

# **SURGICAL OFFICE SKILLS (SOS) - LOCAL ANAESTHETICS**

## **LOCAL ANAESTHETICS**

### **PRELIMINARY READING**

Local Anaesthesia is an extremely useful tool in general practice. It can be used for a wide range of limited surgical procedures such as:

Excision of skin lesions, repair of wounds, drainage of abscess, removal of foreign bodies, excision of cysts and wedge resection and other procedures on the nails. It is a safe, time and cost effective technique. It reduced the risks of hospitalisation and the possible risk of cross infection and General Anaesthesia.

Most general practices and specialise clinics have suitable facilities, staff and equipment to allow the safe management of a variety of common problems.

The general objectives of the Video Book of Surgery and SOS is to encourage the primary care practitioner, in the city, rural and remote areas, to undertake simple procedures under Local Anaesthesia in the office. To this end the Surgeon has been writing, photographing and videoing to encourage the use of basic diagnostic, Local Anaesthetic and surgical skills via the use of this educational material and workshops. The information can be of use to surgical trainees who have limited exposure to these types of problems in the teaching hospitals.

These techniques with appropriate patient selection, the use of informed consent, together with careful post-operative management should lead to satisfactory outcomes.

Included in this series are:

The diagnosis and treatment.

Excision of:

1. Benign and malignant skin lesions including BCC, SCC and melanoma,
2. Repair of laceration – clean and dirty wounds,
3. Drainage of an abscess and haematoma,
4. Removal of foreign bodies,
5. Excision of sebaceous cysts, lipoma and other deep lumps,
6. Diagnostic techniques such as, punch biopsy, shave biopsy, and aspiration cytology.

Mr Brygel has designed and taken part in workshops to enable these procedure to be undertaken by promoting and demonstrating the use of Local Anaesthetic techniques, excision techniques, handling of instruments, suturing techniques and dealing with operative and post-operative problems.

## **PREPARATION PRIOR TO SURGERY**

The practitioner takes a careful history, examines the patient and makes a provisional diagnosis. The practitioner may then decide on suitable investigations, which may assist in the diagnosis or decide whether surgery is or is not required.

The decision as to who should perform surgery, where and what technique is to be used, is based upon:

- 1.** The surgical condition, its site and its relationship to vital structures and the extent of surgery required.
- 2.** The patient: Consider relevant aspects, such as convenience, anxiety, home help, child minding and even economic factors. The patient's general health, particularly respiratory, cerebral and metabolic disease, may affect decisions; the patient's build and the ease with which the surgical site can be exposed for surgery should also be noted.
- 3.** The patient's current medication may interact with anaesthetic agents or may cause problems during surgery or post-operatively. Such medication includes insulin, anticoagulants and anti-platelet drugs, anti-hypertensive and anti-anginal agents. Drugs used in treating asthma, and monoamine oxidase inhibitors for depression require special attention. Medication is especially important in the elderly patient.
- 4.** Past history: Previous problems with anaesthesia such as fainting and surgery may influence decisions regarding anaesthesia. Careful questioning should include allergies or sensitivity to either local anaesthesia, adrenalin or other medication.

## **TECHNIQUES**

The basic techniques of local anaesthesia in the office are:

- 1.** Topical Application: Anaesthetic agents can be applied as creams, ointments or sprays. They can be used on the skin, oral cavity, larynx, eye and urethra. For these purposes high concentrations are often required. Care must be taken because absorption through the mucosa is rapid, and can lead to toxic effects.
- 2.** Direct infiltration — into the surgical site.
- 3.** Field block to the area surrounding the surgical site.
- 4.** Ring block — a circumferential block of an appendage such as a digit, wrist or penis.
- 5.** Simple nerve blocks, particularly on the face, or a peripheral nerve. These techniques can be used to perform surgery on the head and neck, upper limbs, trunk, scrotum, peri-anal region and lower limbs. Local anaesthetic techniques can also be used for gynaecological procedures, e.g. a paracervical block.

## **LOCAL ANAESTHETIC MECHANISM**

Local anaesthetic agents act by reversibly blocking the passage of molecular ions through the nerve membrane. First, the finer nerve fibres of pain and temperature are blocked, then those of proprioception, followed by nerve fibres affecting the sensations of touch and pressure, and finally those involved in motor function.

This sequence is of practical significance. Patients should be told that during the procedure they may feel touch, but there will be no pain. The anaesthetised part will be insensitive to temperature, and the patient is therefore at risk from burns in the post-operative period. The use of a hot water bottle on the surgical site should be avoided. With paralysis, particularly of a limb, joints may be injured unless the anaesthetised area is immobilised, or the patient is kept in bed until the block has worn off.

## **AGENTS**

A wide variety of agents are available. There are two main biochemical groups: the **amides** and the **esters**. Alteration of molecular structure affects the onset of action, solubility, stability, duration of action and relative toxicity. Two agents are used almost exclusively in this series of programs: Lignocaine (Xylocaine) and Bupivacaine (Marcaine). Both are amides and both are ideally suited to modern packaging and sterilising techniques.

In the office this surgeon only uses Lignocaine. It is an advantage to have a command of the use of one or two agents rather than a number of agents. The practitioner will then be fully aware of the characteristics of the familiar drugs including dosage and the speed of onset of action.

## **LIGNOCAINE**

Lignocaine, in particular, has a rapid action. With local infiltration it acts almost immediately. It has a slight vasodilator effect, and as a result is rapidly absorbed. It is commonly used with adrenaline, which decreases the rate of absorption and prolongs the effect of Lignocaine. Delay in absorption also reduces the risk of toxicity and allows a larger dose to be used.

Following absorption, Lignocaine is broken down in the liver by the enzymic amidase. A small amount is excreted unaltered in the urine. Local anaesthetic agents can accumulate in the circulation. Their elimination depends on tissue perfusion, circulatory state, hepatic and renal function. Differences can occur between patients even of the same body size. With clinical judgement, these factors should be taken into account and an appropriate margin left for safety.

The generally accepted safe maximum dose for plain Lignocaine is 4mg/kg — approximately 300mg in a healthy 70 kg patient. When Adrenalin is used, 7mg/kg is the recommended maximum dosage — approximately 500mg. These doses are only guidelines.

## **BUPIVACAINE**

Bupivacaine has a much longer duration of action (4 hours) with the advantage of prolonged post-operative pain relief. This enables the patient to become mobile earlier and reduces the amount of parenteral narcotic required. Bupivacaine is bound to the tissue longer — making toxic effects more difficult to counteract. It also depresses the heart to a greater extent than lignocaine. Safe doses are 2mcg/kg: 0.5% solutions. Bupivacaine is not a vasodilator. Adrenaline does not increase dose allowed.

## **ADRENALINE**

Adrenaline causes vasoconstriction, which prolongs the action of local anaesthetic by decreasing the rate of absorption, which reduces the risk of toxicity. Adrenaline is usually used in a pre-mixed solution, although it may be added to a plain solution just before injection. Adrenaline is used with agents such as Lignocaine, which are shorter acting and have some vasodilating effect. Where patients have poorly controlled hypertension or severe coronary artery disease, the dose of Adrenaline should be reduced or omitted.

Adrenaline has the additional advantage of decreasing bleeding, reducing blood loss, improving operating conditions, but haemostasis should still be obtained.

The procedures demonstrated in Surgical Office Skills usually involve only anaesthetising a small area, e.g. excision of a small skin cancer. Where a large area of anaesthesia is required, regional anaesthesia may be more practical, i.e. a major nerve can be blocked without using an excessive amount of local anaesthetic. This requires a more experienced surgeon, possibly sedation and hospitalisation.

## COMPLICATIONS

Some patients are very apprehensive about injections, possibly due to previous poor experiences. A history of fainting or pain due to an unsuccessful administration of local anaesthesia is often encountered. Ask specifically about dental anaesthesia. Careful explanation of the reasons for and advantages of local anaesthetic will usually reassure the patient. But generally give patients an option for hospitalisation.

1. Fainting is a common problem in apprehensive patients. Fear may be so intense that the patient becomes sweaty and has a vasovagal attack, sometimes even while discussing the prospect of surgery. There may be a history of previous fainting episodes during dentist treatment. Surgery in a suitable office setting, with the patient recumbent, will not avoid all problems, but certainly can minimise them.
2. Allergic reaction to local anaesthetic agents is rare but does occur, and can be fatal. Any shortness of breath, itchiness and swelling should be taken seriously. Prompt and effective treatment with adrenalin is essential and best administered slowly intravenously as a 1:10,000 solution (an IMS MINIJET preparation is available).
3. Equipment failure is rare with modern packaging techniques. Infection due to poorly sterilised equipment, or from leaving a needle in situ should never occur.
4. Toxicity is determined by the concentration, the total dose and the rate of absorption or accumulation in the circulation. Inadvertent injection directly into the vein, described as a 'bolus' effect, is most dangerous. A 2% solution, (200 mg in 10 ml) is more likely to cause a toxic affect than 200 mg given as a 1% solution, (200 mg in 20 ml) particularly if inadvertent intravenous injection occurs.

Sequelae may occur almost immediately without any warning, or may slowly develop, with early warning signs. Minimal signs of toxicity often go unnoticed.

The earliest signs of a relative overdose with lignocaine are numbness, particularly around the lips, twitchiness, then focal convulsions or a full convulsion, loss of consciousness, with cessation of breathing and possibly cardiac arrest.

All agents, but particularly, Bupivacaine<sup>®</sup>, reduce myocardial excitability and prolong conduction time; some have a vasodilator effect. This may lead to a fall in blood pressure, depression of the myocardium, and can directly cause cardiac arrest.

Respiratory effects, e.g. changes in the respiratory rate, are usually secondary to the affect on the central nervous system. Early manifestations of drowsiness or excitability, altered or slurred speech, must be taken seriously. Differing agents have a different propensity to cause adverse effects.

Sedation may reduce the risk of convulsion, whereas early release of a tourniquet may exacerbate the possibility. The risks of toxicity are reduced by careful administration, minimal affective dosage and repeated aspiration to ensure the injection is not given as a bolus intravenously.

5. Infection: local anaesthetic is less effective in the presence of infection. An injection of local anaesthetic into an infected site e.g. for the drainage of a small abscess, is common practice. There is the theoretical possibility when injecting the local anaesthetic of spreading the infection for this reason. Some surgeons prefer a field block, rather than direct infiltration. A major nerve block in the area of the spinal canal is definitely contraindicated when infection is present.

Local anaesthetics are less effective in infected areas, because the lower PH present in the tissues favours the enzymic hydrolysis of the local anaesthetic, and the greater blood flow increases absorption of the local anaesthetic. Antibiotics should be used in the likelihood of spreading infection.

Local anaesthesia is an extremely simple and useful method for a wide range of procedures. The practitioner who is skilled in the various techniques has a great advantage in surgical management.

## CONCLUSION

### KEY CONCEPTS AND PRACTICE TIPS

- Ensure adequate facilities, equipment and assistance.
- Resuscitation equipment must be in hand.
- Assess the patient regarding suitability for the procedure (in the particular setting) and if sedation is required.
- Medical and psychological conditions may preclude some patients.
- Infants and younger children do not cope with operations under local anaesthetic.
- Ensure patient comfort and understanding — before, during and after the procedure.
- The commonest alarming problem is a vasovagal or fainting episode.
- It is advisable to set up an intravenous line prior to performing a major nerve block.
- A thorough knowledge and understanding of one or two local anaesthetic agents is better than a superficial knowledge of many.
- Never use more than the recommended maximum dose of local anaesthetic agent. (4mg/kg for plain lignocaine and 7mg/kg, when Adrenaline is used in conjunction with lignocaine).
- Check carefully, that the correct solutions and volumes are used.
- Most skin lesions can be removed with less than 4 ml of local anaesthetic agent.
- Avoid injecting large volumes in the fingers and tight compartments, where the circulation may be impeded.
- Do not use adrenaline in digital nerve blocks as the fingers and toes are supplied by 'end-arteries' which vasoconstrict intensely. Gangrene may occur.
- Avoid inadvertent intravenous injection by aspirating before injecting.
- Dental syringes (which preclude aspiration) should only be used for superficial injections. The point of the needle must be moved while injecting to avoid inadvertent intravenous injection.
- Dental syringes (which have cartridges and fine needles) allow easier control of the volume injected.
- Fine needles produce less pain, reduce the rate of injection, and the volume required.
- Inject around and deep to the lesion to be excised. Do not inject directly into the lesion.
- Intradermal injection of local anaesthetic causes some pain initially but produces a rapid onset of anaesthesia.
- In wounds, injection through the wound into the adjacent subcutaneous fat minimises discomfort.
- Inject the local anaesthetic agent slowly. Rapid injection may produce a bolus effect and increase the chance of toxicity.
- Allow sufficient time for the local anaesthetic agent to act, rather than injecting more, too soon.
- A potential complication, with the use of local anaesthesia, is the spread of existing infection. Use of contaminated equipment may introduce infection.
- Local anaesthesia is less effective in the presence of infection.
- After completing the procedure, ensure that the patient does not change posture suddenly. Sit the patient up slowly to prevent fainting.
- Do not allow the patient to drive a vehicle after the procedure. Ensure appropriate transport home has been arranged.