell for the unsuspecting inexperienced anaesthetist.

ADVANTAGES OF REGIONAL ANAESTHESIA

- **Avoids general anaesthesia complications:** (trauma to lips, teeth, oropharynx and vocal cords. Bronchospasm. Aspiration. Prolonged sedation).
- **Probably safer** than general anaesthesia when anaesthetist is relatively inexperienced (e.g. remote locations).
- **Some patients prefer to remain awake** and interact with the surgeon. It can be helpful for the surgeon to receive feed back from the patient during the operation.
- **Less postoperative nausea** and vomiting (less opioid).
- **Less sedation post op** (decreased confusion in elderly).
- **Analgesia continues into postoperative period** (new catheter /infusion techniques allow blocks to be continued for several days).
- **Faster return to street fitness** and earlier discharge (cost savings).
- **Subarachnoid block** results in decreased deep vein thromboses, less blood loss and reduced surgical stress response.
- **Obstetrics:** regional blocks in labour and delivery have transformed the experience for mother and baby. Obstetrics is much safer and more pleasant for all concerned.
- **Regional anaesthesia in remote locations is cheap and relatively safe.** No elaborate equipment is required and the entire anaesthetic apparatus can be carried in a small bag.

DISADVANTAGES OF REGIONAL ANAESTHESIA

- **Time delay:** It takes time to perform the block and then 15 - 30 minutes before the patient is ready for surgery. This delay is partly offset by the time saved at the end of the operation and the shortened recovery stay. With good organization and a skilled anaesthetist, I believe the time difference between regional and general anaesthesia is minimal.
- **Patient factors:** There is a degree of discomfort associated with block placement and operative positioning. Patients may be anxious and dislike being aware. These problems can be managed by the judicious use of midazolam and fentanyl. In the postoperative phase some patients are distressed by the paralysis and numbness.
- **Surgeon factors:** Some surgeons are irritated and distracted by an awake patient, especially when the patient persists in engaging in constant conversation with the surgeon.
- **Anaesthetist factors:** Good regional anaesthesia requires a skilled, knowledgeable anaesthetist and the proper equipment.
- **Nerve damage:** There is a minimal risk of permanent nerve damage. This will be discussed in more detail later.
- **Failure rate:** There is a variable failure rate of up to 10%. If this means the conversion to general anaesthesia, the patient is exposed to the combined risks of both.
- **Subarachnoid block complications:** Spinal blocks risk dural puncture headache, urinary retention, hypotension and meningitis.
- **Surgery outlasts the block:** Unless a catheter has been inserted, the anaesthetist has to convert to general anaesthesia.

CONTRAINDICATIONS TO REGIONAL ANAESTHESIA

These can be divided into absolute and relative contraindications. Much depends upon the competence of the anaesthetist, the urgency of the operation and the health status of the patient.

ABSOLUTE CONTRAINDICATIONS:

- Patient refusal.
- Inexperienced, incompetent anaesthetist.
- Major coagulation disorders and patients taking anticoagulants (this especially applies to spinal blocks).
- Infection at site of needle insertion.

RELATIVE CONTRAINDICATIONS:

- Patients who are psychiatrically or psychologically unsuited to a regional technique.
- Surgeons who are uncomfortable with an awake patient.
- Shocked, severely hypovolaemic patients.
- Anticipated technical difficulty. (It would not be prudent to attempt a subarachnoid block on a severely kyphoscoliotic patient).
- Neurological disease (e.g. multiple sclerosis).
- Uncertain duration of surgery (i.e. the surgery may outlast the block).
- Placing the block in an anaesthetised patient (the awake patient will complain bitterly if the injection is intraneuronal).

COMPLICATIONS OF REGIONAL ANAESTHESIA

Serious complications of regional anaesthesia are relatively rare. Complications are usually of a minor nature but at times can be life threatening.

- **LOCAL ANAESTHETIC TOXICITY:** This occurs when the concentration of local anaesthetic in the blood rises to toxic levels. It may be immediate as in accidental intravascular injection or delayed as in absorption of an excessive dose of local anaesthetic.

SIGNS AND SYMPTOMS

- The cardiovascular system (CVS) and central nervous system (CNS) are primarily involved. Symptoms and signs of CNS toxicity occur before the CVS manifestations.
- Early symptoms of CNS toxicity include tinnitus, lightheadedness, facial numbness, a metallic taste and blurred vision. Patients may become confused and disorientated. Nausea or vomiting may occur.
- With higher serum levels nystagmus, tremors and isolated muscle twitching occur. This can lead on to convulsions, coma and respiratory arrest.
- If epinephrine has been included in the local anaesthetic (LA) solution, the initial presentation of an overdose may be a tachycardia and hypertension. If epinephrine has not been added, the early signs are bradycardia and hypotension.
- Blood levels of LA far in excess of the convulsion threshold are required for cardiac arrest to occur. Bupivacaine is particularly dangerous as it causes a ventricular fibrillation can be difficult to defibrillate.
- Intravascular injection can cause convulsions and cardiac arrest due to the rapid rise in blood concentrations whereas the slower systemic absorption of local anaesthetic affects mainly the CNS.
- These emergencies must be handled quickly and effectively. If the patient loses consciousness, the airway must be secured and maintained. A bag and mask (with high flow oxygen) may

be sufficient but ideally suxamethonium should be given followed by intubation. Intermittent positive pressure ventilation is performed until the patient is awake and able to maintain his own airway.

- Convulsions are managed with intravenous midazolam 10 - 15 mg.
- Cardiovascular collapse is a more sinister problem. Administer intravenous atropine (1.2 - 1.8 mg) and phenylephrine (1 - 2 mg) to reverse the bradycardia and vasodilation. Infuse copious volumes of normal saline and institute full cardiopulmonary resuscitation if cardiac arrest occurs.
- If you are able to maintain cardiac output, blood pressure and manage the convulsions the emergency is usually short-lived and a full recovery can be expected. The key is to manage the emergency effectively.
- **Prevention is always better than cure and it is advisable to adopt a few sensible practices:**
 1. Inject local anaesthetics slowly, aspirating every 3 - 5 ml.
 2. Stabilize the needle during injection by placing a short length of fine bore plastic tubing between the needle and syringe (the isolated needle technique).
 3. Always perform a check aspiration before injecting LA (but remember, check aspirations are not fool proof).
 4. Observe the patient, pulse and ECG for signs of intravascular injection. Added epinephrine causes a sudden tachycardia.
 5. Always secure intravenous access before commencing block.
 6. Always have emergency resuscitation equipment on hand and know how to use it.

• NERVE DAMAGE:

- Nerves can be damaged by direct needle trauma or by injecting local anaesthetic into the nerve.
- Eliciting paraesthesia is an accepted method of locating nerves. However there is a widely held view that this practice should be abandoned, as it is potentially harmful. There is no hard evidence to support this view but I believe a nerve stimulator should be used where possible.
- A short bevel needle may contuse a nerve whereas a sharp needle will lacerate it. If a paraesthesia is elicited, it is good practice to withdraw the needle a millimetre or two before injecting. Injection of large amounts of LA into a nerve is extremely painful. The fascicular bundles are stripped and neuronal degeneration can occur.
- The incidence of nerve damage is difficult to quantify but it should be less than 1 in a 1000 for experienced anaesthetists. The good news is that most prolonged dysaesthesias and paresis resolve within a few months. Unfortunately, approximately 1 in 10,000 are permanent.

- **The following recommendations may help to reduce the risk of nerve damage:**
 1. Use short bevel needles. (This is a controversial subject as some argue the sharper, long bevel needles cause less trauma).
 2. Use nerve stimulators and insulated short bevel needles wherever possible (i.e. don't deliberately elicit paraesthesiae).
 3. Avoid rapid, forceful injections. Never inject if there is undue resistance or the patient complains of severe pain. If this happens withdraw slightly and continue injecting.
 4. Avoid regional blocks when the patient is under anaesthesia

• **VASOCONSTRICTOR PROBLEMS:**

- As a general rule epinephrine should not be used in concentrations greater than 1:200,000 (5 micrograms / ml). For skin infiltration 1:300,000 or even 1:400,000 is sufficient. Occasionally, in very vascular areas, a stronger concentration is acceptable. Dentists use 1:80,000 but only in small volumes.
- Never use vasoconstrictors on areas served by end arteries (i.e. fingers, toes, penis, ears and nose). Prolonged vasoconstriction of these small vessels can lead to ischaemic necrosis of the end organ.
- Care should also be exercised when injecting devitalised, ischaemic looking tissue (e.g. around a varicose leg ulcer).
- Most local anaesthetics cause vasodilation which increases bleeding at the site of surgery. Vasoconstrictors such as epinephrine and felypressin are added to counteract this effect.
- If this LA / vasoconstrictor solution is injected intravascularly a transient tachycardia ensues. Higher doses cause palpitations, angina, and hypertension. It is therefore prudent to reduce the dose of epinephrine in patients with a history of cardiovascular disease.
- It is unwise to use epinephrine in significant quantities in pregnancy as it reduces placental perfusion.
- The maximum safe dose of epinephrine in a healthy individual is a contentious issue.
- **My own practise is to use a maximum of 4 micrograms of epinephrine / kg.**
- Thus for an 80 kg man, a maximum of 320 micrograms (i.e. 64 ml of a 1:200,000 solution).
- Adopt the habit of using 1:400,000 solutions for skin infiltration and 1:200,000 for nerve blocks.
- Epinephrine lowers the pH of the local anaesthetic solution and this increases pain on injection. The pain can be reduced by adding sodium bicarbonate (1ml of 8.4%NaOH per 10 ml anaesthetic solution) or by substituting felypressin as the vasoconstrictor.

- Pain can also be reduced by warming the solution to body temperature.

• **INFECTION:**

- Always practice strict aseptic technique. This means sterile gloves, drapes and an appropriate prep solution.
- I routinely use a commercially available antiseptic preparation called Alcoholic Betadine (povidone/iodine 10% in ethanol 30%vv).
- If the patient is allergic to iodine, I use a 1% chlorhexidine with 75% ethanol solution.
- A needle should never be introduced through infected skin. An exception to this is when incising and draining an abscess.
- It is particularly important to observe good aseptic technique when performing a subarachnoid block. Meningitis, whilst rare, is a disastrous complication.

• **HAEMATOMA:**

- Haematomas are uncommon and usually of little consequence.
- A subarachnoid block must not be performed on a patient with a serious coagulopathy or on patients taking anticoagulant medication.
- These patients are at risk of cord compression due to an expanding haematoma.
- If the surgeon wishes to administer a prophylactic anticoagulant, perform the spinal and, providing a blood vessel has not been punctured, give the prophylactic anticoagulant 30 minutes later.

• **WRONG DRUG:**

- This is self explanatory. Always, always check the drug you are about to administer. Catastrophes have been recorded where alcohol and phenol have inadvertently been injected into the subarachnoid space.

• **PNEUMOTHORAX:**

- This is a risk with infraclavicular and subcostal blocks.

• **PSYCHOLOGICAL REACTIONS:**

- Patients are often anxious and benefit from sedation.
- Vasovagal episodes are common (characterised by pallor, sweating, bradycardia, nausea, hypotension and fainting). I am sure many of the so-called reactions to lidocaine which occur in the dentist's chair are simple vasovagal episodes.
- The management is obvious. Lay the patient flat in the recovery position and if necessary administer atropine.

• **HEADACHE:**

- Post spinal headaches can occur after dural puncture. They are due to leakage of CSF and are aggravated by standing and relieved by lying.
- Using fine bore spinal needles (e.g. pencil point 26G) and good spinal technique greatly reduces the incidence.

The treatment is bed rest, hydration and analgesia. If the headache persists for more than a couple of days, an epidural blood patch can be performed.