Local anaesthesia

Overview

Before inserting sutures, a wound should be thoroughly cleansed and infiltrated with a local anaesthetic. This module will introduce the instruments, drugs and techniques you will need, together with key information on managing your patient.

1 What is local anaesthesia?

Anaesthesia means "loss of sensation" and allows a procedure to be carried out without your patient feeling any pain.

Local anaesthesia is the most common technique for minor procedures and is the focus of this chapter. A local anaesthetic numbs a small part of the body where the procedure is taking place. It is used when the nerves can easily be reached by drops, sprays, ointments or injections. The patient stays conscious but free from pain.

2 Other types of anaesthesia

There are several other types of anaesthesia, although these will not be covered in detail in this course:

Regional anaesthesia can be used for operations on larger or deeper parts of the body. Local anaesthetic drugs are injected near to the bundles of nerves which carry signals from that area of the body to the brain. Examples of the most common regional anaesthetics are spinal and epidural anaesthetics. Again, the patient stays conscious but free from pain.

General anaesthesia is a state of controlled unconsciousness during which your patient feels nothing. This is essential for some operations and may be used as an alternative to regional anaesthesia for others. Anaesthetic drugs injected into a vein, or anaesthetic gases breathed into the lungs, are carried to the brain by the blood and stop the brain recognising messages coming from the nerves in the body.

Nerve blocks lie between local infiltration and regional anaesthesia and are increasingly used. The procedure is usually performed with the aid of ultrasound to enable the surgeon to view the placement of the needle.

In our video the injection is being carried out on a patient's left brachial plexus, a bundle of nerves that leads to the arm, prior to surgery on a broken wrist.

3 Golden Rules

In this section we cover 7 basic rules that MUST be followed prior to and during the administration of local anaesthetic:

- good patient management
- accurate and complete record keeping
- sharps safety
- safe use of anesthesia in end arteries
- awareness of signs of systemic toxicity
- safe use of anaesthesia around infected skin
- waiting for effect

3.1 Patient management

Before the procedure, you must take a thorough medical history, checking for contraindications to local anaesthesia. This includes absolute contraindications, in other words known hypersensitivity to local anaesthetic agents, and relative contraindications such as needle phobia and extreme anxiety.

Be aware of your patient as a whole person throughout the procedure. Explain what you are going to do in terms which suit each patient's understanding. Talk to your patient throughout, avoiding the use of trigger words such as "pain" or "hurt".

Remain constantly aware of how your patient is reacting, so that you recognise problems early on.

Emphasise that you will allow time for the anaesthetic to take effect before starting the procedure.

Patients may sometimes faint and should therefore be in a relaxed position in a chair or on a couch, so that they cannot injure themselves or you.

Warn your patient about postoperative pain when the anaesthetic wears off and how to deal with it. Provide written information about what to expect and what to do if problems arise.

3.2 Keeping records

It is vital that the following information is recorded as an absolute minimum:

- drug name
- with/without adrenaline
- concentration
- amount
- who administered it

3.3 Sharps safety

Always make sure you are familiar with the Sharps Safety Policy of the healthcare setting where you

are working. If you are the person using the needle you are responsible for its immediate disposal in an approved sharps container. Never leave sharps to dispose of later and never expect someone else to dispose of them for you, as this increases the risk of contamination and needle stick injury.

3.4 End arteries

Never use local anaesthetic containing adrenaline when anaesthetising any part of the body supplied by an end artery, for example finger, toe, nose, ear or penis.

Adrenalin in an end artery causes intense vasospasm and may completely cut off the blood flow beyond the point of injection. If the collateral circulation is inadequate the territory of the affected artery may become ischaemic, with disastrous consequences.

3.5 Toxicity

Major problems caused by local anaesthesia are rare, but you must be aware of the signs of systemic toxicity and act quickly if they occur. Make sure you are up to date with your national guidelines for resuscitation and treatment of anaphylaxis.

You will find information on safe dosages of anaesthetic in the chapter on Anaesthetic agents.

Useful links:
Resuscitation Council UK: **www.resus.org.uk**
Australian Resuscitation Council: **www.resus.org.au**
American Heart Association Guidelines: **www.heart.org**
European Resuscitation Council guidelines: **www.cprguidelines.eu**

3.6 Infection

Never inject local anaesthetic through infected skin. You should infiltrate around the infected area. Alternatively, you could use a nerve block rather than local infiltration.

3.7 Wait for effect

Always wait long enough for the anaesthetic to take effect before starting a procedure, especially if you have given a ring block. Use a clock.

Test before starting the procedure. Pinch the tissues with your forceps, or gently touch the skin edges with a needle. If the patient feels sharp pain, more anaesthetic is required. Pressure sensation is not dulled by local anaesthetics. With adequate anesthesia, the patient may still feel a sensation of pressure when you pinch the tissues with the forceps, but it should not hurt.

4 Anaesthetic agents

Local anaesthetic agents may be amides or esters. Amides (e.g. lidocaine, bupivacaine, prilocaine) are

more stable in solution than the esters and cause fewer hypersensitivity reactions. Esters (such as amethocaine and benoxinate) are absorbed more rapidly from the mucous membranes.

Lidocaine (lignocaine) is the most commonly used agent and is suitable for almost all cases of minor surgery.

Bupivacaine and prilocaine are longer-acting than lidocaine and other local anaesthetic agents exist, but for minor surgery lidocaine is the most commonly used agent.

4.1 Plain lidocaine

Lidocaine has a rapid onset of action and its effects last for 60 to 90 minutes. Lidocaine solution is available in three strengths: 0.5%, 1% and 2%. The 0.5% is useful in paediatric patients. 1% strength is adequate for most purposes. It has a concentration of 10 micrograms per millilitre. The 2.0% solution is rarely necessary.

Lidocaine solution is supplied in single-dose vials and multi-dose bottles. Use single-dose vials to minimise the risk of contamination.

4.1.1 Dose limits

The dose limit for lidocaine depends on many factors and each patient needs individual assessment taking into account their size, the vascularity of the infiltration site, their cardiac output, drug distribution and metabolism.

The dose limit should not exceed 3 micrograms per kilogram of body weight, i.e. a maximum of 200 micrograms for a 70 kg patient.

In practice you will only need a few mL of local anaesthetic for most minor procedures.

4.2 Lidocaine with adrenaline (Epinephrine)

Lidocaine is also available with adrenaline. Adrenaline is also known as Epinephrine. Adrenaline causes vasoconstriction, in other words it reduces bleeding from vascular areas. This can make procedures easier, for example when operating on the scalp.

Adrenaline reduces the systemic absorption of local anaesthetic, enabling larger volumes to be used without toxicity. Blanching of the skin shows the extent of the anaesthetised field.

Plain lidocaine is adequate for most purposes. Ensure that supplies of lidocaine with adrenaline (Epinephrine) are locked away in a cupboard and kept separately so that you do not use them inadvertently.

4.2.1 Dose limits

You must check the concentration of adrenaline (Epinephrine) in a local anaesthetic mixture before injecting it. Ampoules commonly have a concentration of 1 in 200 000 of adrenaline, equivalent to 5 micrograms per mL.

The dose limit should not exceed 7 micrograms per kilogram of body weight. The total dose of adrenaline given in one episode must be less than 500 micrograms.

Be aware of the cumulative effect of injecting many small lesions in a single session, and never draw up more than the total safe dose for that patient.

Always calculate and record the dose of drugs you use for each patient.

4.2.2 Things to avoid

Never use local anaesthetic containing adrenaline when anaesthetising any part of the body supplied by an end artery, for example finger, toe, nose, ear or penis.

Adrenaline in an end artery causes intense vasospasm and may completely cut off the blood flow beyond the point of injection. If the collateral circulation is inadequate, the territory of the affected artery may become ischaemic, with disastrous consequences.

4.3 Toxicity

Toxicity is caused by high circulating levels of drug. This may be because of a high total dose or because the drug is redistributed from the site of the injection.

The use of vasoconstrictor (adrenaline) will delay the systemic redistribution of the local anaesthetic by reducing blood flow to the area. The effect of the local anaesthetic will therefore last longer.

Most minor surgical procedures need only small amounts of local anaesthetic and are usually far away from major blood vessels. This means that inadvertent intravascular injection of significant quantities of local anaesthetic, or adrenaline, is rare.

If you haven't already done so, go to the topics on dose limits for Plain Lidocaine and Lidocaine with adrenaline to make certain that you are aware of safe dosages.

Be vigilant: if you detect signs of toxicity early you can minimise the adverse outcome. Do not give any more local anaesthetic and be prepared to institute supportive measures immediately until the effect of the drug has subsided.

Early symptoms affecting the central nervous system include: restlessness, tingling of limbs or around the mouth, and confusion.

Late central nervous system manifestations include: depression, convulsions and unconsciousness.

Late cardio-respiratory manifestations include: respiratory depression, arrhythmias and cardio-respiratory arrest.

Cardiac toxicity can be resistant to treatment, particularly if bupivacaine is the local anaesthetic involved.

5 Syringes and needles

Sterile single-use syringes come in a variety of sizes.

A Luer lock allows a variety of needle sizes to be attached.

Each syringe is supplied in a sterile pack. You should discard the syringe safely after a single use.

Ensure that you have a selection of needles. The larger the gauge number, the smaller the diameter of the needle, so a 25-gauge needle is much smaller than a 21-gauge needle. Needles are also colour-coded according to their diameter

Draw up local anaesthetic agent using a large diameter (green 21 gauge, 0.8mm) needle. Then remove the needle and discard it into a sharps container.

Change to the finest available diameter of needle (e.g. blue 23 gauge 0 .6mm or orange 25 gauge, 0.5mm) for injecting. This minimises discomfort.

6 Infiltration anaesthesia

Local anaesthetic can be given through the open wound edges providing that the wound is clean. Anaesthesia can be achieved using multiple small injections around the circumference of the wound or by infiltrating the edges of the wound externally through the skin.

Other techniques, such as ring blocks, can be used for digit injuries where the entire digit is anaesthetised. Inject slowly as rapid injection causes discomfort by distending the tissue.

Allow time for the local anaesthetic to take effect before starting the procedure and check with your patient.

6.1 Checks

Check that there are no contraindications to local anaesthesia and that the preparation is in date.

Calculate the maximum dose of local anaesthetic and ensure you have drawn up less than this.

Ensure that the local anaesthetic is not cooler than room temperature, as injecting cold fluid will increase your patient's discomfort.

Check if the local anaesthetic contains adrenaline.

Record that you are using a plain agent where adrenaline is contraindicated.

Record the name of the assistant you have checked the drug with.

6.2 Anaesthetising a laceration prior to suturing

Before administering local anaesthetic, the wound should be thoroughly cleansed.

Draw up local anaesthetic agent using a large diameter (e.g. green 21 gauge, 0.8mm) needle. Then remove the needle and discard it into a sharps container.

Change to the finest available diameter of needle for injecting. This minimises discomfort.

If you are happy that the wound is clean, you can inject anaesthetic directly into it under the wound margin.

Starting on one side of the wound advance the needle as far as possible under the wound margin. This will minimise the total number of injections required. Aspirate the syringe by pulling back on the plunger before infiltrating the anaesthetic to make sure that you aren't in a vessel. If there is blood in the syringe, withdraw and redirect the needle. Push the plunger down to infiltrate as you draw back.

Work your way around the wound margin in this way, beginning your next injection in already anaesthetised skin. Each time remember to aspirate before infiltrating.

Always remember to inject slowly, as rapid injection causes tissues to distend and is painful.

An alternative technique is to inject the area around the wound, through the intact skin. Where possible, this should be avoided as this will minimise your patient's pain.

Ensure you allow enough time for the local anaesthetic to take effect. For lidocaine wait at least one minute and for bupivacaine you should wait five minutes.

Test before starting the procedure. Pinch the tissues with your forceps, or gently touch the skin edges with a needle. If the patient feels sharp pain, more anaesthetic is required. Pressure sensation is not dulled by local anaesthetics. With adequate anaesthesia, the patient may still feel a sensation of pressure when you pinch the tissues with the forceps, but it should not hurt.

Once you are satisfied that the anaesthetic is effective, dispose of the needle and syringe in an approved sharps container.

6.3 Fan-shaped infiltration prior to removal of small lesion

You may be asked to administer local anaesthetic prior to removal of a small lesion and suturing of the resulting wound. A fan-shaped infiltration technique is recommended in this instance.

Mark the lesion, especially if it is deep or the patient has many similar lesions. This will ensure that you anaesthetise the correct lesion.

Inject the local anaesthetic in a fan-shaped pattern first from one side of the lesion and then the other.

Inject slowly, since rapid injection causes discomfort by distending the tissue.

Ensure that you inject deep to the lesion as well as to the tissue all around it.

6.4 Infiltration by encirclement prior to removal of large lesion

You may be asked to administer local anaesthetic prior to removal of a large lesion and suturing of the resulting wound. An encircling technique is recommended in this instance.

Inject local anaesthetic slowly and steadily, as rapid injection causes discomfort by distending the tissue. Use a series of steps around the lesion. With each new step you should be passing through skin that has just been anaesthetised by the previous injection.

You should take care to ensure that the deep aspect of the lesion is anaesthetised as well.

7 Ring block

A ring of local anaesthetic injected proximally at the base of a digit produces anaesthesia of the distal part. Understand and visualise the anatomy of the digit and its nerves.

A ring block takes longer to work than local infiltration. Ensure you anaesthetise the nerve territory completely. Always wait long enough for the anaesthetic to take effect.

Never use adrenaline. Never give a ring block to a patient with peripheral vascular disease or diabetes.

Never inject through infected skin.

Do not use too much fluid. This may cause pressure ischaemia. 1-3mL is usually sufficient.

7.1 Practise

Angle the needle towards the palm or sole and inject about 0.5 mL of local anaesthetic along one side of the digit.

Withdraw the needle partially and inject a further small quantity just deep to the skin, to anaesthetise any superficial nerve twigs.

Now repeat this process on the other side of the digit.

Avoid piercing the skin on the palmar/plantar aspect of the digit. Make sure your finger is not under the digit so that there is no risk of needlestick injury if you do inadvertently pierce the skin.